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Research on the Mutual Financial Institutions: Comparative Study

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Contents

List of Table

List of Figure

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Abstract

The purpose of this thesis is to examine the feature of mutual financial institutions, specifically comparing Japanese financial institutions, commercial banks and mutual institutions (credit associations and credit cooperatives). In addition the thesis discusses whether there are any differences between the bank-based (Japan) and market-based (United States) financial systems. The sample periods are from 1999 (2001) to 2005 or from 2001 to 2007.

Although the important economic role played by mutual financial institutions is widely recognized, researchers have paid them little attention due to the small size and impact of their customers in the whole economy. Nevertheless this research focuses on the importance of small and medium-sized firms' financial industry in the economy, approaching the issues from a variety of perspectives.

There is not a great deal of existing literature that examines financial institutions in several different countries over the same period. In fact this is the first systematic piece of research to analyze the differences between mutual financial institutions depending on the economic conditions prevailing in the countries in which they are based.

The datasets in this dissertation on Japanese mutual financial institutions and commercial banks are taken from financial statements for each institution (1999-2005) and from the Japanese Bankers Association (2000-2007) respectively. This is the period in which the reforms implemented after the bursting of the Japanese economic bubble were mostly completed. It is useful to consider the economic recovery process. As for the US financial institutions, the datasets are taken from Bankscope database.

At the empirical level the following models are supplied: for market structure ((a) SCP and efficiency hypothesis and (b) Panzar-Rosse H statistics) and for cost structure ((c) cost efficiency and (d) economies of scale). A key distinguishing feature of this paper is its discussion of two features, the market and cost structure, regarding commercial banks and mutual financial institutions.

Our empirical results showed that the market structure of mutual financial institutions in Japan and the US exhibit different features, depending on the economic conditions. In fact, Japanese mutual financial institutions supported the efficiency hypothesis, but those in the US followed the SCP hypothesis. However, in both countries, the competitiveness of mutual institutions was lower than that of commercial banks. As for cost structure, there were similarities between Japanese and the US mutual institutions. It is probably the case that this result derives from the organizational characteristics of mutual institutions. Nevertheless, this does not mean all mutual financial institutions would converge upon a similar cost structure. This thesis will propose that the institutions in question need to satisfy certain conditions such as the size of institution and the range of customers.

Chapter 1 Introduction

1.1. Motivation

The world economy is still suffering from the shock of the economic downturn that had its roots in the subprime loan crisis in 2007. However, the Japanese economy experienced the expansion and then bursting of its bubble economy about 20 years ago and was in the very early stages of recovery when the global recession began. For this reason, the Japanese economy can be considered a model case to settle down the worldwide recession. However, it is still difficult to judge whether the reform policy at that time was the best or the wrong policy, due to the time lag of the policy spreading effect. In particular there is little literature analyzing the financial institutions working with small and medium sized firms, since the policy spreading time to small firms could be longer and they are strongly influenced by the conditions in their regional areas.

Nevertheless, for economic recovery and the development of new business, it is necessary for small and medium-sized firms to generate creative ideas and original skills. It is likely that the recent development of the venture market might provide evidence of this. We believe, accordingly, that financial institutions for small and medium-sized firms have had an important role in the whole economy.

Although this thesis focuses on the financial institutions for small firms, small and medium-sized firms generally have a large informational gap between borrowers and lenders due to the asymmetric information problem. One of the important points in the research on the small firms' financial institutions, therefore, is the way that financial institutions solve this problem. Some of the literature argues that one of the methods for this problem is the relationship lending, and in fact, mutual financial institutions use this method mainly. Mutual financial institutions such as credit associations and credit cooperatives can effectively collect the information of customers, through supplying deposit accepting and loan offering services on the basis of membership contract. Credit associations and cooperatives can solve asymmetric information problem more effectively through creating the human relationships with local community and residents than the monitoring method by commercial banks. Besides, as the membership of credit associations and cooperatives is restricted to a certain range of region, they have also been necessarily required to discover and support the high-potential firms and venture enterprises. These roles would be more important. In other words, if it is assumed that small and medium enterprises could become more essential in the economy, consequently, mutual financial institutions supporting specifically these firms also have more crucial role in the future. From this reason, this dissertation focuses on the mutual financial institutions, and reveals their features.

In addition, there is another purpose in this dissertation to clarify the impact of macro economic conditions to the management of mutual financial institutions. It is widely considered that the organizational form such as mutual financial institutions can be affected strong impact from macro economy because they particularly focus their customer target on individuals and small firms. Macro economic impact in local area goes to the business condition of individual consumers and small firms quickly, and then, financial institutions having close relationship with these customers also have some influence in their management. On the other hand, it is also considered that financial institutions change their lending style depending on the financial behavior of their customers, for example, if they originally prefer the loans from banks, or the direct investment through security companies. For these points, the same empirical estimations are operated to the US mutual financial institutions such as savings and loan institutions (S&Ls) and credit unions. Japanese economy has experienced the severe recession since the 1990s and takes the bank-based financial system, while the US economy enjoyed economic boom during the sample period from 1999 to 2005, and accepts the market-based financial system. By applying the same tests to these different countries, it is possible to discuss the feature of mutual financial institutions objectively.

1.2. Structure of the thesis

Below we provide a brief overview of the structure of this thesis, summarising the scope and contents of each chapter. Chapter 2 examines the recent behaviour of mutual financial institutions in Japan.

The Japanese economy experienced a boom in the 1980s, which came to a sudden end in 1990 due to the meltdown of real estate and stock prices, after which Japan entered its worst recession since the Second World War in the 1990s. In this period the Japanese government reformed the financial system and the number of banks in the market was reduced. According to the government, since 2000 there have been positive signs of a gradual recovery. This chapter considers the performance of mutual financial institutions across the whole Japanese financial system during such a sensitive period.

Chapter 3 describes a number of recent trends affecting the structure of the US mutual financial industry since the 1990s. Saving and loan institutions (S&Ls) and credit unions are taken as examples, and the importance of these institutions in the US financial industry is discussed. The US financial industry experienced recession and the easing of regulations in the 1980s, and then a period of relative boom in 1999-2005, which is the period analysed in this thesis. This chapter refers to literature on the properties of the US mutual financial institutions.

Chapter 4 reviews previous literature on the development of the functions of financial institutions. In traditional economic theory the three functions of financial intermediaries are (i) asset transformation, (ii) credit creation and (iii) financial settlement. With the development of informational economics since the 1970s there has arisen the idea of an informational gap between borrowers and lenders (asymmetric information problem) and of financial institutions playing the role of reducing this gap – the informational production function. This chapter mainly considers two methods for solving the problem of informational gap, relationship lending and transaction lending, with reference to some previous literature. (Berger and Udell (2002))

The main objective of Chapter 5 is to provide a detailed analysis of SCP and the efficiency hypothesis in Japanese financial institutions. The chapter begins by outlining the early development of the theory of market structure, and then provides empirical results for financial institutions in Japan. By analysing not only profit-making firms but also non-profit making firms, market differences depending on organizational form are considered. The significance of geographical location for market structure in mutual financial institutions is also covered.

Chapter 6 investigates the market competitiveness of Japanese financial institutions as another aspect of market structure. The question of what effects organizational form has on market competitiveness is considered, for example by looking at Panzar-Rosse H statistics. Like Chapter 4, this chapter also discusses the impact of economic conditions in each local area.

Chapter 7 describes the methodology employed for measuring the cost efficiency and economies of scale as cost structure, and provides the estimated results for Japanese financial institutions. It is likely to be that organisational form and economic conditions could affect their internal factors such as cost structure. The empirical results of these measures for Japanese commercial banks and mutual financial institutions are reported, and the implications of the recent economic recovery are suggested.

Chapter 8 reports some results for market and cost structure for US financial institutions, and offers brief comparisons between mutual financial institutions in Japan and the US. The Japanese financial industry mainly adopts the bank-based system for business fundraising, while the US banking industry follows the market-based system (Demirgüç-Kunt and Levine (1999), Degryse and Van Cayseele (2000)). Also, the US economy was experiencing strongly favourable conditions during the sample period. This chapter mainly describes the impacts of these systemic fundamentals and of economic conditions on mutual financial institutions in Japan and the US.

Chapter 9 finishes by drawing some overall conclusions from the analysis conducted during the thesis.

Chapter 2 Analysis of mutual financial institutions in Japan[1]

The economic environment of the financial industry in Japan has changed dramatically since the collapse of the bubble economy. The Japanese economy had enjoyed a bubble boom in the late 1980s, and the financial authorities had encouraged it by adopting a loose monetary policy. Stock and land prices were brought down in 1990, triggering the financial collapse, or 'bubble burst' as it is known in Japan. As a result, with these circumstances making it difficult for borrowers to pay back interest on loan, many financial institutions have suffered from an increase of nonperforming loans since the 1990s.

Since 2000 the effects of policies for economic recovery have been finally observed. They are called the monetary easing policy, and include the reform of financial system, low interest rates policy and postal service privatization. Consequently, the Japanese economy has gradually shown some signs of economic recovery.

In this economic situation, mutual financial institutions have also been enduring difficult business conditions and have encountered stiffer competition such as hostile takeovers and bankruptcy. However, the importance of medium and small companies is recognized again since the recent economic recovery. Thus, financial institutions for small businesses, which mainly trade with small firms, have also been confirmed as a crucial entity.

The main purpose in this chapter is to argue about the role of mutual financial institutions in Japan. Three steps will be considered as follows: (i) Japanese macroeconomic change in the last 30 years, (ii) the effect of macroeconomic change on commercial banks, (iii) the effect of macroeconomic change on mutual financial institutions.

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[1] In this dissertation, the name, 'mutual financial institutions' is used equally as the 'cooperative financial institutions'.

2.1. Macro economic change in Japan

Regarding the occurrence and collapse of the bubble economy in Japan, Okina and Shiratsuka (2001) offered a detailed analysis. They argued that one of the main reasons for the bubble economy in the 1980s was the shift of large companies from indirect to direct financing, called 'disintermediation'. As securities business operations by the banking industry had not been permitted at that time, many banks felt concerned by the disintermediation by large companies. Banks, therefore, started aggressively offering loans to small businesses, especially mortgage collateral loans and the property-related loans at low interest rates.[2]

Due to the low-interest loans by banks, general price levels had kept remained and economic growth had gradually increased. In addition, the asset prices of some industries, such as real estate business and non-banks, had increased rapidly. This is why the period between the second half of the 1980s and the beginning of the 1990s is known as the bubble economy in Japan.

However, Japan's central bank (The Bank of Japan) was concerned about the dramatic increase of land commodity prices. It therefore took applied monetary restriction policies on several occasions, raising the official discount rate from 2.5% to 6.0% (Figure 2.1). In response to these restriction policies, the asset prices had started falling rapidly after the peak in 1989-1990, and then the land and stock prices dropped for the long term (Figure 2.2). This period is known as the bubble burst in Japan.[3] Since 1990, the Bank of Japan has moved to a quantitative easing policy in order to avoid a serious business depression. Ugai (2006) provides a temporal evaluation for this policy.

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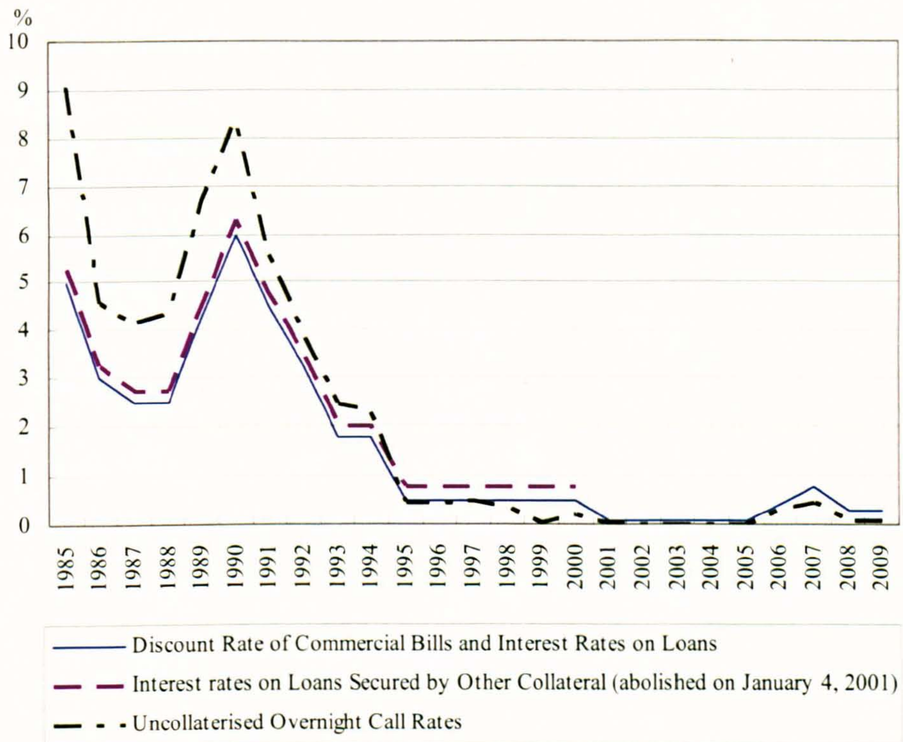
[2] These low interest loans would hold larger credit risks, compared with the expected profits. Okina and Shiratsuka (2001) assessed that it made a serious problem for banks to offer most of their endings only to certain ranges of industry such as real estate businesses and non-banks.

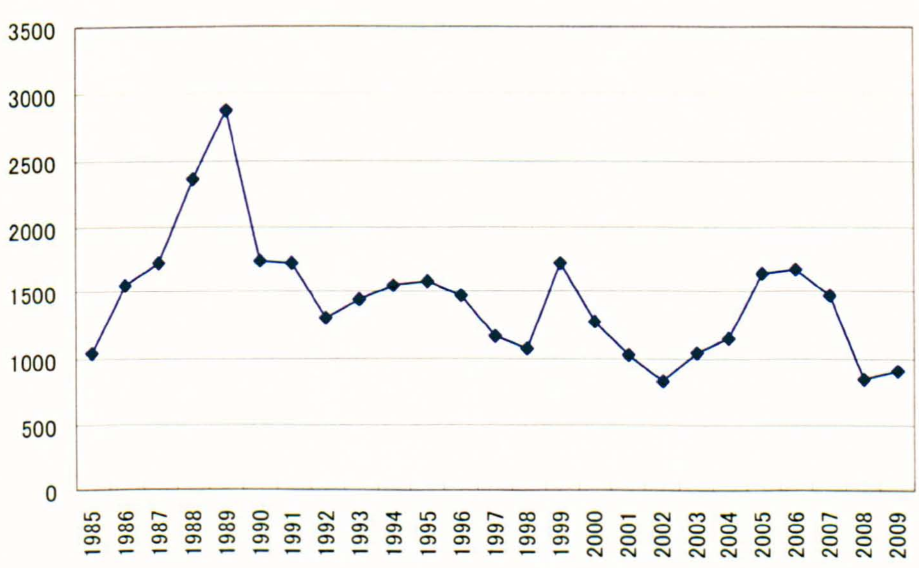
[3] Okina and Shiratsuka (2001) suggest that some other structural problems in Japan caused the long –term recession; (a) inefficient industries such as non-traded commodity industry, (b) business-management systems that were non-adaptive to environmental changes, (c) an imbalance between savings and investment (Maeda, Higo and Nishizaki (2001)).

Figure 2.1 Basic Discount Rate and Basic Loan Rate in Japan (formerly referred to as the Official Discount Rate)



Note: (i) The interest rates on loans secured by other collateral is abolished on 4th January 2001. Two interest rates were unified as 'The Basic Discount Rate and Basic Loan Rate'. (ii) The values are in the end of period.
Source: Bank of Japan, Financial Economic Statistics Monthly Report.

Figure 2.2 Tokyo Stock Exchange Price Index (Year 1968 = 100)



Source: Tokyo Stock Exchange

Ugai (2006) considers that the quantitative easing policy in the 1990s by the Bank of Japan had a positive impact on the economy. In particular, these policies created good conditions for the corporate banking industry and drove financing costs down significantly in the financial market. Since the bubble burst the Japanese economy had not shown signs of health for a long time, despite of the low interest rate policy.[4] The Bank of Japan therefore carried out the quantitative easing policy in order to stop prices declining and to build a foundation for economic growth. This policy consisted manly of three pillars:

(i) The instrumental target in the financial market is changed from the overnight call rate to the outstanding amount of checking account in the Bank of Japan, and its amount is required to keep supplying to the market much more than the needed amount.

(ii) The Bank of Japan would keep supplying these funds until the percentage rise in the consumer price index (CPI) reached a stable rate above 0 % year-over-year.

(iii) The amount of bond purchases, up to a ceiling of bank notes' outstanding issue, would be increased in the case of necessity for the stable fund provisions to the checking account in the Bank of Japan.

Ugai (2006) examined three aspects of the effect of the quantitative easing policy: (a) the effect on the predicting process of the short-term interest rates from the quantitative easing policy, (b) the effect of enlargement of the balance sheet of the Bank of Japan by the increase of the fund provision, and (c) the impact on the change of asset portfolio by increasing the amount of long-term national bonds as buying operation. As a result, Ugai (2006) concluded that the quantitative easing policy totally achieved some effects in the economic recovery.

[4] The official discount rate has been set at almost in 0% since September 1995.

2.2. Effect of macroeconomic change on commercial banks

2.2.1. Classification of financial institutions in Japan

The financial industry in Japan is derived into three main categories: private financial institutions, government financial institutions (public financial institutions), and foreign financial institutions. Also financial institutions are divided into depository and non-depository institutions, depending on the difference of function.[5] [6]

In general the private financial system in Japan has developed through segmentation and specialization. There are therefore many kinds of private financial institutions in Japan: (i) commercial banks, (ii) long-term financial institutions, (iii) financial institutions for the agricultural and fishery industry, (iv) financial institutions for small and medium businesses. The commercial banks are mainly focused on short-term lending, and grouped into four categories; city banks, regional banks, second regional banks, and foreign banks. The second group is targeted on long-term finance, and consist of long-term credit banks and trust banks.[7] The third type includes the members of the agricultural forestry central bank. The fourth refers to credit associations, credit cooperatives, labour credit associations, and commercial and industrial central banks.

[5] Government (public) financial institutions are instituted to respond to the customers to whom the private financial institutions cannot offer loans. These institutions are National Life Finance Corporation, Japan Finance Corporation for Small Business, Shoko Chukin Bank, Japan Bank for International Cooperation, Development Bank of Japan, Agriculture, Forestry and Fisheries Finance Corporation, Okinawa Development Finance Corporation, and Japan Finance Corporation for Municipal Enterprises at the time of March 2007.

[6] Non-depository financial institutions stand for insurance companies, finance companies, securities investment trust sales management companies, and money market / foreign exchange brokers.

[7] There were only two long-term credit banks in Japan. However they transferred into ordinary banks in 2006. As a result, the long-term financial institutions have become only trust banks.

Figure 2.3 Type of private financial institutions in Japan (at 2006.3.)

(a) Commercial banks

→City banks (6), Regional banks(64), Second-tier regional banks (47), and foreign banks (32), Shinsei bank

(b) Long-term financial institutions

→ Aozora bank (1), and Trust banks (7)

(c) Agriculture, Forest and Fisheries financial institutions

→ Agricultural and forestry central bank, Farmer's co-operatives (855), Credit fisheries cooperative joint association (32), Fisheries cooperatives (194), National farmer's cooperative associations, and Farmer's cooperatives (42)

(d) Financial institutions for small businesses

→ Shoko Chukin Bank, Shinkin Central Bank, Credit associations (292), National Federation of Credit cooperatives, Credit cooperatives (172), Industrial Bankers Associations, and Industrial Credit cooperatives (13)

Commercial banks take a stock company form, mainly providing short-term lending, and they comprise city banks, regional banks, second-tier regional banks, and foreign banks residing in Japan. Focusing on the domestic banks, city banks are the ordinary banks, with head offices located in large cities such as Tokyo or Osaka, and with a nationwide network of branches. City banks account for a quarter of the total amount of funds in all financial institutions. Regional banks have head offices located in each prefecture, and carry out business in each local region only. Regional banks account for almost 10 percent of the total funds of financial institutions. Second-tier regional banks were originally the mutual banks, and they transferred into the ordinary banks all together in February 1989. Although second-tier regional banks are categorized into local banks in the same way as regional banks, they are included in different categories due to the different constitution process.

Long-term financial institutions (Aozora bank) mainly offer long-term funds, and do not deal with ordinary savings accounts, unlike the other ordinary banks. Long-term financial institutions principally offer long-term loans to large companies, and their main fund resource is debts. Trust banks make profits to carry out for asset management business and the fiduciary business. Agricultural, forest, and fisheries financial institutions are institutions supporting both production and consumption activities of people working in agricultural, forest, and fishery businesses. They offer the financial service as the part of supporting activities for them. These financial institutions are similar in that both savings and loan services are offered, but differ from commercial banks in targeting only certain types of customers.

Financial institutions for small businesses are focused only on small businesses. In general, small companies cannot raise money in the capital market through equity or corporate bonds. Thus, small firms need to borrow funds from the financial institutions. However, for the financial institutions, lendings to small businesses, rather than large ones, constitutes a relatively high risk. Small business finance was not managed well in Japan before the 1800s, although small businesses were in an important position for the national economy. Therefore, a variety of proper financial institution for small businesses has been established since the 1900s. At the moment there are credit associations, credit cooperatives, industrial bankers' associations, and industrial credit cooperatives in Japan as small business financial institutions.

2.2.2. Recent conditions in commercial banking industry

Before examining the mutual financial institutions it is necessary to make a comparison with commercial banks in Japan, the recent features of which will therefore be analyzed in this section.

Yoshikawa, Eto and Ike (1994) pointed out that the commercial banks were still in a difficult economic condition in the first half of the 1990s. Yoshikawa *et al.* (1994) mainly represented two points from the hearing investigation to city banks and public financial institutions, and from the results of the regression analysis with bank data (city banks, regional banks, long-term credit banks and trust banks); (i) it was difficult to observe any sign of 'credit crunch' for small businesses due to nonperforming loans. It is therefore suggested that one of the main reasons for the decrease in loans to small businesses would be the reduction of the borrowing demand. This reduction is derived from the business depression, and (ii) there are, however, some possibilities that the nonperforming loans have some negative impact on offering the loans in the level of financial institution and borrowers' business. Finally, they concluded that the commercial banks were in a bad condition in the first half of the 1990s due to the nonperforming loans from the burst bubble.

Taniuchi (1997) assessed the competitive conditions in commercial banks in the second half of the 1990s. By examining data from the balance sheet of each financial institution he found that banks at the time had significantly decreased loan offers. Also, he insisted that one of the main reasons for the increased nonperforming loans was tight regulations on the financial sector until the 1990s. He also argued that the relaxation of regulation, including the consolidation of small and weak institutions, need to be practiced intensively.

Woo (1999) analysed (i) the degree of the credit crunch behaviour by commercial banks and (ii) the effect of monetary policy, from the bank data in 1997. He did not find any significant result that the credit crunch blocked the effect of low-interest monetary policy in the early 1990s. However, the existence of the credit crunch hypothesis was found from data of 1997, and the main reason was regulation, which was strengthened in 1997, against the moral hazard behaviours of banks.[8] [9] As a conclusion it was expected that the commercial banking industry was still in difficult circumstances in 1997.

After the bubble burst in 1989 or 1990, all financial institutions, including commercial banks, were in a serious economic predicament. However, economic circumstances gradually improved from early 2000 because of the long-term easy monetary policy.

Using data from 87 major banks, Ito and Sasaki (2002) investigated the effect of the Basel Capital Accord on the banking industry between 1990 and 1993. They also examined the impact of the bubble burst in the same period. The empirical results showed that banks had cut down lending

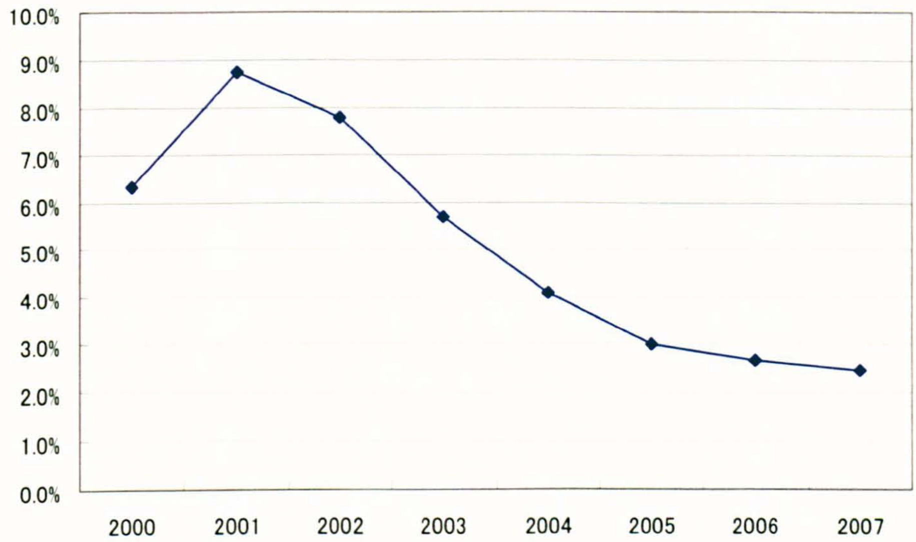
[8] In 1997, the "Prompt Corrective Action (PCA)" framework was published by the Japanese authorities under the "Law to Ensure Financial Institution Soundness".
[9] See Woo (1999), p.13.

and issued more subordinated debts in order to satisfy the criteria of the Risk Based Capital (RBC) standard, because the figure of capital adequacy ratio of the banks had substantially declined in the period. They also argued that trust banks reduced loans due to the impact of nonperforming loans. As a result, they also concluded that the banking industry was in a serious situation in the first half of the 1990s.

There are several studies discussing the impact of the quantitative easing policy since 2001 to financial institutions. To examine the effect of the quantitative easing policy on banks, the hypothesis by King (2002) has been often employed. The hypothesis considers that the excess supply of liquidity services by the central bank will decrease the fund restriction in the private sector, reducing the transaction cost of the financial assets in the capital market. Baba, Nakashima, Shigemi and Ueda (2006) demonstrate that risk premium to financial institutions having many non-performing loans fell significantly due to the quantitative easing policy. That is, the anxiety of cash crisis of financial institutions is resolved by the quantitative easing policy. It was also argued that the relief of anxiety derives another good effect in order to avert further economic deterioration and to keep stable market conditions.

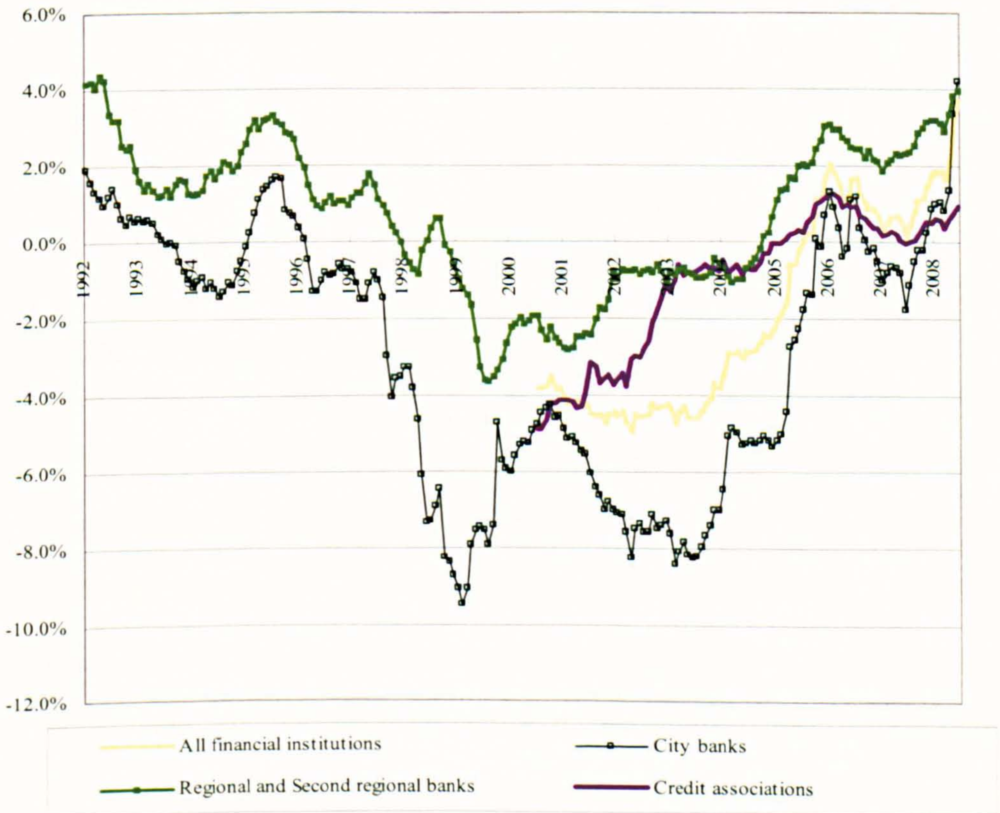
The Bank of Japan (2006) assessed whether the banking industry in Japan has started recovering. In fact, the Bank of Japan (2006) found that the ratio of bad loans in their total loans has significantly decreased since the corporate sectors have improved their business performances (Figure 2.4). The quality of the loan portfolio drastically modified and it increased bank profits. These conditions lead to the fact that both major banks and regional banks have attained positive profits since 2005 as shown in Figure 2.5.

Figure 2.4 Ratio of risk-management loan to total credit in all banks (%)



Source: Japanese Bankers Association, Announcement of financial statements of all banks (each year).

Figure 2.5 Bank lending, movements in average balance (%, year-to-year basis)



Source: Bank of Japan, Statistics database

Also, banks have gradually increased equity capital with the additional retained earnings and new access to capital. It is, therefore, considered that the reinforcement of capital has eventually been attained by controlling of many risks.

In addition, the Bank of Japan (2006) reported that the Japanese banking industry has developed successfully other financial products, apart from loans. In fact, banks have adapted a productive stance towards fee businesses such as investment trusts, personal pension insurance, sales of derivatives and securitization services. The reason is the following exogenous factors occur in the market: the internationalization in the business activities, the increase of M&As, and the diversification of needs to asset management by the household sector. As a consequence, the weight of non-fund profit to total profit in the banking industry has gently enlarged. As stated in the previous literature, most data trends clearly explain that commercial banks in Japan have totally recovered from the severe economic depression. The next question we must consider is whether these economic improvements of the financial industry have become similarly widespread in the other financial institutions. Accordingly, the purpose in the next section is to consider the recent competitive conditions in the mutual financial institutions.

2.3. Effect of macro economic change on mutual financial institutions

The aim of this section is to examine whether the role of mutual financial institutions is becoming more important in the recent economic conditions. The mutual financial institutions were originally founded with a different purpose from commercial banks. Accordingly, it would be expected that these institutions encounter different competitive circumstances. In this section, firstly, in order to declare the differences of mutual financial institutions from commercial banks, the establishment process of credit associations and credit cooperatives in Japan is indicated. Secondly, the features in the regulations are discussed. Taking this knowledge into account, thirdly, the role of mutual financial institutions is considered from Muramoto (2005) in the theoretical aspect. Fourthly, the competitive environment in the mutual financial industry is shown from FSA (2003). Finally, some other approaches with respect to the competition of mutual financial industry, such as those by Susaka and Naruse (2003) and Mashita (2004), are revealed.

2.3.1. Features of credit associations and credit cooperatives: Purposes of establishment

To properly understand the importance and the speciality of credit associations and credit cooperatives, it is necessary to know about the process through which these institutions were established. Why were credit associations and credit cooperatives required in Japan?

Since the second half of the 19th century[10], the Japanese government had promoted a rapid industrialisation policy under capitalism. The policy, however, was so rapid that commercial banks transferred the funds from the countryside only to urban area. Therefore, in countryside communities the gap between the rich and the poor widened significantly, and it made the rural economy declined. The Japanese government at the time deemed that the cooperative financial institutions needed to be established in order to improve the life of common people living in rural areas.[11] Therefore, the Industrial Association Law was enacted in 1900 and the Credit Cooperative Unions were established. (Shinkumi Federation Bank (1976))

After World War Two, the General Head Quarters (GHQ) promoted decentralization to enforce the principle of democracy. And an approval for the de novo credit cooperatives became easily accepted only by reporting the notice to each prefecture. Consequently, a large number of new credit cooperatives were established after the war. They took different management principles from the conventional one (c.f. no prohibition of dual employment to business manager). The conventional credit cooperatives changed their name to "credit associations" all together, because they did not prefer to identify with the de novo credit cooperatives. The credit associations were instituted in 1951

[10] It was the period when Japan started accepting new cultures from European countries after the national isolation policy.

[11] These cooperative financial institutions followed the case of credit unions in Germany, which limits the business area or the lending target. Also, it takes an operational principle of one-member one-vote, as a cooperative organization.

as a cooperative institution directly controlled by the Finance Ministry.[12] (Shinkin Central Bank (2002))

The important point is that both credit associations and credit cooperatives were established not for profit but for mutual help, namely, for the development of their communities. This principle of the mutual institution would be basically the same as the role of relationship lending, which has actively been discussed in some academic journals recently (c.f. *Journal of Financial Intermediation*, 2000, Vol.9 [13]). Although a full discussion will be presented in the following section, the relationship lending means a way that financial institutions would obtain and accumulate the 'soft' information of borrowers, by making long-term and close relationships with their customers. Consequently, they can have greater advantages by using this soft information than the other financial institutions without a relationship. In other words, it means that the cooperative financial institutions directly carry out the relationship lending rather than commercial banks.

In the next part, the legal features of the cooperative financial institutions are considered in order to make clear the effects of the mutual help principle in the institutions.

2.3.2. Features of credit associations and credit cooperatives: Legal aspect

Since the exception credit associations and credit cooperatives have been expected to play a different function from commercial banks. Even in recent years, the behavioural objective is clearly expressed in the business policy of each cooperative institution, and it is important to discuss the reason for the existence of credit associations and credit cooperatives. For the achievement of their purpose, with respect to the form of corporate governance and regulations, special circumstances are given by the

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[12] At that time, most of the other financial institutions changed their names into banks (mutual aid credit company → mutual bank, trust company → trust bank). However, people working in credit unions did not accept to use the name "credit bank" because they did not prefer to be a cash-oriented institution. Thus they chose to use a new name 'associations (KINKO)' which was originally used only for the government-affiliated financial institutions.

[13] See Boot (2000), Degryse and Cayseele (2000), Longfer and Santos (2000) and Ongena and Smith (2000).

regulatory authority to cooperative financial institutions such as credit associations and credit cooperatives. In this section, the special character of the cooperative financial institutions is discussed.

As cooperative financial institutions, credit associations and credit cooperatives have legally approved status as intermediate corporations, unlike commercial banks as stock companies. In general, the intermediate corporation needs have a specialized status as a non-profit corporation, in which the firm belongs neither to the profit-making business groups (including stock companies, limited private companies, limited partnership corporation, and ordinary partnership corporations) nor to public utility company groups (such as aggregate corporations, incorporated foundations). In addition they had to be given the status of a corporation because they are neither individuals nor voluntary groups. Under such circumstances the term, 'intermediate corporation' refers to the firms established under the Law of Intermediate Corporation. In particular, its law states that credit associations and credit cooperatives are intermediate corporations in Article 3.3., and 3.4. respectively.

Consequently, as the historical backgrounds of cooperative financial institutions were originally different from ordinary banks, the government in Japan had to enact new legislation for carrying out a different purpose or policy of cooperative financial institutions.

The governing law of credit associations is the Law of Credit Associations, executed on 15th June 1951 and consisting of 92 articles. Article 1 states that the main purpose of credit associations is to make efforts to save credibility and to protect depositors, in order to make smooth the flow of funds and to encourage saving. There are other articles about special features of credit associations: for example Article 10 sets out the requirements to become a member of credit associations, such as the limitation of business area and operational scale (in the case of business customers).[14] Article 11 states that the number of contribution unit for one person is restricted to less than 10 percent of the total number of contribution unit; and Article 12 states that each member must be given the right of one vote. All these features would be totally different from the ordinary banks.

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[14] In article 10, it is written that the member of credit associations must be people who (i) live or have a house in the community area of credit associations, (ii) have an office in the area, or (iii) work in the area, (and if employers, the number of employees must be less than 300, and the capital amount must be less than 9 hundred-million yen. (Article 3, the enforcement orders of the Law of Credit Associations)).

In addition, with respect to financial services there is another way in which credit associations differ from ordinary banks. Credit associations also give financial services such as deposit-accepting and loan supplying, as do ordinary banks, but there are some limitations on loan offering by credit associations. Article 53.2 states that "... the government ordinance states that credit associations would be available to offer loans to non-members ...unless the performance of institutions is interfered with". In this article, the government ordinance means 'the Enforcement orders of the Law of Credit Associations'. Article 8 in the orders sets down that lending to non-members must be confined to 20 percent of the total amount of lendings. Also, it is also written as the different point from banks that the decision-making of business policy must be carried out at the general representative meeting, in Article 50 of the Law of Credit Associations.

Differences between credit associations and commercial banks can be shown not only in the area of business services but also in the preferential tax system. That is to say, as the cooperative financial institutions belonged to the group of 'Cooperative Corporation' in the section 'Corporation Domestic' of the Corporation Tax Law (Article 2), there is some preferential treatments such as the application of reduced tax rates[15], and the inclusion in expenses of cash dividends depending on business charges (Article 60.2).[16]

2.3.3. Role of credit associations and credit cooperatives

Muramoto (2005) comprehensively discusses the importance of mutual financial institutions in Japan. In the financial industry in Japan, credit associations and credit cooperatives take different

[15] In fact, the amount of corporate tax for ordinary corporation such as commercial banks is '... 34.5% of total amount of income in each year' (Article 66), while that for the cooperative unions such as credit associations and credit unions is '... 25%' (Article 66.2).

[16] The new capital adequacy requirements to the cooperative financial institutions are started in March, 2007, as well as the case of ordinary banks. In the risk assessment for the calculation of capital adequacy ratio, it is required to include not only credit risks and market risks but also operational risks.

organisational forms from other, ordinary banks. Although there are other types of financial institutions for small businesses in Japan, such as regional banks and second regional banks, these are grouped into commercial banks and take a stock company form. In contrast, credit associations and credit cooperatives belong to the group of mutual institutions, which is to say they have completely different features despite offering the same kind of financial services.

Credit associations and credit cooperatives are based on the membership. The main purposes of these financial institutions are therefore to make profits and to maximise the welfare of the members. The ways in which they differ from commercial banks are that; (a) the members are limited to the small and medium companies, and individuals living in a certain geographical area, (b) borrowers are also limited to small and medium companies in its targeting area, (c) there is a loan limitation to one loan per customer, (d) there are membership limitations in a certain range: the number of workers per firm, and the amount of capital per member, (e) the management policy of the company must be decided in the general representatives' meeting, with a system of one vote per member.

Credit associations and credit cooperatives are based on the membership, and it is therefore necessary to contribute to local development. These institutions might sometimes have to offer loans even to companies constituting high risk. Consequently, it causes a situation that credit associations and credit cooperatives could become higher risk institutions, and the nonperforming loan would increase significantly. However, there are also some good points in having a close relationship with local companies and residents. For example, the cooperative financial institutions might find out the good companies rather than commercial banks. It is possible for small companies to have great ideas and workers' skills even if these are risky companies on the balance sheet. In general, although one of the functions in financial institutions is to find such efficient companies, it is eventually difficult for commercial banks to find those good firms. The reason is that commercial banks do not tend to build up a close network with their customers. In contrast, credit associations and credit cooperatives could build up particularly close relationships with local residents and easily find excellent borrowers because the operations of cooperative financial institutions is originally orientated towards the local customers.

In the growing financial unease after the bubble burst in 1990, the government in Japan assumed that the concept "relationship banking" was important for the economic recovery because it was absolutely essential that private companies, especially small and medium-sized firms, develop steadily. The government accordingly expressed a new policy for rationalizing credit associations and credit cooperatives which had good measures for collecting and accumulating a lot of local information.

2.3.4. Recent conditions around the financial institutions for small and medium-sized businesses (Comment by the Financial Services Agency (FSA))

Since the 1990s financial institutions in Japan have faced the most dramatic changes in Japanese history. Since the Second World War there had been a myth that commercial banks could not become insolvent. However, the commercial banks have actually been very concerned about a possible movement toward bankruptcy and reorganisation. It would be easy to imagine that mutual financial institutions such as credit associations and credit cooperatives have been particularly worried because the main customers of mutual financial institutions are small (risky) companies or individuals. This section considers the previous literature on the improvement of economic conditions to which credit associations and credit cooperatives have been exposed.

The Financial Services Agency (FSA) in Japan made a decision to urge regional finance to activate, in order to develop small and medium-sized businesses and to improve local businesses under "the programme of financial revolution"[17]. For the accomplishment of this programme the FSA carried out a new policy, "the action programme for functional reinforcement of relationship banking" in 2005, (published in March 2003) which basically followed the previous programme in the latter half of the 1990s. In this action programme, however, the following new points were decided: (i) the programme is intensively implemented in the first two years, from March 2003 to

[17] It was executed in October, 2002.

March 2005, (ii) the small business banks (regional banks, second regional banks, credit associations and credit cooperatives) must develop and carry out a scheme for the functional enhancement of relationship banking, and (iii) the progress of the scheme must be reported to the FSA every half year.

The programme was expected to accomplish an eventual outcome because it included the specific conditions for the small businesses and regional financial institutions. Concretely, it was considered that the nonperforming loan problem in the small business finance must be improved by using another procedure from the financial revitalization programme for city banks.[18] The reason is that it was afraid the same procedure with major banks might derive to the further depression through the additional failures in the small and local business sectors. Therefore, the programme was required to take a different solution procedure on the nonperforming loan problem from the major banks. It was an attempt to improve both the nonperforming loan problem and the decline of the local economies, together. In fact, it was required to properly accumulate the knowledge and skills for the financial analysis and the consultation of their customer companies. In addition, the database development on credit risk is also desired, and it was also requested that financial services should be diversified and offered properly depending on the level of borrowers' risks. Mashita (2004) surveyed the results of these improvements and argued that the reinforcement of consulting ability to borrowing firms is eventually given in a first priority. However, it is indicated that some other improvements, such as the diversification of loans and the improvement of credit risk database, should be carried out more properly.

On the other hand, there are other types of change in the small and regional financial industry, including the mutual financial institutions. The Congress of Japan in 2006 instituted "the law of financial product and transaction" and "the law for depositor protection against forgery and robbery cash card" in order to enhance user protection and crime prevention in financial transaction. In addition, the other conditions around financial institutions have changed drastically, for example, the lifting of the zero interest policy by the Bank of Japan, and the enforcement of Basel II from March 2007. Consequently, for further appropriate judgement, the FSA announced that the

[18] The solution procedure for city banks was to transfer the nonperforming loans into the off-balance sheet.

evaluation for the supervision would be practiced multilaterally although the operational efforts by small and local financial institutions would still be required (FSA (2003)).

As a result the programme of financial system reform has not progressed sufficiently regardless of some changes in their attitudes of small-business financial institutions. Moreover, it is possible that credit associations and credit cooperatives are still in severe conditions. The cooperative financial institutions are required to respond properly not only to the strict economic conditions but also to the many political or legal changes.

2.3.5. Features of credit associations and credit cooperatives: Economic data

This section discusses how the mutual financial institutions responded to the programme of financial revolutions. Are the mutual financial institutions still in severe conditions due to the recession since the 1990s? Or are they recovering again due to the programme for recovery and the financial system reform?

Firstly, as the mutual financial institutions in Japan, the numbers of credit associations and credit cooperatives are indicated. Table 2.1 represents the number of institutions, members, and administrations of credit associations in Japan. The figures of institutions and administrations decrease every year, while the figure for members gradually increases. This trend would mean that the reformation of credit associations is being achieved smoothly, and as described later in Figure 2.6, the increase in the deposits share of credit associations is also found as evidence of successive reform. Namely, it is expected that the increase in the members and the deposits is caused by the restructuring, including branch integration and the retirement of excess capacity.

Table 2.1 Number of institutions, members, and administrators of credit associations

	No of institutions	No of members	No of administrators
1998.3	401	8,599,612	2,952
1999.3	396	8,733,839	2,950
2000.3	386	8,876,360	2,900
2001.3	371	8,941,138	2,804
2002.3	349	8,981,084	2,734
2003.3	326	9,001,391	2,557
2004.3	306	9,091,805	2,396
2005.3	298	9,134,192	2,342
2006.3	292	9,190,783	2,272
2007.3	287	9,256,033	2,292
2008.3	281	9,280,671	2,307

Source: Shinkin Central Bank Monthly Review

As shown in Table 2.2, the credit associations appear to show the same trend as the credit cooperatives. Credit cooperatives set a smaller size of geographical area and customers as a business target than credit associations. Therefore, although their share of transaction by credit union is not so large, it is possible to say that credit unions play some role as community-based financial institutions as well as credit associations. In terms of the number of credit cooperatives, as credit cooperatives are exposed to higher pressure for a hostile takeover than credit associations, the number of credit cooperatives decreased gradually from over 300 in the 1990s to 164 in 2008. The number of members decreased from 4.3 million in 1998 to 3.4 million in 2003, but it increases to around 3.7 million in 2008. The reason for this trend is that the lending to small businesses and individuals by commercial banks has been restricted due to long-term financial uncertainty since 2003. In other words, many companies having lending applications rejected by commercial banks might have shifted gradually to community financial institutions such as credit cooperatives.

Table 2.2 Number of co-operatives, members, and administrators of credit cooperatives

	No of Co-operatives	No of members	No of administrators
1998.3	351	4,321,921	38,246
1999.3	322	4,146,352	35,492
2000.3	291	4,083,786	33,096
2001.3	280	4,099,015	31,078
2002.3	247	3,966,008	28,560
2003.3	191	3,426,813	24,422
2004.3	181	3,502,008	23,510
2005.3	175	3,579,427	22,953
2006.3	172	3,626,027	22,482
2007.3	168	3,643,119	22,034
2008.3	164	3,673,981	22,005

Source: Community Bank Shinyo Kumiai

The total number of administrators of credit cooperatives has steadily declined - a trend fundamentally different from the case of credit associations. (The number of administrators of credit associations has increased slightly since 2006.) This suggests that credit cooperatives might need a longer period for recovery than credit associations.

The mutual financial institutions have some important functions in a specific part of the financial industry. As noted above, credit association is the institution based on membership, and it is not a stock company. Most credit associations are small and medium-sized, compared with other financial institutions such as commercial banks, because they mainly target small and medium-sized companies and their operations are restricted to a certain range of geographical area. Accordingly, the size and amount of transactions with each institution become relatively small, unlike with commercial banks. However, with regard to the size of total financial transactions, the credit association sector has occupied a significant portion of the Japanese economy. Table 2.3 shows that, for all basic descriptive figures (total assets, loans, and deposits), and credit associations have a larger size than second regional banks, which is a part of commercial banks. With regard to the amount of loans and total assets, credit associations account for half the share of city banks, and the 30 % of regional banks, in spite of the geographical limitation. It clearly shows that for small and medium businesses, credit associations play a more important role than that of a mere regional financial institution.

Table 2.3 Relative size of financial institutions (2009.3)[a]

	No.	Loans and discounts outstanding (banking accounts)	Savings	Assets (banking accounts)
City banks	6	2,248,572	2,735,234	4,635,496
Regional banks	64	1,550,371	2,005,628	2,286,053
Second regional banks	44	435,832	560,995	612,130
Trust banks	7	341,572	368,671	637,161
Long-term credit banks [b]	2	61,876	43,664	115,944
Credit associations	279	648,786	1,154,531	1,238,708
Credit cooperatives	167	94,073	163,633	175,093,

Note: a: 100 millions of yen; 2009.3, b: The values on Long-term credit banks are at 2004.3.
Sources: Financial statement of National banks (Japanese Bankers Association), Overall condition of Credit Associations (Shinkin Central Bank Research Institute), Main Account of National Credit Cooperatives (Central Association of National Credit Cooperatives)

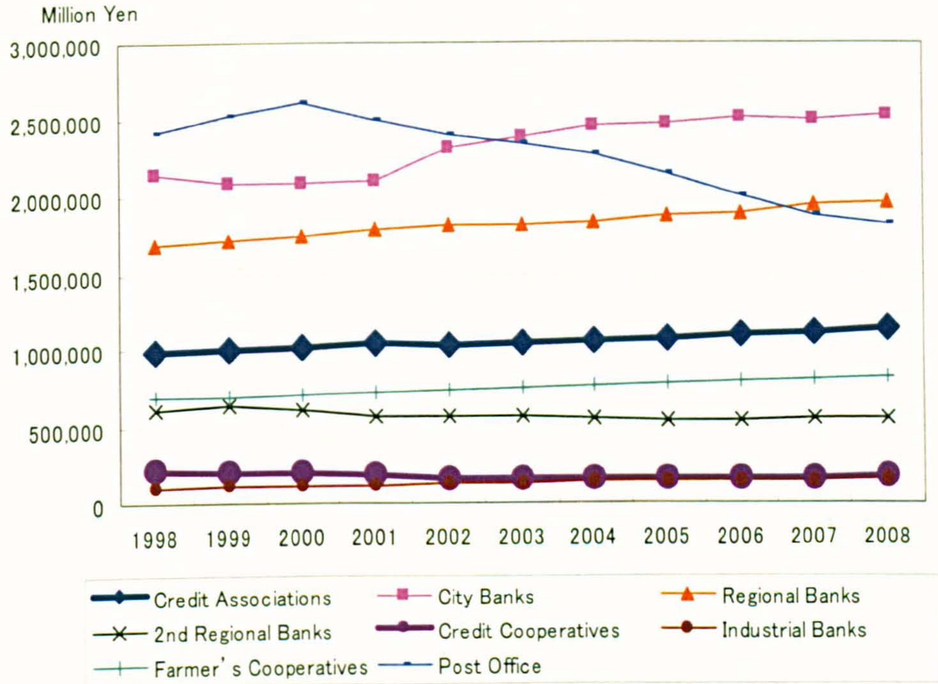
It seems that the needs of deposit-accepting services by credit associations have gradually increased. As shown in Figure 2.6 (share of deposits) and Figure 2.7 (share of loans), the proportion of credit associations in the whole financial industry has remained fundamentally stable since the difficult economic period in the 1990s.

Figure 2.6 indicates the ratio of bank deposits and postal savings in each business category of financial industry since 1998. It can be said that the market share of credit associations to total deposits is stable (from 11.2% in 1998 to 12.5% in 2008), while the deposit of city banks came down until 2000, and then increased gently (from 23.1% in 2000 to 27.7% in 2008). The rate of credit cooperatives has totally decreased in spite of a slight fluctuation (from 2.42% in 1998 to 1.62% in 2003). Considering the fact that the number of members in credit cooperatives has slightly grown since 2003, it appears that credit cooperatives would shift their main customers from companies to individuals. The (public) postal services are privatized in 2003, and many depositors moved their funds from post office to private financial institutions.[19] It is the case credit cooperatives are also

[19] There was a large affair in 2002; the enforcement of postal service privatization. It indicates that three public postal businesses (post service, postal savings service and postal insurance service) were transferred from post office (public) to Postal Services Agency (private), in 2003. It is expected that the funds from post office have shifted to private banks. Figure 2.6 implies the different outcomes between credit associations and credit cooperatives.

considered as alternative institutions by those people, and therefore, the percentage has grown to 1.80% in 2008.

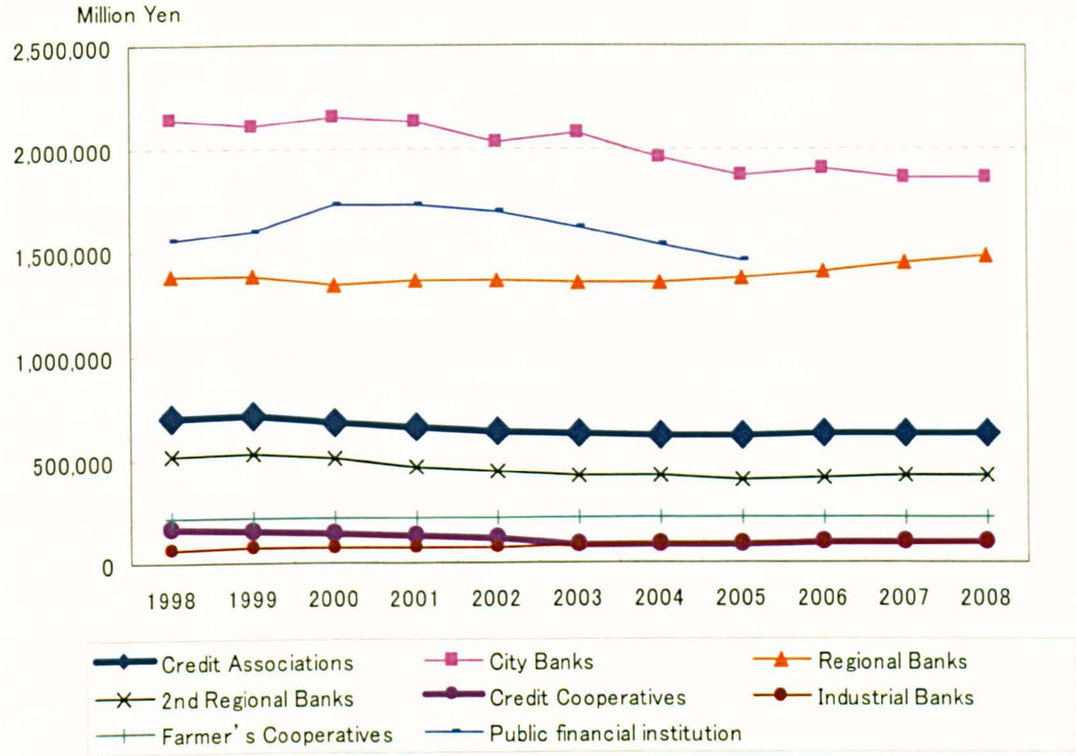
Figure 2.6 Bank deposits and postal savings in each business category of financial industry



Sources: Financial and Economic Statistics Monthly published by Bank of Japan, website by Postal service agency

Figure 2.7 shows total amount of loans in the financial industry. It could be said that all kinds of small-business financial industry have increased their amounts since 2002. In fact, the percentage of loans of credit association to the whole financial industry dropped to 9.65% in 2003. However, it rose again to 13.32% in 2007. Although city banks also moved upwards from 28.19% in 1999 to 30.16% in 2003, regional banks raised their percentages of loans since 2000 (from 19.57% in 2000 to 30.82% in 2008), more than city banks and credit associations. As stated by Susaka and Naruse (2003), it is the case that the downward trend until 2001 would be derived from the decline of fund demands due to the economic recession. And it is widely considered that the upward trend since 2001 would be caused by the quantitative relaxation policy by the Bank of Japan since 2002.

Figure 2.7 Loan and bills discounted in each business category of financial industry



Note: Data on public financial institutions since 2006 have not been applicable.

Sources: Financial and Economic Statistics Monthly published by Bank of Japan, website by Postal service agency

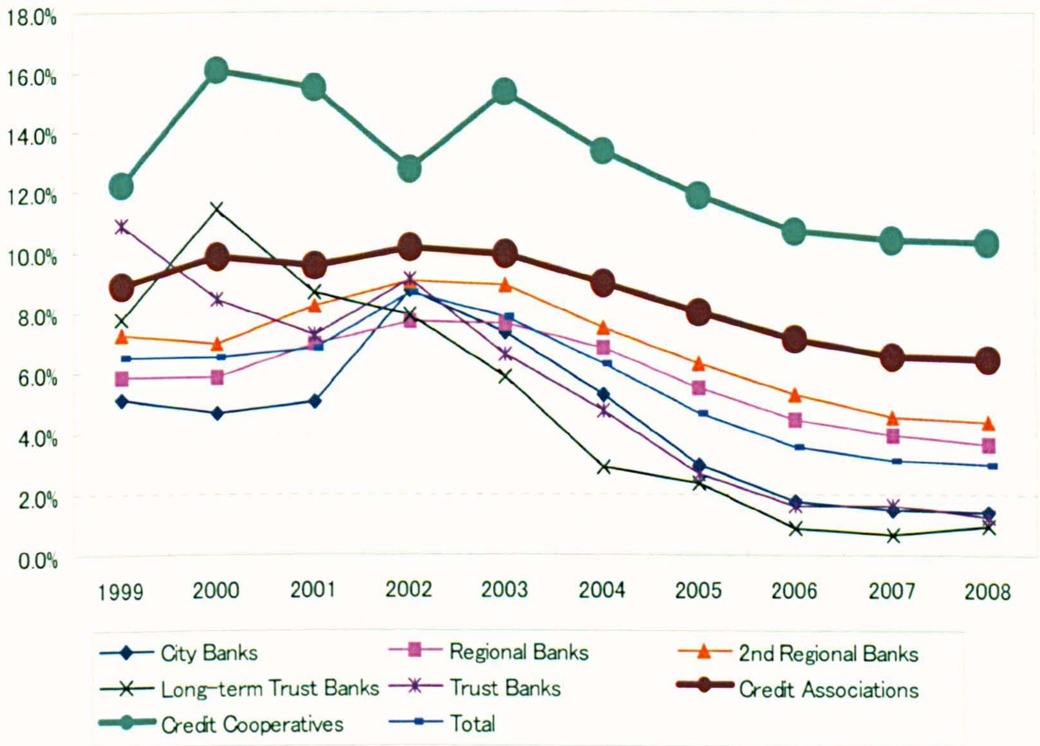
On the contrary, the amount of loans of the credit cooperatives have slightly recovered since 2004, but the proportion has diminished due to the narrowness of the range of customers, as the recent movement (from 1.45% in 2004 to 1.95% in 2008). It is possible to say that credit cooperatives are still in a severe situation.

It is useful to consider the minus aspect such as nonperforming loans.[20] Figure 2.8 indicates the rate of risk-management loans to total credits in each business category. The figures of

[20] This is one of the reasons that credit associations and cooperatives are understated as little worth institution, compared with commercial banks.

both credit associations and credit cooperatives have remained steadily at a high level since 2000, in spite of the temporal improvement in the second half of the 1990s. In general, credit associations and credit cooperatives tend to offer loans to their members even though they take high risks because these institutions are mutual organizations. Consequently, the ratio of risk-management loan rises as a natural result. In other words, the main reason, why these institutions have a relatively high nonperforming loan ratio is that these institutions limit their customers to a particular range. Accordingly, it is difficult to say that having the low nonperforming loans ratio directly means poor management action by executives. However, in spite of the high ratios in the whole financial industry, there seems to be a clear tendency for the ratio to shift to the downward-sloping trend over time.

Figure 2.8 Ratio of risk-management loan to total credit (%)



Note: Risk-management loan is the total of bankruptcy-correction loan, risk loan, and administrative loan.
Source: Japanese Bankers Association

As seen in this section, credit associations and credit cooperatives have experienced various difficulties such as the M&As and the reform of the system. From the various economic data it has been shown that credit associations and credit cooperatives play an important role in the whole financial industry, although it is not as large as city banks. In the next section, some studies are introduced in order to review the features of mutual financial institutions, especially credit associations, in the Japanese financial industry.

2.3.6. Features of credit associations and credit cooperatives: Previous studies

Susaka and Naruse (2003) analyze the financial features of credit associations and try to discern the factor behind the reduction in their profitability. They make the following points: (i) the margin between deposit and loan interest rates in credit association is steadier than the other business categories of financial institutions. However, the ratio to total funds is becoming smaller, (ii) the gross lendings outstanding arrived at a peak in 1999, and then decreased due to the decline in fund demand, (iii) the loan-to-deposit ratio of credit associations had dropped remarkably due to the reduction of loans. The reduction of loan outstanding increased the proportion of surplus operating assets to total assets. The surplus operating assets could not earn large profits due to the low interest rate. Therefore, the margin to total asset has fallen in spite of the high margin. (iv) the current income before taxes finally plunged into the red in 1999. As the main customers of credit associations are small and medium-sized companies it is inevitable for the nonperforming loan ratio to raise. Susaka and Naruse (2003) argued, therefore, that the economic situation of credit associations continues to be hard unless the nonperforming loan amounts are cleared away and unless economic conditions including small business conditions are significantly recovered.

Mashita (2004) gives an assessment of the progress of the functional enhancement scheme by the government. He made an assessment from the central organization of credit associations. Credit associations achieved some progress in two fields; (i) the development of human resources to estimate the accurate value of small businesses, and (ii) the systematic development to prevent the additional nonperforming loans. He suggests, however, that there would be some other space for improvement such as the development of a new pricing model, a new scoring model, and the credit risks databases. Also, he indicates that there are still many other business issues such as the end of the deposit insurance cap (since April 2005) and the adoption of the new Basel Capital Accord (since December 2006), in credit associations.

2.4. Conclusion: Mutual financial institutions in Japan

The Japanese economy has experienced various kinds of economic difficulties in the recent 30 years, and the financial industry has performed various operations in response to each economic condition. Nevertheless, most of the financial institutions have continuously suffered from severe depression due to poor management during the bubble period.

For many kinds of systemic reformation since 2000, the competitive environment around commercial banks has significantly improved.[21] However, mutual financial institutions, which offered financial services for small businesses, are in different situations from commercial banks. It is relatively difficult for mutual financial institutions to make large profits because their main customers are small-sized businesses or individuals. Besides, compared with commercial banks the profitability of mutual financial institutions is strongly affected by local economic conditions. Therefore, in spite of some improvements in the recent financial data, it is suggested that the mutual financial institutions are still in difficult economic circumstances.

However, it is also possible to say that financial institutions for small businesses play an important role. The reason is that small and medium-sized businesses need to build an economic infrastructure of all industries. In other words, it is very difficult for the economy to recover strongly if small companies do not create good ideas and skills. Although there is great uncertainty among customers of credit associations, mutual financial institutions might be able to make this uncertainty an advantage. Namely, with respect to the soft-information gathering from small and medium firms and individuals, it can be assumed that mutual financial institutions are still important in the economy.

[21] It was, however, difficult to estimate if those reformations were right or wrong, at this time.

Chapter 3 Mutual financial institutions in the United States

3.1. On the importance of commercial banks in the US

The purpose of this chapter is to discuss the features of cooperative financial institutions in the US in comparison with those in Japan. First, we will consider the classification of the US financial industry therefore, then review some recent circumstances that have had an impact on the US financial sectors.

3.1.1. Classification of US financial institutions

First of all this section will examine the classification of the US financial institutions. The US financial institutions are mainly divided into two groups: depository institutions and non-depository institutions. (Figure 3.1) The former group consists of organizations that receive deposits (liabilities) and offer loans (assets), while the latter group is the body that mainly obtains funds from capital markets or banks and supplies funds to customers.[22] In addition, the depository institutions are divided into four categories: commercial banks, savings and loan associations, mutual savings banks, and credit unions. In these four groups, as commercial banks have particularly varied assets and liabilities, the commercial banks are separated from the other three institutions. These three institutions, known as thrifts, mainly have the form of mutual financial institutions.[23]

[22] In terms of the way of funding, although some non-depository institutions employ the different techniques (c.f. Insurance companies and so on), all of these institutions have same point that they do not accept 'deposit'. Therefore, these institutions are included into same category 'Non depository institutions'.
[23] However, some thrifts such as savings and loan institutions are taken the organizational form as stock company.

Figure 3.1 Types of US financial institutions

a. Depository Institutions
   Commercial banks, Savings and loan associations, mutual savings banks, Credit unions

b. Non-depository institutions
   Contractual savings institutions → Life insurance companies, Fire and casualty insurance companies, Pension funds (private), and State and local government retirement funds
   Investment Intermediaries → Finance companies, Mutual funds, and Money market mutual funds

In contrast, the non-depository institutions include contractual savings institutions (life insurance companies, fire and casualty insurance companies, pension funds (private), state and local government retirement funds) and investment intermediaries (finance companies, mutual funds, money market mutual funds). Although these institutions are also grouped as financial institutions, the different kinds of regulations are applied to them since they do not deal with deposits.

3.1.2. Macro economic change in the US and the impact on commercial banks

The purpose of this section is to show the special role of mutual financial institutions such as S&Ls and credit unions in the US. However, it would be difficult to adequately understand the features if the other financial institutions such as commercial banks have any impacts in the viewpoint of macro economy. Therefore, in this section, some economic changes in the US financial industry since the 1980s are briefly considered.

There was a large macroeconomic change, disintermediation, in the US since the 1980s. In the US there was high inflation between 1978 and 1981, but although the inflationary pressure usually brings about high interest rates this did not happen. The reason is that an upper limit was placed on deposit interest rates. Therefore, most deposits flowed out from the deposit market to the security market, in which there is no interest-rate regulation. This is called as disintermediation. As a result, commercial banks were concerned with money decreasing and thus declined to offer lending services, especially to small customers.

Consequently the profitability from traditional banking business had declined, and commercial banks had to move to new, higher-risk activities in the 1980s. One of these activities was real-estate lending. In addition, commercial banks were able to offer a new type of deposit, brokered deposits, as the regulations had been gradually relaxed since the establishment of the Depository Institutions Deregulation and Monetary Control Act of 1980 (DIDMCA). The authority of federal deposit insurance issued a ban on this type of deposit in 1984, and although this ban was lifted by the federal court, the pressure exerted by the authority had gradually inflicted damage on the commercial banks. Consequently many banks fell into bankruptcy (over 200 banks per year) in the second half of the 1980s. To re-invest capitals into the Bank Insurance Fund, new regulation, namely the Federal Deposit Insurance Corporation Improvement Act (FDICIA), was established in 1991, and the new banking regulation system was re-organized.

What kind of impact has there been on the S&Ls and credit unions under these new macroeconomic conditions? Firstly, it is possible to say that the S&Ls had been damaged by the mismatch of interest rates induced by the de-regulation of the DIDMCA. This damage caused many S&Ls failures. The remaining S&Ls increased to offer the high risk loans to their customers in order to make more revenue. As a result, these deteriorations in quality lead to a lot of additional S&Ls failures again.[24]

In contrast, credit unions would be greatly influenced by the pressure from commercial banks towards the reduction of common bond requirements. Consequently, the reduction of these requirements caused to give the charters of multiple common bonds to many credit unions. Why did

[24] At this time, the real estate recession in Texas triggered directly.

commercial banks put strong pressure on credit unions? As the reduction happened in 1982, it is to be expected that one of the reasons was disintermediation. In other words, as commercial banks suffered capital outflow, commercial banks could apply strong pressure for deregulation in the credit union industry in order to gain more customers from mutual financial institutions.

3.2. On the importance of mutual financial institutions in the US economy

3.2.1. The Savings and loans industry in the US

This section discusses the features of the US mutual financial institutions, particularly the Savings and Loans industry (S&Ls). In fact, the points are about the background of the US economy and the recent position in financial system.

3.2.1.1. Feature of savings and loans industry : Historical background

The savings and loans (S&Ls) originated in the UK during the Industrial Revolution. Although they hoped to conduct financial transactions with banks, most commercial banks did not have the know-how for offering financial services to working class people. Therefore, the S&Ls were designed to offer borrowing services and reserving services of housing funds to those people. At that time, as commercial banks did not have a habit of lending funds for the housing acquisition to home buyers, the Birmingham Building Society was established in 1781 as the first S&Ls in the UK.

The British model was later adopted in Pennsylvania in the US cooperative associations, the Oxford Provident Building Society, founded in 1891. After that, many similar kinds of building societies were created, especially in industrial areas. Consequently, the number of the S&Ls increased to around 3,500 societies in 1888 (and 5,860 in 1893).[25]

As the early building societies had made for an only limited time, there were certain inconveniences - members could not withdraw from the society, and new members were obliged to pay significant lump sum money. However, they did gradually change into the modern style of financial institutions. The range of membership expanded, and most members became simple depositors. In addition, managers of some building societies started prioritising profitability rather than increasing the social welfare of community, as most members were not interested in the management of building societies except for in emergency. As a result, most societies gradually changed their names from 'Building society' to 'Building and Loan association'.

In the 1920s, a large number of building and loan associations changed their names to the Savings and Loan associations (S&Ls). However, in these associations, the mortgage loans occupied the large percentages of the asset side on the balance sheet. It is therefore likely to be that the associations kept being the housing-loan offering institution. In 1929, before the Great Depression, the number of associations and the amount of assets peaked at 12,342 and 8.7 billion dollars respectively.[26]

After the Second World War the S&Ls dramatically increased their share of the market since the national objective of the government was to construct a very large number of new houses. The fact that the S&Ls could set a higher deposit rate than commercial banks was also conductive to growth. (The deposit interest rate of banks was confined from 1933 to 1980) Coincidently, the name of funds in the S&Ls was allowed to be changed from 'share' to 'deposit'. The S&Ls had stronger characteristics as general financial institutions.

However, the S&Ls' growth eventually slowed due to the implementation of two important policies: deposit interest-rate regulation and the partial removal of preferential taxation in the late 1960s. In addition, in the era of high interest rate in the 1970s, most of the S&Ls suffered from the

[25] Barth (1991), Chapter 2.
[26] In the period between 1934 and 1989, the US government had protected the deposits in S&Ls through the Federal Savings and Loan Insurance Corporation (FSLIC) (the former of FDIC and the Office of Thrift Supervision). Instead, these institutions had to follow the regulations by FSLIC.

fact that the lending interest rate was lower than the deposit one. Most of the S&Ls underwent mergers and consolidations in the 1980s, following the financial liberalization and increased competition with banks. Therefore, the number of the S&Ls decreased from 4,931 in 1975 to 3,391 in 1984.

3.2.1.2. Feature of the savings and loans industry since the 1980s : Economic data

This section discusses the economic circumstances of the S&Ls, using some descriptive data. It mainly appears that the current S&Ls in the US have been significantly affected by the S&L crises in the 1980s and the subsequent reformation. Thus the following part covers four topics on the S&L crisis and reformation: (i) Outline of S&Ls crises, (ii) Impact of the S&L crises, (iii) Reformation, and (iv) Recent conditions. In addition, the kind of impact these affairs had on the market conditions of the S&Ls will also be discussed.

(i) Two S&Ls crises

For 20 years after the Second World War, the S&Ls developed rapidly. In fact, there were almost no S&Ls bankruptcies between 1943 and 1980.[27] However this situation has changed since the 1980s. Firstly, hyperinflation due to the second oil crisis had brought about the high interest rate situation, and the high interest rate environment in the US market caused the disintermediation problem which meant that large amount of funds flowed out from depository industries to the non-depository financial institutions. The reason is that the depository institutions were restricted by law to applying the market interest rate on their deposits. However, in 1980, the Depository Institutions Deregulation and Monetary Control Act (DIDMCA) was passed and the deregulation of the liability side on the balance sheet was advanced. This movement of deposit interest-rate liberalization made for a very difficult environment for the S&Ls. In fact, the S&Ls industry went into the red, especially in 1981

[27] There were only about 10 cases of bankruptcies, which happened in 1966, 1970 and 1980, respectively. (Cebula (1997), p.55)

and 1982, because there had been adverse parity in 1981 (the long-run fixed interest on the existing mortgage loan was 10% on average, but market interest on deposit was 11%). In this way the mismatch of interest rate caused a lot of S&Ls failures, and consequently the first S&Ls crisis took place from 1981 to 1983.[28]

As shown in Table 3.1, there were many acquisitions, mergers and failures in the S&L industry. Therefore, in order to improve this troubled situation, the Depository Institutions Act of 1982 (called as the Garn-St Germain Act) was passed, allowing S&Ls to change from mutual type institutions to stock type corporation. It means that the regulations of the S&L industry were relaxed, particularly on the asset side of the balance sheet. (Barth (1991), Benston (1994), Jayaratne and Strahan (1998), and Kroszner and Strahan (1999))

[28] The numbers of failures were 28 in 1981, 63 in 1982, and 205 in 1988 (Barth (1991) p.28).

Table 3.1 Number of OTS-regulated thrift institutions by institution type, 1984-2008

Year	Total	Federal		State		Federal & State[a]	
		S&Ls	Savings Banks	S&Ls	Savings Banks	S&Ls	Savings Banks
1970	4,694	—	—	—	—	—	—
1971	4,598	—	—	—	—	—	—
1972	4,517	—	—	—	—	—	—
1973	4,485	—	—	—	—	—	—
1974	4,461	—	—	—	—	—	—
1975	4,407	—	—	—	—	—	—
1976	4,373	—	—	—	—	—	—
1977	4,388	—	—	—	—	—	—
1978	4,373	—	—	—	—	—	—
1979	4,362	—	—	—	—	—	—
1980	4,319	—	—	—	—	—	—
1981	4,088	—	—	—	—	—	—
1982	3,608	—	—	—	—	—	—
1983	3,440	—	—	—	—	—	—
1984	3,418	—	—	—	—	—	—
1985	3,626	—	—	—	—	—	—
1986	3,677	—	—	—	—	—	—
1987	3,622	—	—	—	—	—	—
1988	3,438	—	—	—	—	—	—
1989	3,087	—	—	—	—	—	—
1990	2,359	700	909	833	17	1,533	926
1991	2,110	588	793	718	11	1,306	804
1992	1,871	522	784	565	0	1,087	784
1993	1,669	475	780	414	0	889	780
1994	1,543	436	768	339	0	775	768
1995	1,437	414	761	262	0	676	761
1996	1,334	373	724	237	0	610	724
1997	1,215	340	668	207	0	547	668
1998	1,145	318	637	190	0	508	637
1999	1,103	298	631	174	0	472	631
2000	1,068	292	624	152	0	444	624
2001	1,019	287	595	137	0	424	595
2002	974	266	580	128	0	394	580
2003	928	256	559	113	0	369	559
2004	886	242	539	105	0	347	539
2005	863	241	531	91	0	332	531
2006	845	267	494	84	0	351	494
2007	825	297	456	72	0	369	456
2008	802	309	426	67	0	376	426

Sources: Office of Thrift Supervision / 2005 and 2008 Fact Book

Note: [a] As some thrift institutions obtained both federal license and state licence, the number of second line does not necessarily mean the actual total number of both federal thrifts and state thrifts.

The market interest rate had fallen rapidly since 1983, and the proportion of the variable interest-rate mortgage loans had increased. Therefore, the financial condition of the S&Ls industry got back into the black temporarily. However, the real estate recessions from Texas spread out nationwide, and many deregulations were carried out following the DIDMCA. However, these regulation changes caused high risk management of the S&Ls because of new laws approved to pursue profitability and to offer risky assets such as business loans, agricultural loans, consumer loans, and corporate mortgage loans. In other words, the solution being implemented for the interest rate problems created another problem in the form of the deterioration of asset quality.

This disturbance led to a second S&Ls crisis even more severe than the first. To counter this crisis, a new law aimed at reforming the system, 'the Financial Institutions Reform, Recovery, and Enforcement Act (FIRREA)' was introduced in 1989. In the short time between the collapse of the Federal Savings and Loan Insurance Corporation (FSLIC) and the approval of FIRREA by Congress, the number of S&Ls failures rapidly increased to 315 in 1990 and 232 in 1991. However, the number of failures started decreasing from 1991 onwards.[29]

(ii) Considering the market competition in the S&Ls industry after the 1980s debacle

What did the S&Ls learn from having experienced one of the greatest financial crises in their history? Barth (1991) argued that many features of the S&Ls were found from this experience.

Firstly, many S&Ls experienced consolidations in the 1980s. Secondly, the structure of corporate governance in the S&L industry drastically changed from mutual forms to stock forms. Thus, the power the stock holders could exert over the corporate manager increased significantly. Thirdly, the percentage of federal institutions increased about 12%, from 50% in 1980 to 62% in 1989, and the ratio of assets controlled by the federal institutions, also went up 12% to 76% in this

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[29] It seems that the FDICIA in 1991 affected to this decrease of S&Ls failures. The financial authority following the FDICIA requested to interrupt the operations before becoming insolvent if the S&Ls do not fulfil the capital requirements. Therefore the number of failures became small.

period.[30] These figures mean that some S&Ls with state-charter had concerns about their futures. Nevertheless, some other S&Ls chose to change from federal-chartered S&Ls to state-chartered savings banks, in order to avoid extra costs involved in the regulation by the OTS. Fourth, as a result of deregulation by both state and federal government, it appeared that most of the S&Ls started diversifying their activities. For example, the share of mortgage assets in the S&Ls increased significantly from 4% in 1980 to 14% in 1989. This change showed that financial services tended to divide into three categories (originating, servicing, and lending) due to the development of information technology and the creation of the secondary market. Fifth, the S&Ls industry recognized from the heavy losses by 1.9 billion dollars in 1989 that there were non-operating factors that worsened the quality of assets. Sixth, the number of S&Ls becoming insolvent kept increasing every year until 1985. Seventh, the number of the healthy S&Ls (over 6% capital ratio) has grown since 1984.

As a result of a variety of indirect conditions, hundreds of S&Ls became insolvent, and the solutions to these problems were carried out by the FSLIC. In fact, the FSLIC had taken some actions to assist the insolvent financial institutions from 1980 to 1989; (1) liquidation of funds, (2) assistance with mergers, (3) stabilization of financial conditions, (4) management consignment program, and (5) the merger of supervisors.

(iii) Reformation of the S&Ls in the 1990s

Although the FSLIC worked out many solution schemes for the insolvent S&Ls, the financial burdens increased significantly. The General Accounting Office finally reported in 1986 that the FSLIC itself had become insolvent, and the US Congress passed the Competitive Equality Banking Act in 1987 in order to compensate the FSLIC. However, for its compensation, the FSLIC accepted to reform, (the reserve for payment decreased from 6.4 billion dollars to -14.2 billion dollars in 1987) and the establishment of the FIRREA as a new sanctioning body was passed by Congress in August 1989.

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[30] Barth (1991), p.26.

In general, the FIRREA has some direct influences on the S&Ls and the Federal Home Loan Banks in the following ways: (1) funding provisions, (2) activity restrictions, and (3) capital requirements. The FIRREA differed from the FSLIC in so far as: (a) the structure of regulation was changed from one-committee system to three-committee system (that is, each committee controls three functions, namely overseeing regulation, supervisory, and deposit insurance), (b) the regulatory institutions were given formal and strong mandatory power,[31] and the total fund in new deposit insurance organization (Savings Association Insurance Fund) was significantly increased, (c) the FIRREA strongly limited the activities of insured S&Ls with some regulations and capital requirements (the same level of risk-based capital as commercial banks), and increased the deposit insurance premium, (d) the FIRREA established a new standard, in which the proportion of mortgage assets would be 70% for special borrowing privileges of loan, (e) the Resolution Trust Corporation was established, (f) the qualification of commercial banks was improved by the FIRREA in order to make commercial banks buy up the poor S&Ls, and (g) the programme for the housing supply was offered through financial supports from the Federal Home Loan Banks to the member S&Ls with many low-income customers.

(iv) Present conditions of the S&Ls

Thrift institutions such as the S&Ls have experienced some major changes, such as the first S&Ls crisis from 1981 to 1983, the constitution of the Depository Institutions Act of 1982 (the Garn-St Germain Act) and the second S&Ls crisis from 1988 to 1992. As a result, as shown in Table 3.2, the assets of savings institutions as a proportion of the total assets held by all financial institutions dropped sharply from 32.56% in 1988 to 15.08% in 2002. However, the decrease of total assets of the S&Ls stopped in 1993 when the FIRREA started performing properly. Subsequently the proportion of assets held by the savings institutions has gradually increased since 1998.

[31] The regulatory power is in the Treasury Department and the insurance fund for savings and loans.

Table 3.2 Ratio of assets by type of financial institution

	Commercial Banks	Savings Institutions	Credit Unions
1984	66.62%	30.38%	3.00%
1985	66.11%	30.57%	3.33%
1986	65.44%	30.86%	3.70%
1987	64.05%	32.07%	3.88%
1988	63.46%	32.56%	3.98%
1989	66.88%	28.94%	4.18%
1990	69.59%	25.85%	4.55%
1991	71.68%	23.25%	5.07%
1992	72.95%	21.44%	5.61%
1993	74.22%	20.04%	5.74%
1994	75.41%	18.97%	5.62%
1995	76.27%	18.14%	5.59%
1996	77.03%	17.31%	5.66%
1997	78.35%	16.02%	5.63%
1998	78.54%	15.71%	5.76%
1999	78.50%	15.72%	5.78%
2000	78.93%	15.38%	5.68%
2001	78.15%	15.71%	6.14%
2002	78.54%	15.08%	6.38%
2003	78.33%	15.19%	6.48%
2004	78.09%	15.70%	6.20%
2005	78.08%	15.87%	6.05%
2006	80.13%	14.05%	5.82%
2007	80.92%	13.45%	5.62%
2008	83.92%	10.45%	5.63%

Sources: FDIC; Historical Statistics on Banking (Commercial Banks Reports and Savings Institution Reports), CUNA; CU statistics.

Table 3.3 Balance of Savings Institutions

	Total Deposits	Total Loan & Leases	Total Assets
1984	944,733	737,658	1,144,246
1985	1,022,739	825,907	1,262,654
1986	1,083,167	869,049	1,386,866
1987	1,137,819	924,205	1,502,111
1988	1,193,134	1,006,094	1,606,489
1989	1,081,417	923,923	1,427,512
1990	987,142	821,937	1,259,178
1991	906,681	733,603	1,113,002
1992	828,353	656,828	1,030,214
1993	774,157	635,042	1,000,891
1994	737,180	642,787	1,008,568
1995	741,907	655,216	1,025,742
1996	727,923	688,815	1,029,019
1997	704,136	698,753	1,026,186
1998	704,869	721,224	1,088,421
1999	706,980	761,358	1,148,524
2000	735,193	827,827	1,217,338
2001	811,870	877,623	1,316,773
2002	878,654	896,908	1,358,946
2003	925,294	1,005,614	1,474,106
2004	991,388	1,214,340	1,691,764
2005	1,068,176	1,336,138	1,837,927
2006	1,093,800	1,252,446	1,769,896
2007	1,105,535	1,280,135	1,857,945
2008	953,534,	1,035,106	1,532,317

Note: Million US dollars.
Source: FDIC, Statistics on Banking

3.2.1.3. Features of the US S&Ls : Previous studies

This section focuses on the academic research studies of the S&Ls. Broadly speaking there are two main focuses in these studies; (i) the impact of two crises on the S&Ls industry, and (ii) the particularity of organizational structure (cooperative institution).

(i) The impact of the S&Ls crisis

Regarding the impact of the S&Ls crises, three topics in particular have been studied: (i) the causes of the S&Ls crisis, (ii) the impact of the S&Ls crisis, and (iii) the changes after the S&Ls crisis.

a. Causes of the S&Ls crises:

Firstly, Cebenoyan, Cooperman and Register (1993) focused on the causes of the S&L crisis. They insist that one of the significant factors behind the S&L crisis is the reduction of management efficiency in individual institutions. In other words they consider that the increase in the number of inefficient institutions means an increase in "deadweight loss" in the whole S&L industry, and that this weakens the industry. They calculate the cost efficiency of the institutions, following the separate stochastic cost frontiers approach. In addition, a maximum likelihood (MLE) logit model is employed to estimate the relationship between inefficiency and bank failures. The result shows that more inefficient S&Ls have a higher probability of bank closures, and it is therefore concluded that the cost inefficiency is one of the direct causes of the S&L crisis.

Secondly, Barth, Hudson and Jahera (1995) examined what factors are laid behind the inefficiency. They consider the impact between difference of charters (federal or state) and risk-taking behaviour, and that between types of ownership and risk-taking behaviour in the S&Ls' management. That is, they expect that the main factor in the S&Ls crisis was not loose regulations in the 1980s but continuous risk-taking behaviour throughout the whole S&Ls industry. Here, risk-taking behaviour means the change of the main financial products of the S&Ls from traditional home mortgage loans to direct investment. In fact, they investigate relationships between ownership structures (mutual or stock) and risk-taking behaviour (direct investment), or between capitalization (capital-to-assets) and risk-taking behaviour. The result shows that the stock S&Ls tend to have relatively insufficient capital levels and excess risk-taking. It is concluded, therefore, that the stock S&Ls tended to manage inefficiently.

Fok, Li, and Finch (1995) measure the product efficiency of thrifts with the nonparametric linear approach. From the results of a single-year test they find that product efficiency is influenced by factors such as organization form, firm size, management style, and asset quality. However, they found in the multi-year analyses from 1986 to 1989 that the technical efficiency of management significantly influenced the possibility of failure. Therefore, they concluded that it is meaningfu managers and regulators to use the technical efficiency figure in order to predict future failures.

There is also another idea by Cebula (1997) that not only internal but also external factors should be when considering the cause of the S&Ls crisis. He examines the reason why the ratio of S&Ls failures is different in every state. He estimated the factors of failure ratio with the heteroskedastic Tobit model and found that a variety of regional factors[32] had various effects on the performance of the S&Ls. Also, he suggests that the regulators need to pay attention not only to individual specific factors but also to the wider range of factors such as economic conditions.

b. Impact of the S&Ls crises:

Some studies focus on the impact of the S&Ls crisis or on the reformation of the subsequent economic system. Blacconiere (1991) investigates the effect of Regulatory Accounting Principles (RAP) – which was introduced as a solution to the S&Ls crisis by the FSLIC (Federal Savings and Loan Insurance Corporation) and the FHLBB (Federal Home Loan Bank Board) – on the stock value of the S&Ls. Originally, there was the General Accepted Accounting Principles (GAAP) as the accounting standard for the S&Ls. In the early 1980s, the RAP was established as a new accounting standard by the FSLIC and FHBB. Then, for the S&Ls crisis in the 1980s, the RAP attracted attention. Blacconiere (1991) investigates the impact of the RAP in the S&Ls industry with two factors model. From the empirical result it is found that the RAP has a significantly positive impact to the returns in the market through the enhancement of capital adequacy ratio. In other words, it was found that most of the S&Ls might change their accounting standard measures. Therefore, to understand the seriousness of the S&Ls crisis it is necessary to consider the differences between accounting standards.

Mansur and Elyasiani (1994) focus on the establishment of the FIRREA and its implications for the level of equity returns of commercial banks and the S&Ls. Daily stock returns of

[32] These factors are the averaged growth of products in the state, the deposit expenditures in the S&Ls, the volatility of deposit expenditures, the averaged outstanding account of the reservation on collateral loans in fixed interest, and so on.

commercial banks and the S&Ls are used for the stochastic analysis, using the Multivariate Regression Model (MVRM), and the shareholders of the S&Ls have received remarkably positive returns since the establishment of FIRREA. As a result, the FIRREA had an effect of letting the S&Ls focus on the housing finance business.

The impact of the S&Ls crisis on the financial system is discussed by Fuller and Koher (1994), who study how much social cost would have been generated if the health criteria of financial institutions had been mistaken. In other words, they assume that there was some "zombie" S&Ls in the S&L industry.[33] Their conclusion is that the Z-score in the Multiple Discriminant Analysis (MDA) is useful for the accurate assessment of troubled institutions.[34]

c. Changes after the S&Ls crises:

With regards to the S&Ls crisis, there is another topic on how the economic conditions around the S&L industry changed after the crisis. Pantalone and Platt (1993) study the settlement of the S&Ls crisis, especially mergers. In fact, they examine whether there are any significant differences of performance or risk-taking behaviour, compared to the pre-merger period. In the result of their estimation, it was found that the acquisition-oriented S&Ls are constrained to take lower profits and riskier management over the post-acquisition period. Thus they conclude that total social losses could be enlarged over the long term, as the S&Ls that carried out the merger in the short-term tend to perform worse after the S&Ls crisis.

Also, there is another aspect of how the management efficiency of the S&Ls changed for the reformation of regulations after the crisis. In the 1980s, many regulations for the S&Ls were amended for the many S&L failures, and the degree of competition increased for the relaxation of regulations. The main points of the relaxation were the abolishment of regulation Q and the

[33] "Zombie" S&Ls were assumed as the institutions which were relieved by the government regardless of the actual bankruptcy.
[34] $Z = W_1X_1+W_2X_2+\dots W_nX_n$, where Z is the discriminant score or Z-score, W_1, W_2, and W_n are discriminant coefficients, and $X_1, X_2, \dots X_n$ are the financial ratio.

establishment of the Depository Institutions Act of 1982, which is called as the Garn-St Germain.[35] By the enforcement of easing regulations, Gropper and Hudson (2003) expect the expense-preference behaviour would decline inside the S&L intuitions.[36] The easing of regulations leads to more competitive conditions in the market, and its condition should connect to control the expense-preference behaviour by managers. In addition, the reduction of its behaviour would induce improvements in management efficiency from the output side. They developed the model by Akella and Greenbaum (1988). The result shows that the disposals of regulation, which constrain the competition, improve the management efficiency through expanding their output.

(ii) Speciality of the S&Ls as cooperative institution

There are several researches that focus not only on the S&Ls crisis but also on the particularity of organizational form such as the mutuality. The mutuality was considered also in Chapter 2. In fact, it was studied in the ownership structure of the S&Ls (mainly mutual form), compared with commercial banks (stock form).

Firstly, Hermalin and Wallace (1994) discuss the impact of organizational form on the level of efficiency. Following a concept of agency problem, the organizational form of mutual institutions connects to the expense-preference behaviours and generates a managerial slacking problem or perquisite taking problem. Thus the efficiency of stock form is generally higher than that of mutual form. Nevertheless, managers of stock forms change into risk-takers if there is an "asset-substitution" conflict between shareholders and debtors (depositors). (Harris and Raviv (1991)) As the managers of stock forms prefer taking risks, they accept higher risks even if there are lower returns. Thus, it is possible for stock forms to have relatively lower efficiency than mutual forms. Consequently, which hypothesis is more applicable to the S&Ls industry? With regards to this question, Hermalin and Wallace (1994) estimate the relative efficiency of the S&Ls using non-parametric techniques. As a

[35] The Garn-St Germain law eased the regulations which limited the conversion from mutual institution to stock institution and the S&Ls' financial products.

[36] Previous literature on the expense-preference behavior are Berle and Means (1932), Williamson (1963), and Jensen and Meckling (1976). The research on baking industry was taken by Edwards (1977), and then those on the S&L industry were done by Akella and Greenbaum.

result they find that the stock S&Ls are more efficient than the mutual S&Ls in the case of the controlled business line and the case that the agency problem between owner and manager is improved. However, it was expected that mutual S&Ls would have higher efficiency if the business line were not controlled. Therefore, as the asset-substitution conflict between stockholders and debtors (depositors) still exists, the degree of relative efficiency would be mixed depending on the control of the business line.

Fok, Li and Finch (1995) also investigate the product efficiency of California's S&Ls with the non-parametric linear approach, and discuss the determinants of the efficiency. From the result of the California thrifts in 1989 using the truncated regression analysis model, it was concluded that both technical efficiency and economies of scale are significantly high scores and the product efficiency is significantly affected by organizational form, size, management form, and the quality of assets. In particular, in terms of the organizational forms, it was found that mutual S&Ls have lower product efficiency and economies of scale.

Gropper and Hudson (2003) argue that the expense preference behaviours might have a larger impact on the level of output than profit, and it would reflect the efficiency. To consider this hypothesis they examine the output levels of the S&Ls before and after the crisis. If the expense preference behaviours affect the output level, the increased competition after the crisis should make the output level decline. In other words, managers of S&Ls, who have to carry out steady and robust management, would offer fewer risky loans.[37] Their study is based on Akella and Greenbaum (1988).[38] From the result of estimation between mutuality and expense preference behaviour, Gropper and Hudson (2003) found that both expense-preference behaviours and output level significantly decreased in the case of declined mutuality (increased competition).

Previous studies show that mutual institutions are more likely to show the expense preference-behaviours and to have lower efficiency. In that case, management inefficiency might be assumed to be linked with the number of S&Ls failures in the crisis. Thus, for the adequate

[37] See Baumol (1972).

[38] Some previous researches investigated the impacts on inputs. (Edwards (1977), Hannan (1979), Hannan and Mavinga (1980), Verbrugge and Jahera (1981), Smirlock and Marshall (1983), Blair and Placone (1988))

improvement of the system it would be important to accurately assess the reasons for the S&Ls failures, such as macro economic factors or the inefficiency of individual S&L. In terms of the estimation between inefficiency and insolvency ratio, Hermalin and Wallace (1994) found that inefficient S&Ls have 4.5 times higher probabilities of bankruptcy than the efficient ones. It meant that inefficient S&Ls have higher bankruptcy probability and that the level of inefficiency is affected by other factors than organizational form.

3.2.1.4. Conclusion for the savings and loans industry

In general there are some direct causes of the S&Ls crisis, such as the real-estate business depression and the interest-rate mismatch. However, there was also another factor, the degree of management efficiency, separating the S&Ls that survived from those that failed. Some previous studies show this indirect factor induced the expansion of the S&Ls crisis. (Cebenoyan, Cooperman, and Register (1993), Barth, Hudson, and Jahera (1995), and Fok, Li, and Finch (1995))

Following these backgrounds, a variety of structural reconstructions have been carried out after the S&Ls crisis. For example, the following changes had been practiced: changing the accounting standard, putting weight on housing finance, and accepting indices other than the capital adequacy ratio. Most previous studies also discuss these topics. (Blacconiere (1991), Fuller and Koher (1994), and Mansur and Elyasiani (1994)) However, these studies conclude that the effects of increased competition and scale merit have not necessarily appeared since it is still in the period of transition. (Pantalone and Platt (1993), and Gropper and Hudson (2003))

In addition, most of the other researches consider the question as to what kind of figures can clearly represent the speciality as mutual institutions. As a result of the previous studies, it was not concluded that the difference of organizational forms would reflect the degree of management efficiency. Namely, some studies showed the stock S&Ls are efficient while others find that the mutual S&Ls are efficient. If the stock S&Ls are relatively efficient, the main reason of the inefficiency in mutual S&Ls might be agency problems. In contrast, if the mutual S&Ls are relatively efficient, the asset-substitution conflict problem could be considered the main reason for inefficiency in the stock S&Ls. (Hermalin and Wallace (1994), and Fok, Li, and Finch (1995))

3.2.2. The credit unions industry in the US

This section discusses the credit unions industry as another US cooperative financial industry. What are the credit unions? Why were they built in history? And how have they developed over time?

3.2.2.1. Feature of the US credit union industry : Historical background and regulations

(i) Feature of the US credit union industry : Historical background

This section will consider whether credit unions actually differ from the S&Ls, even though they are often grouped together in the category of mutual financial institutions. First of all, in this part, the difference of historical background is discussed. The origin of the credit unions comes from credit cooperative associations in Germany of 1848. The aim of the foundation of those institutions was to raise people out of poverty for religious and ethical reasons, and to foster their independence. Although it is mentioned that the first credit union in the US was created in New York in 1864 by German immigrants, Alphonse Desjardan from Canada had an impact on the establishment of the first US credit unions. It is possible to say that the US credit unions therefore were affected by two countries – Germany and Canada.[39]

The early credit unions did not develop very quickly. In 1920, the state law had established only 9 states, and there were only 176 credit unions across the whole country in 1925. Even in 1934

[39] See Moody and Fite (1971), chapter 1.

in which the Federal Credit Union Act was established, there were about 2,500 credit unions in 38 states and about 450,000 members in nationwide.[40] Nevertheless, the power of credit unions had extended from this year to the 1970s, and has subsequently dropped since the 1980s. (The numbers of credit unions were 10,586 (1950), 20,094 (1960), 23,687 (1970), 21,465 (1980), 14,549 (1990), 10,684 (2000).) However, the number of members goes on increasing. (Table 3.4)

The main reason of this rapid growth was for the credit unions to meet the needs of an enormous amount of consumer credit. In other words, commercial banks had not been interested in consumer finance for a long time, and the S&Ls and savings banks had been restricted to the field until recently. The credit unions attained their drastic development because they focused on consumer lending and met an unsatisfied popular need.

Table 3.4 Number of credit unions and members

Year	Total CUs	Members	State CUs	Federal CUs
1980	21,465	43,930,569	9,059	12,406
1981	20,784	45,187,932	8,841	11,943
1982	19,897	46,568,525	8,502	11,395
1983	19,095	47,446,666	8,143	10,952
1984	18,357	49,210,277	7,825	10,532
1985	17,654	51,907,540	7,544	10,110
1986	16,928	54,947,680	7,182	9,746
1987	16,274	57,227,653	6,889	9,385
1988	15,709	58,687,790	6,600	9,109
1989	15,121	60,490,312	6,310	8,811
1990	14,549	61,610,959	4,802	9,747
1991	13,989	62,267,904	5,779	8,210
1992	13,385	63,845,767	5,486	7,899
1993	12,960	65,436,212	5,266	7,694
1994	12,551	67,389,848	5,056	7,495
1995	12,230	69,302,489	4,902	7,328
1996	11,887	71,381,765	4,738	7,149
1997	11,659	73,468,908	4,682	6,977
1998	11,392	75,616,617	4,583	6,809
1999	11,016	77,516,502	4,453	6,563
2000	10,684	79,751,873	4,352	6,332
2001	10,355	81,589,260	4,237	6,118
2002	10,041	83,345,147	4,091	5,950
2003	9,875	84,847,962	4,100	5,775
2004	9,346	86,050,841	3,774	5,572
2005	9,011	87,014,017	3,619	5,392
2006	8,662	88,221,913	3,477	5,185
2007	8,396	89,324,410	3,361	5,035
2008	7,966	89,913,600	3,121	4,845

Sources: Credit Union Yearend Report 2005 and 2008, CUNA CU statistics.

[40] Ibid. chapter 8.

(ii) Feature of the US credit union industry : Regulations

Like savings banks and the S&Ls, credit unions can choose their charter, either state or federal. In 2008, 60.8% of 7,966 credit unions were offered the federal charter by the government. (Table 3.4) Federally chartered credit unions were subject to the regulations from the National Credit Union Administration (NCUA).[41] In terms of the number of members and total asset, the federal credit unions respectively represent 55.0% and 54.3% of all credit unions in 2008.[42]

In 1934, the U.S. Congress passed the Federal Credit Union Act, which was signed by President Roosevelt. The purpose of this federal law was to make enough credits and to promote the credit unions through a national system. This act was established not only by the federal credit union system but also by the Bureau of Federal Credit Unions, which is the predecessor to the NCUA, to charter and oversee federal credit unions. The general articles in the Federal Act were based on the Massachusetts Credit Union Act of 1909, and these articles became the basis of many other state credit union laws. Under the articles of the Federal Credit Union Act, a credit union must be chartered under either federal or state law. This is known as the dual chartering system, which is still in existence.

The Federal Credit Union Act is amended periodically to evolve and to keep a status as modern credit union law. Since the establishment of this law, the federal credit unions could offer a variety of financial services to respond to the expectations of their members. For example, the main financial products by the previous federal credit unions were basic passbook share savings accounts, share drafts, share certificates, credit cards, and individual retirement accounts. However, in recent years many credit unions have expanded their lending programs. That is, they include real estate, member business, and guaranteed student loans as well as the traditional consumer loans (primarily

[41] However, the NCUA offers the guarantee of deposit insurance (up to 100,000 US dollars) to insured credit unions through the National Credit Union Share Insurance Fund (NCUSIF). The NCUSIF currently covers about 98% of deposits of all credit unions.
[42] See CUNA; CU statistics, Annual Credit Union Data.

auto and signature loans). In addition, due to technological developments, most federal credit unions respond to the needs of members by offering transaction services through telephone and personal computer via the internet.

This section will consider the features that the credit unions share with the S&Ls and also the ways in which they are different.

In general, credit unions are financial "self-helping" organizations, and their purpose is to deposit funds from members and to offer loans to members. Unlike commercial banks, therefore, the credit unions focus on satisfying their members' needs with regards to deposits and loans, and on improving the financial circumstances of members. They are totally different from commercial banks pursuing profits as a private company.

These different objectives have a significant effect on the features of credit unions. Compared with commercial banks there are roughly six different points in credit unions. Firstly, the size of credit unions is significantly smaller than most commercial banks while the number of credit unions is much larger than commercial banks. On average, the credit unions have assets of approximately 30 million dollars, while average commercial banks have about 500 million dollars. Also, only 5% of credit unions have assets of more than 100 million dollars, and two-third of them actually possesses less than 10 million dollars. The reason for this situation is that the credit unions took on the relatively small number of customers who had not been traditionally offered financial services by commercial banks. These customers generally have a smaller than the average income, and thus were neglected by commercial banks. However, in the demographic data these customers recently appear to be earning above the average American income. As a result, some credit unions have become large enough to compete with commercial banks, although the majority of them are still small.

Secondly, due to the difference in ownership pattern between banks and credit unions, there are some different points, such as tax treatment and behavioural objective. Namely, credit unions have a feature that they are owned by members having common bonds of occupation, association, or community since credit unions are 'not-for-profit' or cooperative organization unlike commercial banks. The cooperative organization essentially transfers money from the deposits of members, known as 'share', to loans of the other members. The earned profit of credit unions in the lending process is returned or reinvested to the members as the retained earnings. Therefore the credit unions are permitted pay a lower amount of income tax. Due to this deduction of income tax, credit unions can offer a lower interest rate on loans, and this low interest confers a larger cost advantage to the credit unions than commercial banks and S&Ls.

Thirdly, each individual member of the credit unions has the right to one vote at the annual general meeting regardless of the size of their deposits.[43]

The fourth feature is that the financial services offered by credit unions are specialized in basic products such as basic savings and loans. For example, 95% of federal credit unions provide small loans such as loans for the purchase of cars and unsecured personal loans. [44] As they cannot earn the enough profitability due to these limited services, the staffs are covered by volunteers who are also members.[45]

The fifth point is that the membership is confined only to individuals who share a common bond. According to the Federal Credit Union Act of 1934, membership of credit unions must have a common bond of occupation or association, or belong to groups within a well-defined neighbourhood, community, or rural district. Credit unions therefore have a feature that they strongly link to the managing conditions of main membership companies.

The sixth feature is that, unlike commercial banks, credit unions are limited to offering consumer loans and market services. The asset portfolio of the credit unions therefore becomes biased – 65% of their total assets are small consumer loans of less than 10,000 dollars. Additionally, credit

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[43] As a principle rule, it is required for the member of the board to be voluntary. However some states accept the small amount of board members' compensation.

[44] In contrast about 95% of large sized credit unions with more than 50 million dollars of assets supply many kinds of services such as mortgage loans, credit card loans, and so on.

[45] Large credit unions can employ the full-time staffs including managers and pay rents for the office space. (U.S. Treasury (1997), p.23)

unions have a large amount of government bond (over 25% of total asset), and a small amount of occupant mortgages.[46] In spite of these restrictions, most of the members deposit their funds to the credit unions. It means that their customers trust the safeness of credit unions, and the favourable conditions of deposit interest. That is, these references of members are considered as one of the feature of credit unions.

While every credit union exhibits the six features above, they can still be divided into a number of groups depending on the geographical conditions of the business area or the type of membership. Firstly, they can be divided into state and federal credit unions depending on the supervisory organization that offers the charters: state credit unions are regulated by the state agencies and federal credit unions are controlled by the National Credit Union Administration, NCUA.[47] Secondly, credit unions can also be categorized along membership lines, and traditionally there have been three types of classification: occupational (place of employment)[48], associational (industry group, professional body, labour body, labour union and so on)[49], and residential credit unions (geographical group).[50] Nevertheless, third category, called 'multiple', has recently been created.[51] Therefore, if the common bond shown by the credit union is single, it is defined as a single-bond credit union. In contrast, if credit unions accept members who fulfil one of their multiple bond conditions, they are categorized as multi-bond.

[46] However the financial crisis in the 1980s damaged the credit unions through these mortgages because the 43% of them were loans for small sized consumers (less than 10,000 dollars).

[47] NCUA is the independent government institution as well as FRB and it has the National Credit Union Share Insurance Fund (NCUSIF) insuring capital funds of credit unions, as the affiliated institution. The NCUSIF is established in 1970 and insured the capital funds (deposits) up to 100,000 dollars officially.

[48] The occupational credit unions (single bond) are normal and occupied about 40% of all institutions. They have around 25% of total assets in the industry.

[49] The associational credit unions (single bond) are about 10% and their total assets are about 2.5%.

[50] The number of residential credit unions (single bond) is about 8%.

[51] Multiple credit unions, which were originally single bond occupational or associational ones, increased since the affiliation of select employee groups (SEGs), as shown in the next section. By 1997, the number of multiple credit unions is about 37% and the share of total assets is about 60%.

3.2.2.2. Features of the US credit unions : Current conditions

This section examines economic conditions and the recent incidents. In general, the movement of deregulation in the US has taken place since the 1970s. The deregulations have had a great impact on the financial products and services of credit unions, and made enormous changes to all the financial and operational procedures. For example, the aspect of deregulation having the largest impact was the easing of the common bond requirement. The membership of credit unions was originally restricted to the group with a single common bond (c.f. same employer, same association, and same community). However, in 1982 the NCUA approved the entrance of non-members (multiple groups or select employee groups, "SEGs") in the credit unions as unrelated membership. These credit unions are referred to as the multiple common bonds credit unions. The reason for this approval was that commercial banks requested the reduction of common bond requirement in the credit unions. Historically the credit unions were had been granted special privileges in terms of exemptions from federal income tax. Some community banks and thrifts complained about this privilege, and therefore the participation of the SEGs was approved by the NCUA.[52] Although the US Supreme Court decided this was against the law, the US Congress overruled the Supreme Court, and enacted the Credit Union Membership Access Act (P.L. 105-219, August, 1998). In fact, federal credit unions were authorized to affiliate the unrelated groups up to 3000.[53] This act also permitted groups with over 3000 unrelated individuals to join existing credit unions.

Although this policy initially brought about many credit union failures, it subsequently advanced the growth of credit unions' membership.[54] The number of credit unions decreased from 19,095 in 1982 to 11,016 in 1999, but members increased from 46.6 million to 77.5 million (Table 3.4). Accordingly, the size of the credit union industry expanded with this intensive growth: the average assets size of all credit unions rose from 83 billion dollars in 1982 to 423 billion dollars in 1999 (Table 3.5 Figure 3.2). The expansion trend continues in the 2000s.

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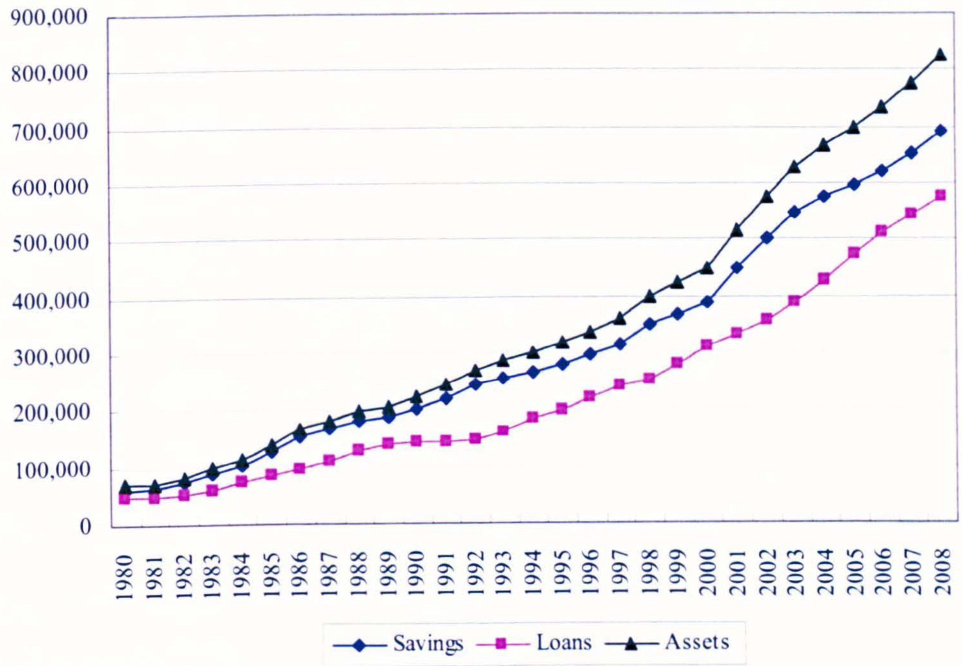
[52] For instance, the federally credit union of AT&T added 150 SEGs which is equal to the 65% of all members.
[53] This act did not change the article about tax exemption but restricted the commercial lending.
[54] However, the low income credit unions, which have less than 5 million dollars total assets and offer their services mainly to labouring classes, still had issues. (Kebede and Jolly (2001))

Table 3.5 Balance of Credit unions

	Total Savings	Total Loans	Total Assets
1980	61,724	48,703	68,974
1981	64,622	50,369	72,291
1982	74,847	51,489	82,680
1983	89,693	60,517	98,327
1984	102,568	75,442	112,960
1985	125,813	85,123	137,462
1986	152,860	95,518	166,299
1987	166,018	110,734	181,735
1988	178,511	126,619	196,512
1989	187,508	136,343	206,255
1990	201,082	141,889	221,759
1991	219,635	142,258	242,481
1992	243,562	146,107	269,812
1993	255,800	157,957	286,716
1994	263,623	181,935	298,935
1995	278,813	198,337	316,170
1996	295,394	220,194	336,452
1997	315,687	238,656	360,585
1998	349,311	252,344	398,925
1999	367,008	279,023	422,567
2000	389,625	309,367	449,799
2001	449,013	330,894	514,691
2002	500,106	355,233	574,687
2003	545,475	388,361	629,134
2004	574,960	428,279	668,104
2005	596,596	473,762	700,390
2006	621,124	510,773	732,498
2007	652,849	543,733	776,588
2008	691,766	575,814	825,802

Note: Million US dollars.
Source: CUNA; CU statistics.

Figure 3.2 Balance of Credit unions



Note: Million USD

3.2.2.3. Features of the US credit unions : Previous studies

This section discusses previous academic studies of credit unions. Broadly speaking there are two topics: (i) the effects of the reduction of common bond requirements and (ii) the special characteristics of credit unions.

(i) Impact of the reduction of common bond requirements

There are many studies on the impact the reduction of common bond requirements has had on the business strategies of US credit unions. In theory, it would be expected that healthy and stable credit unions attempt to expand the range of their membership after a liberalising measure such as the reduction of common bond requirements. The expansion of market power by a small number of credit unions might allow an increase in the number of mergers and the degree of concentration. Most of the previous studies have focused on the idea of whether the increase in concentration connects to the improvement of credit union industry.

Emmons and Schmid (1999b) discuss whether the decline of common bond requirements was the correct answer. In other words, which common bond is better for credit unions - single common bond or multiple common bonds? In cases where the institutions offer services only to their members, the expansion of membership leads to two possibilities. The first is that the expansion of potential membership would reduce the degree of affinity between members, and would make credit unions inefficient. The second is that the increase of membership and assets leads to the economies of scale, and the management of credit unions could therefore become more efficient. Emmons and Schmid (1999b) define the participation rate as a proxy of efficiency, and investigate the relationship between its rate and the difference of common bonds (single- or multiple). The earned result shows that larger potential memberships lead to lower participation rates in credit unions. However, it was found credit unions with multiple common bonds would have relatively higher participation rates, leading Emmons and Schmid (1999b) to conclude that there are features of economies of scale in the credit union industry.

Fried, Lovell and Yaisawarng (1999) also directly measure operational efficiency in order to examine whether there is some benefit in the consolidation and mergers of credit unions since the implementation of multiple bonds by NCUA. The point of their measurement is to distinguish acquiring credit unions from the acquired credit unions. Using the linear programming (techniques) efficiency calculation, the result suggests that the members of both acquiring and acquired credit unions can obtain some benefits at least for three years since the merger. However, Fried *et al.* (1999) also investigate some differences between successful and unsuccessful mergers. The reason is that the benefits of the first estimation were calculated from the average data. The result of the second estimate shows that the acquiring credit unions can receive significant benefits from merger if their loan portfolios are lower and the ROAs are higher. In contrast, the acquired credit unions also can receive some benefits if they have any previous experience of merger and select their targeting employee groups. It is concluded that if they carefully consider their choice of partners, their overhead costs would be diffused and the losses to their members might be kept to a minimum.

It was generally found that fostering credit union mergers by permitting multiple common bond requirements improves operational efficiency to some extent. However, there is also the question of whether this improvement is delivered to their members who they are also the owner of credit unions. For this question Leggett and Strand (2002) make a hypothesis that one of the reasons might be the special nature of the ownership structure of credit unions. In the case of stock company, stockholders have a right to explain depending on the number of holding stocks. Stock holders have therefore the sufficient motivation to supervise their manager. However, in the case of mutual financial institutions, this motivation, which members supervise managers, would gradually be decreased due to the growth of membership, as mutual financial institutions give only one vote to each depositor. Thus it would be expected that managers use most profits not for members but for reinvestment in the institutions. Leggett and Strand (2002) presume that this process is an agency problem in mutual institutions, and its problem would be exposed in some indices such as net interest margin, employee compensation relative to assets, operating expenses relative to assets, or return on average assets. As a result of their regression analysis it was found that credit unions with multiple memberships have significant agency problems. In other words, even if their incomes are increased by economies of scale through mergers, the increased incomes might not restore their members.

Frame, Karels and McClatchey (2002) introduce the question of whether growth in membership has any effects on the degree of risk-taking by credit unions. The result of their estimate shows that multi-bond credit unions, which are occupational credit union, have higher risks (loan-to-share ratios) and lower capital than single-bond credit unions. This trend means that multi-bond credit unions can have many opportunities for investment since the concentration risks of membership are lower.[55] Thus the trend could be recognized as a desirable change. However, they also suggest some negative points, such as the fact that the diversification of membership might weaken the informational advantage of common bond requirement.

(ii) Special characteristics of the credit unions as cooperative financial institutions

With respect to credit unions, another main topic is what kinds of impact are caused from mutuality.

[55] Concentration risk indicates the risk that the variety on balance sheet is lost due to the restricted customers. (Frame *et al.* (2002), p.615)

Firstly, many literatures were interested in the question which agency group holds decision-making power in the occupational credit unions' management. In general, credit unions must be controlled by members because credit unions are membership organizations. Nevertheless, there are some other cases such as member-control, borrower-control, sponsor-controlled or market-controlled. The hypothesis by Emmons and Schmid (2001) assumes that the interest rate of deposits have positive links with loan demands in the case of member-control (especially, depositor-control), but would be negative in the case of borrower-control. The reason is that borrowers have incentives to avoid setting higher deposit interests which engages to higher loan interest. Also, in the case of sponsor-control, it is also assumed that deposit interest rate could be set relatively higher. The reason is that higher deposit interest rates connect to the increase of the borrowers' ratio to all members, and additionally, the increase of loan incomes is supposed to increase the return to sponsors. As a result there is expected to be a positive relationship between deposit interest and loan demands. In the case of market-controlled credit union, there was not a significant relationship between deposit interest rates and the loan-to-member ratio. Their study showed the result that deposit interest of credit unions has a positive relationship with loan demands, and it is consistent with the sponsor-controlled hypothesis.

Secondly, there is the issue of whether risk-taking behaviour has some impact on the level of salaries received by managers. With respect to the management of credit unions, their members and sponsor companies make some important decisions, while the managers also make decisions in many cases. Managers sometimes have an incentive to adopt expense-preference behaviour since credit unions are non-profit corporation, and its behaviour brings about the inefficient management. Emmons and Schmid (1999a) consider the relationship between the expense-preference behaviour and the salary of managers. The reason is, if the managers' salaries are properly paid by their sponsors, it was expected that the inefficient management institutions should be reduced to a certain level. As a result of estimate following Demsetz efficiency wage hypothesis[56], it was found that the agency problem in credit unions is consistent with the efficiency-salary hypothesis. In other words, for decreasing the risks by managers, it is required to offer adequate salaries to managers.

[56] Demsetz (1983) considered that the management efficiency would be improved even in non-profit firms if managers engaged to accept lower salary in the case of low operating performances of firms, and vice versa.

Thirdly, there is the question of what kind of factors has an impact on the revenue of Low Income Credit Unions (LICU). The LICU strongly share many of the features of mutual institutions. The reformation of the credit union industry in the 1980s made the circumstances that the LICU need to take higher risks for increasing their assets. As the size of financial risks changes depending on the performance of credit unions, it was important to investigate the relationship between risk-taking behaviour and subsequent revenues. Kebede and Jolly (2001) assume the pattern of credit unions could be distinguished into either (i) borrower-dominated, (ii) saver-dominated, or (iii) neutral, depending on the economic condition of each credit union. They expected that the LICU could behave neutrally. As a result of estimate, they found that the LICU would alter their risk-taking behaviours depending on the degree of income-asset ratio. That is, it was shown that (a) the degree of risks is relatively high in the case of low income-asset ratio, (b) the risks are also lower in the case of moderate ratio, and (c) the risks are higher in the high ratio.

Fourthly, Hannan (2003) analyzes what kind of impact on the competitive power (particularly deposit price) would be generated by the entry of credit unions into new market where they must compete with the other type of financial institutions. They examined the relationship between the importance of credit unions[57] and deposit interest rates of the other financial institutions such as commercial banks and thrifts. Unlike commercial banks, credit unions can offer different types of financial services since they limit the range of their members. If many customers prefer the financial services offered by credit unions, commercial banks need to raise their deposit interest rates to regain their customers. The result of regression analysis shows that the existence of credit unions in the deposit market has a positive relationship with the deposit interest rates of banks, and the level of deposit interest rates is moved up by the new entry of credit unions.

Finally, Goddard, McKillop and Wilson (2002) consider an impact of mutuality on the growth of credit unions. Are there any other factors affecting the growth in size of credit unions, such as age, charter type, scope of membership growth? In other words, they examine whether the larger credit unions are more efficient, and whether they have a smaller amount of nonperforming loans.

[57] It was defined as the degree of market entry, and concretely used the deposit share of credit unions in the market, the number of credit unions' members per adult population, and the number of "potential" members of credit unions per adult population.

From univariate and multivariate cross-sectional and panel studies, they found the larger credit unions have a lower growth rate.[58] This does not mean, however, that the large credit unions always grow slowly. In terms of the size of institutions, the impact of assets would be different from that of membership. In addition it was also found that other factors – such as age of credit union, charter type, financial structure and performance – would influence the growth rate. In particular, if the scope of potential members in credit unions is set wider, the speed of growth could be slower. In conclusion, the law of proportionate effect (LPE) does not fully fit in the case of the credit union industry, and the growth rate is affected by other factors from their membership and the regional characteristics.

3.2.2.4. Conclusions for the credit union industry

One of the topics in the previous studies on credit unions is the impact of the reduction of the common bond requirement has on them. Firstly, it is generally shown that the change in the requirement would expand the size of stable credit unions through mergers, and the change might induce an increase in economies of scale and management efficiency. (Emmons and Schmid (1999b)) However, certain conditions are required if efficiency is to improve. Moreover, even if the improvement of efficiency was attained, some problems might be generated (for example, members cannot receive the benefit). (Fried *et al.* (1999), Leggett and Strand (2002), Frame *et al.* (2002)) Although there are still some conditions to offer stable financial services to their members as mutual institutions, it was found that the reduction of common bond requirements had a positive impact on the credit union industry.

Another topic on the US credit unions being focused by previous researches was the effect of their behavioural objective, in particular mutuality. As well as the S&Ls there are many papers about the expense-preference behaviour of managers in credit unions due to mutuality. In fact, the issue considered is whether expense-preference behaviour expands the management risks of credit

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[58] Goddard *et al.* (2002) insists in p.2353 that it is related to this result the fact that the resource of capital in credit unions is only retained earnings.

unions and if it has any significant impact on their revenue and assets. Although there is some evidence to support these hypotheses, the expense-preference behaviour does not always generate in the credit union industry. This problem could be improved by the supervising of sponsor-companies and by adjusting the salary of managers. (Emmons and Schmid (1999a, 2001), and Kebede and Jolly (2001)) In addition, it has been found that the management of credit unions is influenced not only by internal factors such as managers and sponsors but also by external factors such as regional economic conditions and the diversification of the other financial institution in the same market. (Goddard *et al.* (2002) and Hannan (2003))

Chapter 4 Literature Review

This chapter will focus on the role of financial institutions and cooperative financial institutions as discussed in the already-existing literature.

4.1. Importance of financial institutions

4.1.1. Importance of financial institutions: Traditional discussions

In general, financial institutions have three main functions in supplying financial services such as deposit-accepting and loan-offering. The first function is that of being a financial intermediary. Although divided into two functions since the 1970s, this is traditionally understood as an asset-transformation function. (Bhattacharya and Thakor (1993), Greenbaum and Thakor (1995) and Boot (2000)) The asset-transformation function means that the fund-raising and the fund-lending are carried out by banks through transforming primary securities into indirect securities. That is, banks can make loans using accumulated deposits while borrowers can choose between various kinds of loans in accordance with the total sum and payment period they require. There is also a benefit to lenders in that they are more able to successfully increase their excess funds than would be the case if they looked for borrowers by themselves. The primary securities, which are also called direct securities, refer to the bill and the borrowing instrument, which companies issue to borrow funds. The primary securities concretely stand for stock, corporate bonds and public bonds. In other words, banks accept stocks and bonds from borrowers, and alternatively offer a loan service. In contrast, banks receive the excess funds from lenders (depositors), and provide indirect securities such as a deposit certificate and an insurance paper to lenders. If lenders were to find borrowers by themselves and serve the fund in exchange of receiving indirect securities from borrowers, the risk on lenders may increase more than in the financial intermediation process by banks. The reason is that, for lenders, primary securities are a high-risk product while indirect securities are low-risk. Consequently, it is assumed that banks perform the function of increasing social welfare through transforming risky assets (primary securities) into risk-less assets (indirect securities).

The second function is a credit creating function, by which money (deposit currency) in a community grows through banks' repetition of deposit-accepting and lending-offering. Banks keep money from a lot of depositors, and reserve some cash so as to be able to accede to requests of refund for withdrawal. Some depositors might withdraw their deposit almost immediately, but others would leave it deposited for a long time. In general, it is inconceivable that all the depositors would demand withdrawals at the same time, which is why banks do not have to reserve the full amount of their deposits in cash. Banks keep some cash close at hand, and use the rest of the deposits as loans to borrowers. The borrowers generally use the money for the transaction with their customers. The customers who receive the money will put it in the bank as deposit unless they have plans to use it immediately. The banks reserve some money and issue new loans with the remainder. By going over these processes, money, called deposit currency, is created, and the sum of total deposits rises rapidly. This system is named credit creating, and it results in the volume of transactions in a community expanding drastically, thereby giving a significant stimulus to the economy.

The third function of financial institutions is that of settlement. Many people have deposit accounts in financial institutions, and use them for making money transfers and paying utilities bills. As the banks are linked to one another through the original payment network, the purchaser of goods is able to complete the signing of a transaction without meeting the seller. Consequently, banks contribute to decreasing transaction costs in the whole community.

4.1.2. Importance of financial institutions: Discussions since the 1970s

The traditional roles of financial institutions, as noted above, are as financial intermediaries, in credit creating and in settlement. However, since the development of informational economics in the 1970s it has been argued that in fact there are other functions of financial institutions. In particular, by Akerlof (1970), it appears that the concept of the financial intermediary function has changed significantly.

The financial intermediary function had traditionally represented qualitative asset transformation. Banks make smooth the flow of funds in the economy by deposit-accepting and loan-offering services. Securities issued by banks in return for deposit-taking are highly liquid, but securities issued by companies in exchange of borrowing money are relatively illiquid and unmarketable. That is to say, banks play the important role of transferring the illiquid-assets of borrowers into the liquid assets, and improving economic conditions toward Pareto optimality (Diamond and Dybvig (1983)).

However, this concept of the financial intermediary function has changed because of the development of informational economics since the 1970s. It has been considered that the most important function of financial institutions is to reduce the gap of asymmetric information between lenders and borrowers. The concept of asymmetric information was introduced in the field of economics by Akerlof (1970), and subsequently applied in the area of financial systems by Leland and Pyle (1977), Diamond (1984, 1991), Ramakrishnan and Thakor (1984) and Boyd and Prescott (1986). The idea behind asymmetric information is that in transactions there are significant informational differences between sellers and buyers. In the financial market, borrowers have more and better information than lenders. Specifically, when it comes to the borrowers' collateral, diligence, moral character and so on, the borrowers themselves obviously know more than lenders do. In cases where the borrowers are companies, it means they have 'insider' information regarding the project in question.

If there were no banks and the financial intermediary services were provided only in the capital market, lenders could not adequately assess the risk borrowers represent without real information on their status. In other words, if there is an asymmetric information problem, it is impossible for lenders to get knowledge about the ability of borrowers and about the projects due to the moral hazard problem.[59] The reason is that borrowers have an incentive to get better conditions for the loans by giving the lender only positive information regarding the feasibility of their projects. In the capital market, if the lenders supervised the borrowers by themselves in order to avoid the moral hazard problems, most transactions would not be carried out because of the huge cost involved would exceed the revenue raised by the transaction. (Moral hazard problem)

With respect to informational economics, if there are no financial institutions in the economy, there is another problem apart from the moral hazard problem. That is, if banks did not exist in the economy, it is possible for another factor to cause financial markets not to perform successfully. For example, if there are a variety of the projects by borrowers, it is extremely difficult for lenders to assess those projects properly even if the borrowers do not have an incentive to moral hazard. Therefore, those projects would estimate lower than actual in the market even if they are excellent projects. If this average value of the project in the market is higher than the average cost of its project, it is to be expected that the market would be dominated by projects of lower value. The reason is that borrowers can foist these low quality projects to lenders due to the lenders' limited knowledge. As a result, as lenders could realize that most projects in its market are of quite low quality, most lenders might withdraw from the market. (Adverse selection problem)

However, the existence of financial institutions such as banks serves to decrease these problems. In this regard we can find a new function of financial institutions. This argument has been newly developed since the 1970s. In particular, the following functions of financial institutions have been discussed: (i) declining the verification cost, (ii) reducing the screening and monitoring cost, (iii) diminishing the problems of moral hazard and adverse selection.

First point is the reduction of the verification cost. It is particularly difficult for borrowers and lenders to find each other directly because the real economy is extremely huge and complicated. A small number of borrowers such as large companies may find lenders through the capital market,

[59] Moral hazard means that the provision of insurance encourages risk taking rather than discourages it. In the case of capital markets, it means that the borrowers do the risk taking behaviour intentionally due to the information asymmetry.

but most small and medium sized companies need to utilize the financial intermediary function performed by banks. For them, it is very important that banks transfer funds from lenders to borrowers. As banks connect and intensively collect intensively information on both lenders and borrowers, it is only by contacting them that these companies can easily find adequate partners. As a consequence, social costs would fall and social welfare could rise dramatically.

Secondly, financial institutions can greatly reduce the monitoring cost of borrowers.[60] It is expected that the reduction in information-producing costs brought about by banks would provide further incentives to make social investments. Financial institutions such as banks generally have an expenditure advantage in the sense that they can easily collect information on borrowers through the process of deposit-accepting and loan-offering. If the financial institutions did not perform their function, lenders would have to spend huge amounts on monitoring borrowers. Furthermore, if lenders do not monitor borrowers, the free-rider problem could also occur. Diamond (1984) examines the cost advantages of delegated-monitoring by financial institutions, and argues that delegated monitoring by financial institutions brings about the Pareto improvement in the market.

Thirdly, the intermediation on the part of financial institutions brings the financial market close to the condition of perfect information and decreases the adverse selection problem. In addition, the welfare of the community would be increased. As noted above, the adverse selection problem means a kind of market failure. It connects to problem that there are only low quality borrowers in the market due to the informational gap between lenders and borrowers. The delegated-monitoring and screening of borrowers by banks are available not only to reduce the verification cost but also to restrain the opportunity-exploiting behaviour, because banks can accumulate expert knowledge about the borrowers through both long and close relationships. Accordingly, as borrowers have a fear of coming unfavourable information into open, the possibility of opportunity-exploiting behaviour on the part of borrowers would drop sharply.

As a consequence, the following three functions can be added as the new roles of financial institutions after the development of informational economics: (i) lowering the verification cost, (ii)

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60 Schumpeter (1939) pointed out that the increase in social welfare financial institutions bring about by decreasing social costs.

reducing screening and monitoring costs, (iii) diminishing moral hazard and adverse selection problems.

Included in the concept of informational economics, small and medium companies have a larger asymmetric information problem than large firms. This is because large firms can readily prepare financial statements and easily appeal to lenders through the capital market. In contrast, due to having fewer staff it would probably be more problematic for individually-owned companies or small businesses to disclose their financial statements and to utilize the capital market. However, it is to be expected that small and medium-sized firms would keep playing a significant role as a foundation of every industry. Therefore it would be particularly meaningful to focus on financial intermediary services for small and medium firms, namely, the relationship lending system that is convenient in order for them to obtain information on both lenders and borrowers.

4.2. Importance of mutual financial institutions

In this section the information production activities that financial institutions perform in order to remove the information asymmetric condition is discussed, with the main question being that of how financial institutions, as lenders, bridge the gap that separates them from borrowers.

Financial institutions can reduce the asymmetric information problem between depositors (lenders) and companies or individuals (borrowers) by conducting intermediation activities. However, with regards to measure the ability of fund-borrowers, another method has recently been focused upon. It is different from the traditional method based on the long-term and close relationships with customers - which is to say the new method represents a mean of assessing the repayment ability of borrowers without using long-term information. The reason is that econometric models and information technology have developed drastically (Berger and Udell (2002)). However, these modern techniques are employed only for the large and profitable companies, and most financial institutions generally accept the traditional method. (Uchida, Udell and Yamori (2006)) The following parts discuss these two methods in greater detail, and consider which method is better for cooperative financial institutions in deciding whether or not to make a loan.

First it is suggested that the decision-making process regarding loans can clearly be divided into transaction-based lending and relationship lending, and the features of both method will be discussed with reference to the previous studies.

4.2.1. Definitions of transaction-based lending and relationship lending

Berger and Udell (2002) divided lending to small businesses into two categories: transaction-based lending and relationship lending. The former entails multiple transactions with a single customer or a single transaction with multiple customers. Banks use 'hard' information such as financial ratios, collateral ratios and credit scores in order to decide whether loans should go ahead, and can thereby readily make an objective judgement. In contrast, in relationship lending financial institutions make decision using 'soft' information about borrowers, obtained and accumulated through their long-term and close relationships with them – which sometimes has certain advantages in comparison with transaction-based lending.

Boot (2000) provides a clear definition of relationship lending before Berger and Udell (2002). Boot (2000) defines relationship as that which takes place when (i) financial institutions invest in the customers as well as acquiring customer-specific information, (ii) financial institutions obtain a variety of soft information underlying the long term inter-relationship (deposit-accepting, the issuing of credit-letters, cheque clearing, and cash management services) and assess the management capability of their customers, and (iii) financial institutions carry on advantageous transactions.

The customer-specific information in this definition means information that only the financial institutions and the customers have access to. For example, in the loan-contract, customer-specific information can be obtained only in those cases when banks offer screening or monitoring services (Greenbaum and Thakor (1995)). Financial institutions can then create additional opportunities to earn profits by re-utilizing this information at the other time.

Berger (1999) states that three conditions would generally be required for relationship lending to take place: (i) the financial institutions must be able to collect public information easily, (ii) private information must be collected through long and multiple relationships with borrowers and (iii) this information must be appropriated and treated as confidential information.

Which lending method should the cooperative financial institutions choose? To answer this question it is necessary to consider the merits and drawbacks associated with both methods, which will be done in the next section.

In addition, the effects of both these methods will also be considered. However, due to the recent development of banking technology there is one issue with regard to which the difference between the two methods is ambiguous. For example, some banks which were mainly using relationship lending try to adopt transaction lending. And in contrast, investment banks which were mainly using the transaction lending try to adopt relationship lending. It should be understood that there are many factors determining which method is adopted, such as techniques, competitiveness and regulation. The next section will therefore discuss the effects of these factors on the basis of the previous research.

4.2.2. Transaction-based lending

4.2.2.1. Definition of transaction-based lending

As for the lending method, this section discusses a transaction-based lending. This is a technique that is mainly practiced by large banks. It focuses on 'hard' information such as financial ratios, collateral ratios, and credit scores rather than 'soft' information in order to assess borrowers. Banks can assess borrowers by utilizing the comparative and marketable measures. As it is possible to obtain easily rather than soft information in relationship lending, total cost of transaction lending is relatively lower than that of relationship lending.

The expression 'transaction lending' has been used since the 1990s with regard to the decision-making process concerning loans. In the past transaction lending had been used only for limited borrowers. However, due to the progress of informational technology in recent years, it has since been widely adopted. There are six types of categories of transaction lending method, which have been researched separately. ((i) Financial statement lending: Stein (2002); (ii) Small business credit scoring: Berger, Kashyap and Scalise (1995), Mester (1997), Akhavein, Frame, and White (2001) and Frame, Padhi and Woosley (2004); (iii) Asset-based lending: Berger and Udell (1995) and Udell (2004); (iv) Factoring: Bakker, Klapper and Udell (2004); (v) Fixed-asset lending: Ono and Uesugi (2005); and (vi) Leasing: Chemmanur and Yan (2000), Hendel and Lizzeri (2002) and Gilligan (2004))

4.2.2.2. Classification of transaction-based lending

Berger and Udell (2006) separate transaction lending into six groups, depending on the information resources, the policy of screening or underwriting services, the monitoring strategies and mechanisms, and so on. The characteristics of each group are discussed below.

The first group is financial statement lending, a transaction process based on the reliability of the financial statements of borrowers. Two conditions are required for this lending process: (i) borrowers need to have adequate financial statements, and (ii) borrowers need to be in the strong financial situation with regard to financial ratios. The lending contract may be influenced by a variety of factors such as the existence of collateral and personal guarantees, but in general it is possible for lenders (financial institutions) to predict the ability of borrowers to repay with a fair degree of precision.

The second measure is small business credit scoring. Loans to small businesses are liable to be greatly affected by the hard information available to the manager of small firms. The information is collected mainly from the private consumption data in consumer credit bureaus. This method, using not only business information but also owners' private information, is applied particularly to the risky and informationally-opaque small firms. (Frame *et al.* (2004) and Berger, Millar, Petersen, Rajan and Stein (2005))

Asset-based lending is also a kind of transaction lending which focuses on the existence of collateral and a part of business property (c.f. inventory and obligation). In fact, it calculates the functional models in order to estimate dynamically the liquidity values of assets, underlining the hard data of borrowers. The hypothetical values of assets need to be assessed every day, every month and every year, depending on the size of the loans. This measure is similar to some other methods insofar as it utilizes pledged assets the ability of borrowers to repay, but is distinct in that it uses not the total value of company but the collateral values. (Udell (2004))

The fourth measure, factoring, is also a sort of transaction lending. In fact, it entails lenders (financial institutions) purchasing 'receivable accounts' from borrowers. These receivable accounts represent the borrowers' right to be repaid by other companies. The borrowers can therefore receive funds from lenders, instead of the right of accounts receivable. The factoring measure differs from the above two measures in three respects. Firstly, the factoring transaction needs to deal only with the receivable amounts in all assets, unlike the other asset-based lending underlying the inventories. Secondly, the original assets must be sold only to 'lenders'. Thirdly, the factoring transaction needs to be sold as a bundled product of three financial services (a financing component, a credit component and a collections component). Borrowers therefore need to outsource these financial services. The factoring measure is placed in the transaction-lending category because financial institutions make decisions on the basis of hard information about borrowers and on the value of the accounts receivable. (Bakker, Klapper, and Udell (2004))

The fifth measure is a fixed-asset lending measure. It includes the value of equipment, motor vehicles and real estates as the object collaterals of asset-based lending. However, by including fixed assets it would become rather complicated to assess the value of total assets. The reason is that financial institutions need to employ a wide variety of methods in estimating borrowers' market value, considering different types of assets such as the fixed-assets (long), liquid assets (short). (Ono and Uesugi (2005) and Klapper (2006))

The sixth measure is leasing, a kind of lending contract including the purchase of fixed assets by lenders. Financial institutions, as a lender, purchase the fixed assets and at the same time conclude a rental contract of fixed assets with borrowers. Certain options are often included in the contract, such as the opportunity for borrowers to buy out their fixed assets at a pre-determined price at the end of the leasing period. The reason why the leasing is included in the transaction lending is that the decision to underwrite services is taken on the basis of hard information regarding the quality of leased. Some studies argue that leasing measures have the beneficial effect of decreasing the adverse selection problem (Chemmanur and Yan (2000), Hendal and Lizzeri (2002) and Gilligan (2004)).

4.2.2.3. Advantages and disadvantages of transaction-based lending[61]

In summary, transaction lending refers to decisions regarding loans that financial institutions make after having assessed borrowers on the basis of hard information. The next question concerns the benefits financial institutions might derive from opting for the transaction lending method.

The first advantage is that the time taken to approve a loan could be shortened. Taking credit scoring as an example, the approval process has in most cases decreased from two weeks to a few hours (Lawson (1995)). By saving time like this, benefits accrue not only to financial institutions but also to customers. Customers are required only to provide a limited amount of information in their borrowing applications, and the application processes are expedited. Besides, as the cost of these procedures for financial institutions is not high, it is possible to improve operational efficiency since staff can instead focus their attention on more complicated cases.

[61] As the most previous studies on transaction lending have been carried out separately, there is little research on the entire advantage or disadvantage of transaction lending. However, it might be possible to apply the concepts of the entire advantage or disadvantage for each method, as all measures are alike in using hard informational data to assess the risk that borrowers represent.

Another benefit is that transaction lending can improve the objectivity of loan-approval processes. Financial institutions can respond fairly to all customers with the same standard of services, regardless of race, gender or other such factors. Even if a bank as lender rejects a borrowing request, it is possible to show easily that its rejection is due not to discrimination but to business-related factors. (Mester (1997))[62]

In contrast, the disadvantage for financial institutions is that the transaction lendings is connected to increasing market competition. Through the expansion of transaction lending, borrowers could easily apply to their loans. As financial institutions can easily obtain information about borrowers, they can offer loans even in cases where in the past, due to lack of information, they would not have done so. As the improvement in the quality of information could increase the precision of risk analysis, it leads to the intensification of market competition. (Frame *et al.* (2002))

In addition, it is also argued that the accuracy of the risk assessments or the econometric models needs to be improved. As noted by Mester (1997), if the econometric model does not fit in the cases of some customers, the advantages of transaction lending would be corroded by poor performance in spite of the significant decrease in disadvantages. And, even in the good model, financial institutions would not make a profit effectively if the used data were not adequate or correct. In other words, transaction lending is available only in limited cases, and not all financial institutions can employ it.[63]

4.2.3. Relationship lending

4.2.3.1. Definition of relationship lending

As discussed before, relationship lending is a way in which financial institutions obtain and accumulate 'soft' information about borrowers, through making long-term and close relationships

[62] However, there are some people who do not accept that this benefit in terms of objectivity really comes about. The reason is that low-income individuals and members of minorities tend to have bad historical data and in the past have had only limited access to borrowers. (Mester (1997))

[63] In the case affecting exogenous factor such as financial crisis, it is difficult to add all determinants and the damage could be spread.

with customers. By using this 'soft' information the financial institutions can pursue more advantageous lending transactions than institutions lacking such relationships.

In general, soft information is obtained not only through direct contact with borrowers but also through monitoring their long-term performance. It also includes the further possibility of companies on the basis of previous communication with borrowers (Petersen and Rajan (1994), Berger and Udell (1995) and Degryse and Cayseele (2000)). This soft information is possessed only by the loan-supplier because it is difficult to observe, verify, and to pass on easily.

It might appear that this relationship lending could solve all problems related to asymmetric information because as a lending method it is especially effective in performing financial intermediary functions. However, as suggested by the fact that a number of large companies prefer transaction lending, the relationship lending method also presents some problems. The following sections will bring these problems into focus by referring to previous studies, then the advantages and disadvantage of relationship lending will be discussed in comparison with transaction lending.

4.2.3.2. Previous studies of relationship lending

Most of the previous studies raise four topics with regard to relationship lending: (i) why are banks likely to develop close relationships with borrowers? (ii) how close is the desirable relationship between borrowers and banks? (iii) what are the deterministic factors in relationship lending? and (iv) how is relationship lending influenced by market competition?

Firstly, the question of why banks have an incentive to forge close relationships with borrowers will be discussed. Longhofer and Santos (2000) in particular have examined the benefits banks derive from relationship lending. Suppose that a firm, being offered funds from several financial institutions, it maintains an especially close relationship with a bank. If the firm's business performance gets worse, the low-ranked financial institutions on the list will loose incentives to offer additional investments since it is difficult for those financial institutions to receive the surplus benefits from the firm. In contrast, the bank having a close relationship can receive repayment from the borrower, in spite of the poor business performances. Consequently, if the bank with a close relationship offers an additional loan, it can enjoy all the ensuring benefits. To sum up, with respect to the close relationship, the longer and closer it is, the better the benefits the bank can receive.

Although it is logically understood that relationship lending has a number of benefits, there is another question. What is the desirable relationship between borrowers and banks? As shown in the previous section, there are not only advantages but also disadvantages to the relationship lending method. If some borrowers do not desire to be 'locked in' by banks, they are better off building multiple relations with some other banks. But which is better – having multiple relations or just one? With regards to this question Ongena and Smith (2000) consider the determinants of the relationship between banks and borrowers. They used data from 1079 companies in Europe and found that some companies have multiple relationships with several banks. This data was collected from cases in which the banking system and bond market were separate, although both were stable, and in which the rights of lenders were not relatively strong.

The third topic is the question of the deterministic factors in relationship lending. How large is the preferable range of financial products (not only lending but also other services) in relationship lending, and what is the ideal period over which relationship lending should take place? Previous empirical studies gave rise to mixed conclusions. Some researchers found that longer relationships lead to a larger amount of loans (Pertersen and Rajan (1994) and Berger and Udell (1995)). Boot (2000) also discovered that longer relationships are connected with lower interest rates and smaller values of collateral. In contrast, Degryse and van Cayseele (2000) reach the opposite conclusion that longer relationships tend to raise the interest rate on loans and create the 'lock-in problem'. However, Degryse and van Cayseele (2000) also find evidence that the expansion of the relationship range is conductive to lower interest rates, if the firms continue their other transactions apart from borrowing.[64]

Consequently, how long and how strong is the desirable relationship lending? With respect to these determinants there are a variety of previous studies. These studies examine links between the relationship and loan conditions as follows: the links between the relationship and the changes in

[64] Also, Degryse and van Cayseele (2000) find that a requirement of collateral shortens the duration of relationship, and expands possible types of relationship.

interest rates on loans (Harhoff and Körting (1998) and Scott and Dunkelberg (1999)); that between the relationship and the collateral requirements (Harhoff and Körting (1998a) and Scott and Dunkelberg (1999)); that between the relationship and the degree of dependence on trade debt (Petersen and Rajan (1995)); and that between the relationship and the increase of credit (Cole (1998), Elsas and Krahnen (1998), Scott and Dunkelberg (1999) and Machauer and Weber (2000)).

The fourth question is that of how relationship lending is influenced by market competition. Boot (2000) discusses the relationship between them, concluding that increased competition might reduce the level of relationship lending, but increase its quality.

Boot and Thakor (2000) consider the relevance between the relationship and competitions using the two kinds of market competition: the inter-bank competition group and the competition with the capital market. They found that strong competition between banks tends to increase the amount of relationship lending, but strong competition with the capital market tends to decrease it.

In addition there are some other topics regarding relationship lending: the effect of bank consolidations (Berger, Saunders, Scalise and Udell (1998) and Berger, Goldberg and White (2001)[65]) and the impacts of the relaxation of regulations and technical innovations (DeYoung, Hunter and Udell (2004)[66]).

4.2.3.3. Advantage of relationship lending

This section largely follows Boot (2000) in considering that the relationship lending method presents several distinct advantages.

The Parato improvement would be attained with regard to the information position between banks and borrowers. In other words, by employing the relationship lending method, borrowers can

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[65] Berger *et al.* (2001) insist that small business lending would be smaller due to the bank consolidation. They suggested, however, that the loan reduction could be compensated by banks in same local area.

[66] DeYoung *et al.* (2004) indicate that deregulation and technical innovation could lead to the intensification of competition and the decline of relationship lending because a favourable environment for large banks would be created by rationalization such as reduction of branches and product mix.

express more private information (which they do not want to make official) than would be the case in transaction lending. The reason is that making that information official would mean conceding certain benefits to their competitors. (Bhattacharya and Chiesa (1995))[67] Also, by making a relationship lending contract, banks tend to increase their incentives to invest in the information producing process of borrowers, as banks can receive the benefits as the monopolistic and continuous lenders. As a result, relationship lending could improve the information flow between lenders and borrowers.

In the relationship contract, there is a certain level of flexibility with the discretion. As the relationship between banks and borrowers typically has less rigidity than transaction lending in the capital market, it is relatively easy to conduct the re-negotiation of contracts. Relationship lending could therefore reduce the cost of re-negotiation and the welfare in the community would also be improved (Boot, Greenbaum and Thakor (1993)). In other words, as banks have steadily decreased informational uncertainty with borrowers through close transactions over a long period, it is possible for banks to obtain more valuable information than it would be through other methods.

The costs of re-negotiation in the future might also be reduced. In general, the contract of relationship lending incorporates a wide range of agreements. Therefore, even if some information were to be changed by borrowers in future, the relationship bank can prepare for this change immediately. (Berlin and Mester (1992) and Dennis and Mullineaux (2000)) Its advantage certainly depends on the degree of bank lending to borrowers relative to the other debts. If borrowers mainly use the capital market to raise money, borrowers would not prefer a relationship lending contract requiring many documents by banks.

The relationship lending (especially asset-based lending) can include the collateral that is needed for the purpose of monitoring by banks. Therefore, it becomes particularly difficult for borrowers to indulge in selfish behaviour. A lot of previous studies show that the existence of collateral might help relieve the moral hazard problems and the adverse selection problems. (Stiglitz

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[67] Cases where borrowers have the inside information could lead to the two-audience problem. It would therefore be necessary that the adverse-selection problems are remained without being solved. The borrowers, however, must disclose their information to the bank. This means the bank is extremely important in order to clear the informationally asymmetric problem.

and Weiss (1981) and Chan and Thakor (1987)) However, it is to be expected that collateral has beneficial effects only in cases where its value is monitored by the banks (Rajan and Winton (1995)).

The relationship lending measure is that banks can easily make profits from the asset (i.e. loans) due to intertemporal risk smoothing. (Petersen and Rajan (1995)) In contrast, if the relationship is short and distant, banks have few opportunities to compensate the losses caused by unprofitable loans.

Having grown up with relationship lending, borrowers would be available to easily access the capital market. In general, as the de novo or young companies do not have any previous stature it is quite hard for them to raise funds in the capital market, even if they have many ideas and excellent skills. However, once borrowers are able to establish credibility, it becomes fairly easy and reliable to appeal to the capital market. (Diamond (1991), Hoshi, Kashyap and Scharfstein (1993) and Chemmanur and Fulghieri (1994))

4.2.3.4. Disadvantages of relationship lending

Relationship lending is regarded as having two kinds of disadvantages. One of them is the soft-budget constraint problem. This problem could come about in those cases where banks do not have the necessary strength to enforce the loan contract – which is to say that if a borrower had financial difficulties, a bank having a close relationship with that borrower might find it difficult to reject a request for additional loans. In general, de novo banks and the banks without relationship would not accept such a request. The reason why the relationship banks offer the additional loans is that the banks wish to get back the loss of the prior investment. In fact, the problem is that the borrowers might have incentives to apply purposely for such undesirable loans although they know that the banks could not refuse its request. That is, borrowers can re-negotiate with banks regardless of their unhealthy business situation once the relationship between them has been agreed. (Bolton and Scharfstein (1996) and Dewatripont and Maskin (1995)) Consequently, if the re-negotiation of additional loans is easy, borrowers might fail to improve an undesirable business situation. However, this problem would be alleviated if the banks loan is prior to the other debts - that is, if it is possible for banks to intervene in the decision-making process of borrowers and prevent them indulging in risky behaviour.

Another disadvantage of relationship lending is the hold-up problem, caused when banks are in the situation holding information exclusively. The stronger the relationship, the more valuable information the banks can collect. In the situation having information exclusively, as an extreme case, the bank would set a higher interest rate on loans. (Sharpe (1990) and Rajan (1992)) As inside information on the borrower is held by the banks, the borrowers stop asking for additional loans. As a result, opportunities to make potentially valuable investments might be missed. Alternatively, borrowers may decide to build relationships with multiple lenders rather than with a single bank. In having relationships with multiple firms the situation of informational monopoly would be small, and the interest rate on loans should decline at once. Nevertheless, relationships with multiple lenders sometimes give rise to the disadvantage that the lending contract might not be carried out by banks, since the banks' profits can be far below what they would be in situations of informational monopoly. (Thakor (1996) and Ongena and Smith (2000))[68]

4.2.4. Assessment of lending techniques for cooperative financial institutions

This section has discussed how financial institutions can reduce the asymmetric information problem. As a summary, this section considers which is better for cooperative financial institutions – transaction lending or relationship lending.

As discussed in Chapter 2, cooperative financial institutions perform financial activities in order to increase social benefits for the local area or for their customers. If only the behavioural objective is considered, relationship lending might be much better than transaction lending for the cooperative financial institutions, the reason being that the management conditions of small

[68] Von Thadden (1995) offers a solution to the hold-up problem, arguing that a long-term line of credit with a termination clause would be preferable. If the borrowers operate a company poorly it might be possible that a termination clause could temporally contain the hold-up problem.

companies could be more unstable than those of large companies. As transaction lending assesses the repayment ability of borrowers only on the basis of hard data such as financial ratios, it might be difficult for most customers of cooperative financial institutions to satisfy the conditions for transaction lending. In contrast, by forging close relationships between financial institutions and small customers it is possible to develop small companies or a local economy more effectively due to the use of soft information about borrowers. In addition, there is another reason that most of the credit cooperatives, except for the large institutions in large cities, would have difficulty in covering the costs of collecting large amount of financial data regarding companies. Therefore, some studies show that most banks doing business with large firms adopt transaction lending, while other banks with smaller customers mainly employ the relationship lending. (Berger and Udell (2004) and Berger *et al.* (2005))

Nevertheless, negative factors might come to outweigh the benefits if financial institutions trust too much when it comes to relationship lending. Once the cooperative financial institutions receive the default risks from poor customers, the financial health of the cooperative institutions might also be exposed to risky situations since the size of profit per loan of cooperative financial institutions is relatively small. In addition, advanced BIS regulation requires using more hard information in order to assess the conditions of borrowers.

As a result, the best way to select the appropriate lending procedure might be after ascertaining whether their business areas and customers have a lot of soft information or whether it is easier to collect hard information regarding customers.[69]

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[69] However, paradoxically, the judgment must be made on the basis of the information available from the relationship.

Chapter 5 Market structure of mutual financial institutions: SCP and efficiency hypothesis

Chapter 4 stressed the importance of assessing the feature of business area in each cooperative financial institution, in order for them to select the appropriate lending method such as relationship-lending or transaction-lending. As the implication of these methods it is necessary to analyse the impact of market structure on bank conduct or bank performance. The reason is that the measurement of market structure, using market measures such as concentration ratio or competition index, could indirectly show us the economic conditions of their business areas.

To investigate features of corporate behaviour in market characterised by imperfect competition, such as an oligopoly, it is useful to measure the degree of market competition. Two kinds of measure, the structural and non-structural approach, are often employed, and this study focuses on the former. This structural approach consists of the SCP approach and the efficiency approach. The SCP approach is the model which can examine whether a highly concentrated market causes collusive behaviour among large banks and whether it improves the market performance. In contrast, the efficiency approach is used to see whether the efficient behaviour by large banks connects to the improvement of market performance. In fact, following these structural approaches, the relationship between concentration and profitability is estimated.

In the following part it is assumed that the market of the cooperative financial industry is characterised by imperfect competition. To consider the market structure, firstly, the theory of SCP and efficiency hypotheses as the structural approach will be summarized, and then the model will be analysed empirically.

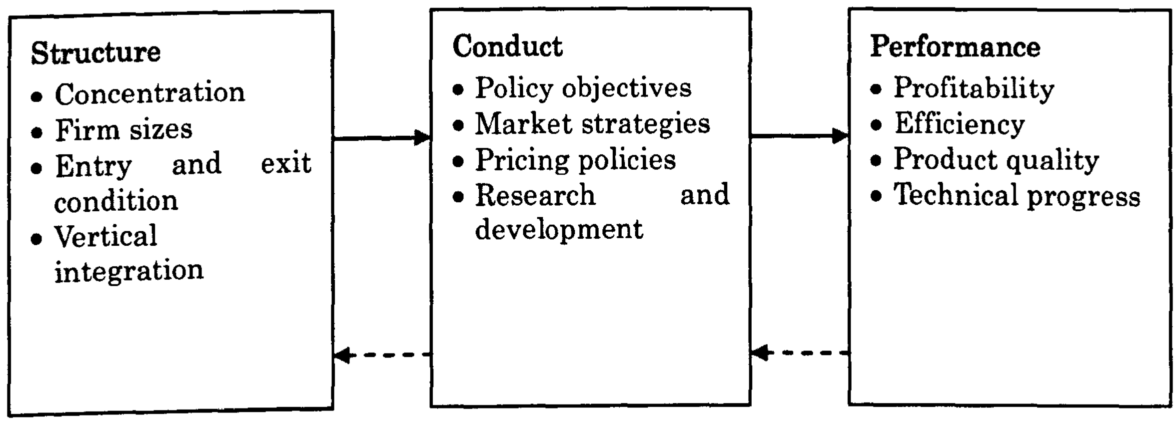
5.1. Background to the SCP and efficiency hypotheses

Two of the most common methods for measuring the impact of monopoly on competition are the Structure-Conduct-Performance (SCP) approach and the efficiency approach, both of which are included in the non-structural approach. The SCP approach was introduced by Maeson (1939) and Bain (1951, 1956) after the Second World War, and the efficiency approach by the Chicago School in the 1970s.

The SCP hypothesis examines the relationship between market structure, corporate conduct and corporate performance. In fact, market structure comprises concentration, firm size, entry and exit conditions, and vertical integration. Corporate conduct means policy objectives, market strategies, pricing policies, and research and development. Corporate performance entails profitability, efficiency, product quality, and technical progress. In other words the SCP hypothesis suggests that market structure is an exogenous variable that affects the firm's product – and the changes in the firm's product affect the firm's performance in the market. In fact, it is widely considered that higher concentration in the market (Structure) reduces competition (Performance) through the acceleration of collusive behaviour among leading firms (Conduct). (Figure 5.1) In a market structure where only a few firms control the industry, this degree of competition is less than that of a competitive market structure containing many firms. It would lead to the situation in which collusive behaviour is easily caused, and does not incur costs. Collusive behaviour might raise interest rates on loans and service charges as output price, and reduce deposit interest as an input price. In other words, in the collusion hypothesis, the product price such as interest rates on loans becomes higher. As the high product price is applied to all market participants, profitability should not be influenced by the size of company. It therefore supposes that medium and small banks can also obtain high profitability. As a result the SCP hypothesis has been developed to determine whether an imperfectly competitive market, such as an oligopoly situation, is affected by collusive behaviour. (Bain (1951, 1956), Weiss (1974))

Until the first half of the 1970s, the theory of corporate behaviour in the oligopoly market had been associated with the collusion hypothesis. Excess profitability in the oligopoly market had been recognized as undesirable profits in the context of public welfare. Since the 1970s the SCP hypothesis has been used for anti-trust policy through which the government limits (or forbids) collusive behaviour.

Figure 5.1 The structure-conduct-performance paradigm



Source: Goddard, Molyneux and Wilson (2001)

Members of the Chicago school such as Demsetz (1973), however, offered a different explanation from the traditional SCP hypothesis for the relationship between market structure and bank performance. They suggested that the positive relationship between concentration and profitability did not necessarily reflect collusion behaviour among a small number of companies: it might simply show that efficient performance by large companies leads to high profit. It is therefore possible to say that the high profits of those large companies are the natural outcome of good production and good management practices, and are not caused by collusion pricing behaviour. Large companies can therefore significantly increase market share and profitability, as these are the only means available for decreasing the price of products according to the theory of profit maximization. If the efficiency hypothesis of Demsetz (1973) is correct, large companies can only achieve high profitability in the long term. This concept is called the efficient hypothesis. In this hypothesis, Demsetz (1973) insisted that the factor of market structure, which influences profitability, is not defined by concentration but by market share. This is because the efficient firms would be able to acquire high market share and high profit naturally, even in situations of low concentration or in a highly competitive market.

Chicago School members were represented by Demsetz (1973) that the anti-trust policy being supported in the SCP paradigm is incorrect because it could decrease public welfare. In other words government policy might impose a penalty on the largest and most efficient corporations, and it goes against the market principles. Namely, if the anti-trust policy against the market theory is implemented, it might bring about imperfect competition and discourage economic growth. Finally, the appropriate government policy is to protect the corporation which has a significant market share through sound management. In fact, it means to decrease and eliminate regulations as entry barrier.

5.2. Model of the SCP and efficiency hypothesis

In the mean time, with the development of above theory, the econometric model specification for the SCP hypothesis has progressed since the 1970s. An estimate of the SCP hypothesis was first made by Bain for manufacturing industry and was subsequently developed for banking industry.

5.2.1. Development of the SCP and efficiency model for the banking industry[70]

The SCP model, initially used mainly in manufacturing industry, has been applied to the financial industry since the 1970s. According to the researchers, all firms acquire the equilibrium price coincidently or iteratively, and the market structure influences this process by making certain effects on the interaction between firms. In US SCP studies, multivariable regression analysis is mainly employed. The general form of the SCP model is as follows:

$$P=f(CR, S, D, C, X)$$

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[70] Heggestad (1979) argues that the model of the SCP hypothesis in the banking industry would be useful to create the equilibrium price of a lot of products, by using the following forms: (i) the level of elasticity of demand in the market or firm, (ii) the cost function of the firm, (iii) the interaction between the prices and quantity of the related financial products and the demand-cost functions of firms, (iv) the objective function of firms in the market, (v) the interaction in the market between firms.

where P is a performance measure, CR denotes a market structure, S is a market size or other market structure variables such as a proxy of entry regulation, D is a set of variables that reflect the level of market demand, C is a set of variables causing the cost difference, and X is a set of control variables for the features of a specific product.

5.2.2. Selection of measures

a. Measurement of bank performance

Although there are many approaches for measuring bank performance, two methods are traditional. In the first, performance is measured by relating the price of specific products and services, while the second method focuses not on the individual product but on the entire bank performance such as profitability.

The most general price measurement in the former approach is as follows; (i) average annual loan interest rates and charges, which are divided by the quantity of discount loans at a certain time-point, (ii) average deposit interest, which is the sum of annual deposit interest divided by the quantity of deposits at the year end, (iii) average service charge of demand deposits.

Some studies, however, such as those by Gilbert (1984) and Smirlock (1985) criticize the use of average deposit interest and loan interest as measure of bank performance. The first reason is that both the stock variables (c.f. the outstanding loan at the year end) and the flow variables (the loan interest rate for one year) are mixed in an equation. It is not clear which is better as a price measure, an average value per year or year-end value. The second reason is that the average deposit rate in many US studies, which was regulated by regulation Q, might be employed. That is, average deposit interest might be affected not by market structure but by the maturity distribution of bank deposits or the denomination value if there is a limitation like regulation Q. In order to avoid these issues it is necessary to employ survey data to acquire figures for interest rates and service costs in the specific category.

It is a problem that only one price on the single bank product is used as the total performance measure for a company because it might cause cross-subsidization between products and services for multi-products to be dealt with by most of the banks. In other words, to use only the specific average price could invite misunderstanding when comparing with the bank performances because the features of cross-subsidization are not taken into consideration. (Molyneux and Forbes (1995))

The latter approach with profitability for the bank performance is employed more simply and more widely. Rhoades (1985) and Evanoff and Fortier (1988) consider that it has two main advantages: the first is that profitability can include both flow variables (profit) and stock variables (asset and capital), and second is that the issues regarding cross-subsidization can be avoided by putting all products' profit or loss in one figure. In fact, most studies use the return on assets and the return on capital. Comparing these two approaches, the latter using the profitability measure could successfully find the significant relationship of market structure to industry performance. (Gilbert (1984)) However, it might be difficult to make an interpretation of the profitability measure due to the complexity of accounting procedures. For instance, the SCP hypothesis should focus not on the value of profit but on the variability of it if banks make a sacrifice of some potential benefits in order to try reducing risks by investing in risk-free assets. (Neuberger (1998)) And if bank managers choose expense preference behaviour to increase their own utility, large banks in highly concentrated markets do not necessarily make abnormal profit (Berger and Hannan (1998)). Berger (1995) asserted that most regression models for SCP hypothesis would be misread because of the omitted variable bias.

b. Measurement of market structure (Concentration)

As the banking industry deals with multiple products it is difficult to define all structures from the simple market range and to find the accurate market measure for the degree of monopoly. Vernon (1971) points out that the banking industry is loosely concentrated and these markets are neither in a state of monopoly nor perfect competition. In this case the concentration ratio in the local market might be an ambiguous index for the monopolistic performance, and the relation between structure and performance would be weak.

Heggestad (1979) indicates that there are three conditions necessary for measuring the concentration of the banking market: to find the appropriate general index for the concentration, to select the relevant economic variables for measuring the difference between bank size, and to divide the competitions with other industries (c.f. the competition between banks and non-banks). Severe errors would occur in most studies if the proper indices are not employed. Heggestad, however, argues that the deposit-based measures are totally appropriate because a variety of concentration measures in the banking industry are mutually related and those are just approximate values.

The above points into consideration, the previous literature principally adopts two kinds of concentration index. First is the k-bank concentration ratio. In the data requirement condition which is simplified and restricted, the k-bank concentration index is used the most frequently in empirical studies. The following equation is employed to aggregate the market share of the k-large banks in the market:

$$CR_k = \sum_{i=1}^{k} S_i$$

where CR_k is the k-bank concentration index; S_i is the market share of bank i. While this index emphasises the k leading banks, the remaining banks in the market are neglected. There are no rules for the determination of the number of banks, so the number of banks included in the concentration index could be determined at discretion. The concentration index is considered as one point on the concentration curve, and is the first-order measure ranging between zero and one. In cases where there are an infinitely large number of banks of equal size (that is, if the k-bank value is relatively small in relation to the number of total banks), its index approaches zero. And conversely, the figure would be near one if the small number of banks occupies the large percentage of share in the market.

If the n-banks of the same size dominate the banking industry, $CR_k = \sum_{i=1}^{k} s_i = \sum_{i=1}^{k} 1/n = k/n$.[71]

The next indicator is the Herfindahl-Hirshman index (HHI), the most common measure of the concentration index in the theoretical literature. It is often used as the benchmark against which to estimate the other concentration measures because the HHI includes the impacts from all banks. The function form for the HHI is:

$$HHI = \sum_{i=1}^{n} S_i^2$$

This represents the sum of squared market share. The HHI expresses the importance of large banks by assigning them a large weight. And by including each bank individually, problems such as the arbitrary cut-off and the insensitivity to the share distribution are avoided. The HHI index is ranged between 1/n and 1. If all banks have the same size in the market, the HHI would approach the minimum value, which is the reciprocal of the number of banks. On the contrary, the index would be one in the case of monopoly. As the HHI reacts well to the number of firms and the variance, it is shown as the appropriate index. However, as these measures are mutually related, the selection of market structure does not have any critical importance for the test of the SCP hypothesis. (Heggestad (1979))

In general, the structure of the concentration index becomes either discrete or cumulative. The discrete measure of concentration corresponds to the arbitrary point on the concentration curve – for instance, the k-bank concentration belongs in the group of this discrete measure. The advantage of the discrete measure is that the data required is simple. However, in the previous literatures it has both supporters and opponents. Most supporters take the view that the market movement, which is dominated by a small number of banks, would not influence the total number of banks in the market. Therefore the concentration index based on the total number of banks does not necessarily indicate large size, and it could limit the final impacts on market change. In contrast, the opponents consider that although all banks have some impacts on the market, the discrete index does not include their impacts. That is, the opponents assert that in the case of the discrete index, some structural changes in

[71] This formula is a decreasing function to the number of banks in the market, and is equal to $n_e=k/CR_k$.

the industry are ignored. Competitive behaviour not just large banks but also by small banks might have significant impact on the market.

The cumulative and summary measure of concentration explains the distribution of the entire scale. This viewpoint implicitly assumes the structural change of all distribution affects the value of the concentration index. In this group there are some indices such as the HHI, the comprehensive industrial concentration index (CCI), the Rosenbluth index (RI), the Hall-Tideman index (HTI) and the Entropy measure (E), belonging in this group.[72, 73]

c. The other market structural variables, market size or entry barrier

Another market structural factor is the entry barrier. In economic theory, the entry of new firms into the market generally means an increase in competition. That is, concentration would decrease, and competition increase, if the number of firms in the market were to rise. In the US banking market, the federal and state government offers the licence for bank and permits the branch establishment. Therefore an entry barrier created by the authorities might have some impact on the number of competitors, and therefore on the degree of competition in the banking market.

One of the functions of the regulating authority would be to promote public welfare by setting the public interest rate, it being assumed that the competitive market should be regulated in order to maintain the liquidity of the settlement system. On the other hand there is another idea, following market theory, which is that the regulating authority needs to spur competition and that entry barriers should be reduced. If a regulating authority takes the latter view, as noted in King (1979), it would be important for some variables for entry barriers to be included in the SCP model and assessed. The reason is that the entry barrier would have an impact on banking performance as

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[72] Each index defines to comply with the following equations: $CCI = s_1 + \sum_{i=2}^{n} s_i^2 \left(1 + \left(1 - s_i\right)\right)$, $HTI = 1/\left(2\sum_{i=1}^{n} is_i - 1\right)$, $RI = 1/(2C)$ (which is identical to the HTI for $C = \sum_{i=1}^{n} is_i - 1/2$), $E = -\sum_{i=1}^{n} s_i \log_2 s_i$

[73] See Appendix. 1.

well as on concentration. In fact, some US studies argue that a higher entry barrier could be conductive to higher profits for banks in the market (Berger and Hannan (1989)). Other US studies examine the effect of market power on bank performance by comparing a state permitting only the unit bank with a state doing branch of banks. However, as expressed by Evanoff and Fortier (1988), it would be better to use separate equations for each case because using binary variables in a single equation might influence the effect of the other explanatory variables.

In terms of entry barriers there are other cases where existing firms prevent the entry of new firms. In fact, if existing firms are unable to prevent new firms from entering, decisions regarding price will be subject to the same degree of competitive influence, and the behaviour of the other firms might be seriously reduced. Finally entry barriers could have significant impacts to the performance measure of individual firms.

Shephard (1997) divided entry barriers into the exogenous and endogenous, with the former caused by the structural properties of the industry, such as product features and the production techniques, and the latter deriving from conscious price or non-price decisions taken by existing firms in order to try to prevent the entry of new firms.

Based on Bain (1956), Shephard (1997) argues that there are four kinds of exogenous entry barriers: capital requirement, economies of scale, absolute cost advantages and product discrimination. The capital requirement could be divided into two entry barriers: the first is the capital adequacy ratio for new banks set by the EU Second Banking Directive, and the second is large amounts of investment in the banking infrastructure, which is required for daily banking business. In other words, it performs as an entry barrier because new banks must fulfil exacting requirements to acquire a banking license. The entry barriers from economies of scale would be caused by the need to operate at a certain size in order to compete with existing firms. That is, if the new banks cannot achieve the minimum efficient scale (MES), its scale difference would constitute an entry barrier. The fact that existing firms hold absolute cost advantages over new firms by controlling various elements of the production process is also considered an entry barrier. This is to say that existing firms may have priority access to superior management techniques or experiences, or other crucial inputs – for example it may the case that it is difficult for new firms to hire skilled workers. Product discrimination can be divided into three cases. Firstly, if existing banks are able to enhance their reputation through customer loyalty, there are significant disadvantages for new banks even when they offer products of the same quality. (Neven (1990)) Secondly, the switching cost of customers to transfer from one bank to another bank might act as an advantage of product discrimination. Thirdly, it might be difficult for new banks to enter the market if the existing banks have already bought about a situation of saturation, in terms of the space of geography or products.

What is considered as a barrier is the way existing firms act strategically in order to deter the entry of potential competitors. Preventive or retaliatory pricing action by existing firms is an endogenous barrier, as are the requirement of extra selling costs to new firms, the creation of excess capacity, excess advertisement, market segmentation, pre-emptive patent action, the cost inflation of new entry firms by controlling the primary materials, and brand proliferation.

For instance, if existing firms have absolute cost advantages or economies of scale over potential entrants, the existing firms could adopt a restrictive pricing strategy in order to create difficulties for the new entry. A restrictive price means the highest price the existing firms can impose in order to exclude the potential new entrants: they can intentionally prevent entry by setting a high price at which the potential competitors would be unable to make a profit. Excess advertising by existing firms might also play a role as an endogenous entry barrier: by spending the expensive advertising cost, existing firms can increase revenue and also receive discounts on their advertising spending. As a result, these existing firms can operate price discrimination – and if they can gain additional customers it is also possible for their excess returns to be used to fund the fight against future competitors. (Comanor and Wilson (1967))

There are some other variables of market structure which are included in SCP studies, which are employed in order to take impacts toward bank performance into account. They are the number of banks, the market share of each bank, and the binary variable to explain the competition between banks and non-banks. There is also another binary variable to express whether banks locate in metropolitan and statistical area.

d. Market demand conditions

All SCP studies use some proxy variables for the demand conditions of the market. In most studies measures such as market size and market growth are employed. In fact, either the total amount of bank deposits or assets in each market are used to measure market size. Market size is needed to proxy variables of the market future possibility. In other words, it is expected that bank performance is affected by market size because a larger market increases the possibility of new firm entering or stronger competition (Evanoff and Fortier (1988)). Also, demand growth is often used as the proxy variable for the change in demand conditions in the local market.

e. Cost differences

Most of SCP studies commonly use the size of each bank, namely its total assets, for the cost difference between banks. This variable is incorporated in all models which try to explain differences from bank-size such as scale economies. Also, other cost measurements such as wage rates or the amount of interest payments by local banks are taken to represent the cost differences between banks. (Berger and Hannan (1989)) Many studies also employ the ratio of demand deposits to total deposits as a crude proxy since demand deposits are expected to be relatively dependable financial sources for banks.

f. Other control variables

In SCP studies that use the rate of loans and deposits as a measure of bank performance, many variables such as the type, size and expiration on loans and deposits are accepted in order to explain the feature of the performance. Also, to control for risk features, most studies include a variety of other variables – for instance the loans-to-asset ratio is sometimes used as a rough proxy for portfolio risks because loans tend to be more risky than the other assets in the bank's portfolio. Most previous studies from the 1980s include the capital-to-asset ratio or the equity-to-asset ratio for the difference of risk level across banks. That is, if these ratios are low it means that there is high risk. Clark (1986) introduced the ratio of loan-loss reserve to total loans to measure default risk.

5.2.3. Differences between measures and empirical results

Most previous studies in the USA and Europe find some relationship between concentration and profitability. In particular, Short (1979) is one of the pioneers who applied the SCP hypothesis to the banking industry, examining whether profit is associated with ownership, capital growth and capital deficit. The results of research into 60 banks in Canada, Western Europe and Japan showed that there is a positive relation between profitability and concentration. And the capital deficit would provide opportunities to make high interest loans. It is expected that the growth rate of the number of firms would have a negative influence on profitability. However, it is found that private banks could have higher profits than state banks.

Smirlock (1985) examines the link between profitability and market share in 2,700 banks in the USA. The model includes a set of control variables which reflect differences in the size and growth of the banking sector, to change capital resources, bank scale and the alliance with holding corporation. He concluded that the collusive hypothesis is rejected.

The model of Evanoff and Fortier (1988) includes not only a set of control variables for differences of risk, cost, and demand factors, but also concentration and market share as determining factors of profitability. Evanoff and Fortier (1988) examines the effect of regulation on bank performance by dividing the market into high entry barrier and low entry barrier. In the case of high entry barrier, market share has a strong impact on profitability, and conversely, in markets with low entry barriers, market growth has a significant and negative effect on bank profitability. In other words, the result supports the efficiency hypothesis.

Bourke (1989) investigates the determinants of profitability. In his model, the dependent variables are divided into specific factors of individual banks (c.f. the liquidity-to-capital ratio) and common factors for all banks (c.f. concentration, market growth, capital deficit, inflation, and regulation index). Three variables such as concentration, capital ratios, liquidity ratios and interest charges are used for the market structure, and all of these measures exhibited a positive relationship with profit. The estimated result provides little evidence to support the collusion hypothesis.

Berger and Hannan (1989) suggest another method to test the collusive hypothesis by focusing on the relationship between concentration and price. If banks hope to use their market power effectively, the price in the concentrated market should be higher than that in the competitive market. The empirical evidence found a negative link between concentration and deposit interest, using a sample of 470 banks. In other words, the banks in a highly concentrated market exercise market power by paying low deposit interest. However, Jackson (1992) argues that banks in highly concentrated markets offer higher deposit interest than banks in less concentrated markets, using a sample of 221 banks in 104 local markets.

Molyneux and Thornton (1992) analyse 18 sample banks in Europe during 1986-1989, employing a variety of profitability measures including before and after tax returns on total assets, and the return on total equity. In the profit function they use concentration, capital and liquidity ratios, inflation, the growth of the money supply and staff expenses as dependent variables. Concentration, interest rates and staff expenses positively influence profitability; on the other hand, liquidity has a negative impact on profit. They found that concentration has a positive impact on profitability but the effect of market share is not significant.

5.2.4. Development of the SCP and efficiency model

a. Other factors in the relationship between market structure and profitability: Cost efficiency

Berger (1995) adds efficiency as a determinant of profitability, and examines the US case by analysing the connection between market structure, firm size, and efficiency in banking performance. He estimates the following model;

$$ROE \text{ or } ROA = a_0 + a_1 CONC + a_2 MS + a_3 X\text{-}EFF1 + a_4 S\text{-}EFF + u$$

where *ROE* is the return on equity, *ROA* is the return on assets, *CONC* is the Herfindahl index, *MS* is market share in the deposit market, *X-EFF* is the bank-specific measure of production efficiency, and *S-EFF* is another bank-specific measure of product efficiency. The results show a significant positive relationship between *MS* and *X-EFF* with US bank profitability. This means that, on average, larger or more efficient banks are able to earn higher profits. Berger interprets these results as indicating that large banks can obtain large amounts of profit because they have relatively high market power and apply product differentiation. Further, more efficient banks have superior management and production techniques – thus the efficient hypothesis is supported.

Berger and Hannan (1998) assesses the hypothesis that firms in highly concentrated markets do not achieve cost minimization due to the implementation of the market power. In their empirical model, bank efficiency is regressed upon concentration and a vector of dummy variables to control for differences of ownership and geographical conditions. Empirical evidence shows that banks in highly concentrated markets tend to have lower efficiency and the collusive behaviours are supported.

b. Other factors in the relationship between market structure and profitability: Contestability theory

Baumol (1982) suggests that contestability is one of the determinants affecting market structure. This is the concept that, if the entry conditions are relatively free and new firms do not have to incur the sunk costs, a monopoly would set prices at the same level as the competitive market in order to prevent new entry. In other words, in the case of low entry barriers, the new firms enter the market with reasonable prices and make profits, then those firms would withdraw from the market before the existing firms take counter-measures against them. Therefore the existing firms should set their prices equal to those in the competitive market in order to avoid such a scenario. That is, existing firms do not drive up prices through collusive behaviour but prevent new firm entry by creating the conditions of zero profit.

Contestability theory offers an alternative to the traditional SCP hypothesis. In it, the power of existing firms is limited by the existence of potential firms entering the market. However, empirical evidence of the relationship between concentration and profitability does not necessarily show the existence of potential competitors. In other words, real contestability, in which the potential competitors are included in the market, would have a higher level of competitiveness than the limited contestability in the observations, and could have a greater impact on industrial structure.[74] Following the contestable market theory, therefore, the most important structural feature is not concentration but entry barriers. It is unclear, however, how useful the contestability theory is for assuming features of competitive structure in the market. The reason is that empirical evidence gives only weak support to contestable market theory, even in the better cases.

5.3. Model specification: the SCP and efficiency hypotheses

In order to test the SCP and efficient hypotheses, this paper employs the profit equation model following Weiss (1974) and Smirlock (1985), and focuses on the endogenous variables for bank performance measures such as concentration ratio and market share. This profit function consists of the exogenous variables for market structure measure and the other dependent variables as follows:

$$\pi_{i,t} = a_0 + a_1 CR_{j,t} + a_2 MS_{i,t} + \Sigma X_{i,j,t}$$

where $\pi_{i,t}$ is the profit of bank, i, $CR_{j,t}$ is a market structure measure of group, j, in which bank, i, is joined (usually a measure of concentration). $MS_{i,t}$ is the market share of bank, i, and X_i is a vector of control variables which include both firm-specific and market-specific features of bank, i. The SCP

[74] Empirical studies are conducted by analysing whether bank revenues responded to the change in cost conditions. The empirical model is typically represented as:

$$LTRASS = a_0 + a_1 LPL + a_2 LPK + a_3 LPF + a_4 LASS + a_5 LLNASS + a_6 LCAPASS + a_7 LIBTDEP + u$$

where LTRASS is total revenues to asset, LPL is personal expense, LPK is capital expenditure to the fixed asset, LPF is annual interest expenditure to total funds, LASS is asset, LLNASS is the ratio of loans to assets, LCAPASS is the ratio of capital to assets, and LIBTDEP is the ratio of interbank deposit to total deposits. The LLNASS and LCAPASS are used to control the risk differences. And the LASS and the LIBTDEP are employed for economies of scale and the deposit-structure, respectively.

hypothesis predicts that $a_1 > 0$ and $a_2 = 0$. The efficiency hypothesis suggests that $a_1 = 0$ and $a_2 > 0$.

Most of the previous literature on the SCP and efficiency hypotheses generally employed two kinds of bank performance measures (Gilbert (1984) and Molyneux, Thornton and Lloyd-Williams (1996)). The first is some measure of price, such as the price of specific financial products and services, which ensures that corporate performance is included in the function. The second kind employs measures of profitability such as return on assets (ROA) and return on equity (ROE). In addition the revenue is also employed as the comprehensive profitability measure.

The measures of market structure in the banking industry are mainly composed of four types of dependent variable. First are variables to consider the SCP and efficiency hypotheses. The value of market concentration is employed in order to discuss the collusive hypothesis in most of the literature. In fact, for the concentration ratio, the cumulative proportion of the top three or five institutions in the industry is used. Next, for the efficiency hypothesis, the value of market share of each institution is used. The reason is that, in the efficiency hypothesis, better bank performance is associated with superior productivity and management. In other words, the institutions with better management skills can decrease the product prices and to increase their profits through growing the market share in the case of the profit maximization. Therefore, the appropriate variable, which affects bank performance in the efficiency hypothesis, would not be the concentration ratio but the market share. As for the concentration ratio and market share, for the multilateral analysis, those in asset, deposit and loan market are adopted in this research.

The second factor is a variable for the effect of market demand conditions in the cooperative financial industry. For this variable several indices are generally adopted such as the logarithm of total assets. The reason is that this variable might also have some notable effect on bank performance. In fact, this research also employs the logarithm of total assets. It is expected that the large size of the market leads to many new entries and makes market competition stiffer, and this means lower profitability for the individual firm. As a result there would be a negative relationship between total assets and profitability.[75]

The third points are the bank-specific variables with regard to the conditions in which each financial institution face. In the previous research, several variables such as the risk-category differences and the ownership difference are employed as control variables for each institution. (Lloyd-Williams *et al.* (1994) and Molyneux *et al.* (1996)) In this paper, firstly, the loan to asset ratio is employed for the portfolio risk. If the ratio increases it means that the opportunities for profit increase, so the loan-to-deposit ratio would have a positive relationship with profitability. In addition, secondly, the logarithmic number of branches is used for the effect of regional network. If there is a close network in the local area, the financial institutions can supply fine-tuned financial services, thus potentially leading to higher profitability.

In fact, this paper will adopt the following two equations in order to investigate the hypothesis regarding the market structure of cooperative financial institutions. And these equations will be applied in turn to the asset, deposit and loan markets.[76]

$$\ln\left(1 + ROA_{i,j}\right) = \alpha_0 + \alpha_1 CR_{n,j} + \alpha_2 MS_{i,j} + \alpha_3 \ln AST_{i,j} + \alpha_4 \ln \frac{LOAN_{i,j}}{DEP_{i,j}} + \alpha_5 \ln BR + \varepsilon \qquad \textbf{(5.1)}$$

75 If the coefficient of asset has a positive value it might reflect the impact of economies of scale.

76 There are mainly two reasons for that: (i) the established empirical researches in this field were referred, for example, Loyd-Williams and Molyneux (1994), Bikker and Haaf (2002), including the recent papers by Matthew *et al.* (2007). Secondly, in the case of the estimation of OLS, the assumption that the variance of error term is constant (homoscedasticity) must be satisfied. If this assumption does not satisfy (heteroscedasticity), the variance of estimator can be biased. Then, the estimated results or hypothesis tests may be misleading. To improve this problem, in some cases, it is required for the variables to transform into logarithm number. By changing into logarithm, it is possible to reduce the difference between explanatory and explained variable, and to reduce the heteroscedasticity. Also, taking logs of all variables including asset is standard practice.

$$\ln REV_{i,j} = \alpha_0 + \alpha_1 CR_{n,j} + \alpha_2 MS_{i,j} + \alpha_3 \ln AST_{i,j} + \alpha_4 \ln \frac{LOAN_{i,j}}{DEP_{i,j}} + \alpha_5 \ln BR + \varepsilon \qquad (5.2)$$

where:

$ROA_{i,j}$ = bank i's profit measure as the return on assets in market, j,[77,78]
$REV_{i,j}$ = bank i's profit measure as total revenues in market, j,
$CR_{n,j}$ = the n-firm concentration ratio in market, j,
MS_{ij} = banks i's market share measure in market, j,
AST_{ij} = bank i's total assets in market, j
$LOAN_{i,j}$ = bank i's total loan in market, j,
$DEP_{i,j}$ = bank i's total deposit in market, j,
$BR_{i,j}$ = the number of i-bank's branches, in market, j,

The panel data analysis is carried out in this paper. It has a great merit that the degree of freedom is increased and that the dynamic issue can be available. However, in general, the various extra factors are often included into the random error term in the panel data analysis. For instance, they are the firm-specific conditions and the period-specific conditions which are unobservable in the accounting data.[79,80] By cutting those factors from the equation it is possible to estimate the hypothesis more accurately. In other words, by employing the individual effect for the institution-specific condition and the time effect for the periodical condition, it is expected that clearer results will be derived. As for these effects, the previous panel data analyses employ the fixed effect and/or random effect. In this paper, from the assumption that the individual effect and the time effect are correlated with the dependent variables respectively, the fixed effect is employed. Also, as a contrast, the pooled OLS estimation without fixed effect is estimated.

In other words, the estimation model in this paper assumes the error term to be 'ε=η+v' including cross sectional fixed effect as 1-way model and as 'ε=η+λ+v' including both cross sectional

77 In the estimation, the logarithm of (1+*ROA*) is used as the variable of profitability. The reason is that some banks indicate negative figure of *ROA* and it is impossible to transfer them into logarithm.
78 The market, j, means asset, deposit or loan market.
79 Management ability, for example – although it influences profitability, it is not possible to observe as a variable. The firm-specific effect is assumed to be the same as every points of time.
80 For example the excessive profits due to the babble economy, although the bubble economy induces higher profitability, it is not possible to observe as a variable. The period-specific effect is assumed to be the same in every institution.

fixed effect and time-period fixed effect as 2-way model. That is, η means the cross sectional effect and λ refers to the time-period effect. Also v represents the random error term which is presumed to be 'Identically and Independently Distributed' (IID).

5.4. Data and sources

Extensive data are employed in this study: in fact, the number of samples for mutual financial institutions is about 300 credit associations and 200 credit cooperatives over the 1999-2005. These samples are collected from the annual financial statement for each institution. In addition, in order to discuss industrial features, banking industry data is also collected from Japanese Bankers Association.

The sample period for macroeconomic data in Chapter 2 and dataset of individual commercial banks in Japan is up to 2008, while that for the credit associations and cooperatives in Japan is from 1999 to 2005. This is because the data resources are different. Macroeconomic data and commercial banks' data are disclosed on the Internet by Bank of Japan and Japanese Bankers Association. However, those for credit associations and cooperatives are published only as the paper-based annual report by Shinkin Central Bank and National Central Society of Credit Cooperatives. The sample periods are different because these data had to input via keyboards.

5.5. Empirical results on the SCP and efficiency approach

5.5.1. Market structure of commercial banks in Japan

Before discussing the mutual financial institutions the market structure of commercial banks will be analysed. By comparing these financial institutions it is possible to comprehensively understand the market structure. Table 5.1, Table 5.2 and Table 5.3 report the empirical estimated results, employing the 'ln (1+ROA)' for dependent variable, and each cases are estimated for asset markets, deposit market and loan market regarding concentration ratio and market share, respectively.[81] Two kinds of results (on the right and left-hand sides) are shown on each table, depending on the level of concentration (3-institutions and 5-institutions concentration). The first three columns on the left show the results using the 3-institutions concentration ratio (e.g. CRA3), and the others on the right represent those using the 5-institutioins ratio (e.g. CRA5). At the top of the columns in tables, 'Normal', '1-way' and '2-way' mean the level of fixed effect: "Normal" means pooled OLS, "1-way" means the cross-section fixed effect is included, and "2-way" means both the cross-section and period fixed effects are taken into account.[82] These effects are considered in the lower section in each table, with "$\eta = 0$" and "$\lambda = 0$"– referring to the result on F-test of the null hypotheses if there is, respectively, significant cross-section and period fixed effect.

Regarding all cases for assets, deposits and loans market, the coefficients of the concentration ratio (CR) in all three markets are negative, and those of the market share (MS) are positive. These results are robust regardless of whether pooled, 1-way, and 2-way results are used. Although these results are not clearly supporting the hypotheses particularly in the point of negative coefficients of the concentration ratio, the market of commercial banks in Japan conforms to the efficiency hypothesis partially, from the results of the positive coefficients in market share in 1-way or 2-way model in each market having the lower Schwarz criteria. It could be said that the negative coefficients of concentration ratio come from the fact that the revenue becomes small due to the disposal of nonperforming loan being triggered by the merger and consolidation.

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81 Coefficients of concentration ratio and market share in asset-, deposit- and loan market are indicated in the tables as follows: concentration ratio; CRA, CRD, and CRL, market share; MSA, MSD and MSL.

82 With regards to some specifications, since we do not have a balanced panel we could not report the Hausman test for the 2-way model. However, the results from the 1-way model indicate that the fixed-effects model should be applied rather than the random effects specification. Further, the most of F-tests for the one (η=0) and two way (η=0 or λ=0) fixed effects models rejects the exclusion of fixed effects and so the fixed-effects specifications are preferred to pooled OLS.

Table 5.1 Empirical results of SCP hypothesis for Japanese commercial banks, Dependent variable: ln(1+ROA)

Asset	Normal	1-way	2-way	Normal	1-way	2-way
Constant	0.13072***	0.967726***	1.094138***	0.135662***	0.996216***	1.101598***
	(4.446556)	(7.953741)	(9.040431)	(4.5782)	(8.176939)	(9.021055)
CRA3	-0.051416***	-0.058154***	-0.09381***			
	(-3.624351)	(-4.554839)	(-3.200283)			
CRA5				-0.059449***	-0.079309***	-0.078559**
				(-3.537153)	(-5.111049)	(-2.551991)
MSA	0.357628***	1.462538***	1.56469***	0.286657***	1.425758***	1.518457***
	(6.198603)	(9.294577)	(10.05679)	(4.396994)	(9.112625)	(9.709997)
lnAST	-0.002918	-0.047332***	-0.059351***	-0.002426	-0.048785***	-0.059879***
	(-1.347147)	(-6.061572)	(-7.5083)	(-1.112616)	(-6.252158)	(-7.55799)
ln LOAN/DEP	0.032069*	-0.034135	-0.001309	0.034449**	-0.030024	-0.00149
	(1.893669)	(-1.556314)	(-0.058943)	(2.031249)	(-1.3713)	(-0.066935)
lnBR	-0.014482***	-0.047203***	-0.042728***	-0.014999***	-0.045685***	-0.041309***
	(-3.967331)	(-5.412636)	(-4.957076)	(-4.096407)	(-5.266971)	(-4.79692)
R2	0.124229	0.426757	0.456779	0.123666	0.430361	0.454334
Adj.R2	0.119663	0.333406	0.362938	0.119097	0.337597	0.36007
H0: η=0	—	3.365407***	3.681417***	—	3.433348***	3.689711***
H0: λ=0	—	—	6.48991***	—	—	5.15905***
Schwarz.	-4.436027	-3.934042	-3.937986	-4.435384	-3.940349	-3.933495
F	27.20694	4.571534	4.867574	27.06625	4.639309	4.819825
Obs.	965	965	965	965	965	965

Note: (i) each figure below the coefficients is t-value., (ii) *** significant at 1%, ** significant at 5%, * significant at 10%.
Source: Japanese Bankers Association, Financial Statements of All Banks.

Table 5.2 Empirical results of SCP hypothesis for Japanese commercial banks, Dependent variable: ln(1+ROA)

Deposit	Normal	1-way	2-way	Normal	1-way	2-way
Constant	0.120738***	0.816121***	0.868466***	0.127801***	0.843389***	0.903321***
	(4.204459)	(7.321904)	(7.828636)	(4.421709)	(7.588666)	(8.082921)
CRD3	-0.047829***	-0.054054***	-0.107248***			
	(-4.104943)	(-5.149136)	(-4.140196)			
CRD5				-0.064831***	-0.085412***	-0.132875***
				(-4.239467)	(-6.06284)	(-4.4086)
MSD	0.400889***	1.561049***	1.54204***	0.331356***	1.549576***	1.544412***
	(6.774032)	(9.892944)	(9.791649)	(5.183906)	(9.900497)	(9.82308)
lnAST	-0.001538	-0.032897***	-0.038517***	-0.001369	-0.034904***	-0.040011***
	(-0.751198)	(-4.673686)	(-5.424306)	(-0.668337)	(-4.971184)	(-5.639047)
ln LOAN/DEP	0.034574**	-0.014975	0.006997	0.037874**	-0.008857	0.006584
	(2.051377)	(-0.690373)	(0.314809)	(2.243752)	(-0.409663)	(0.296608)
lnBR	-0.017605***	-0.06361***	-0.058712***	-0.017465***	-0.060345***	-0.056513***
	(-4.90002)	(-6.925579)	(-6.370621)	(-4.863691)	(-6.625216)	(-6.160587)
R2	0.133151	0.435284	0.454439	0.134146	0.441959	0.455924
Adj.R2	0.128636	0.343433	0.360308	0.129636	0.351193	0.36205
H0: η=0	—	3.415887***	3.548592***	—	3.521723***	3.640208***
H0: λ=0	—	—	4.12784***	—	—	3.017894***
Schwartz.	-4.44715	-3.950732	-3.935434	-3.962622	-3.938161	1.361568
F	29.49186	4.739008	4.827729	29.74638	4.869225	4.856744
Obs.	966	966	966	966	966	966

Note: (i) each figure below the coefficients is t-value., (ii) *** significant at 1%, ** significant at 5%, * significant at 10%.
Source: Japanese Bankers Association, Financial Statements of All Banks.

Table 5.3 Empirical results of SCP hypothesis for Japanese commercial banks, Dependent variable: ln(1+ROA)

Loan	Normal	1-way	2-way	Normal	1-way	2-way
Constant	0.134675***	0.980691***	1.098421***	0.137336***	0.993801***	1.097108***
	(4.584276)	(8.18367)	(9.208669)	(4.631485)	(8.263981)	(9.11391)
CRL3	-0.056781***	-0.064994***	-0.091455***			
	(-3.752448)	(-4.792209)	(-2.96733)			
CRL5				-0.056816***	-0.076688***	-0.056068*
				(-3.1759)	(-4.721308)	(-1.816149)
MSL	0.393404***	1.609682***	1.706208***	0.331136***	1.547671***	1.668684***
	(6.413421)	(9.794967)	(10.46963)	(4.755315)	(9.433002)	(10.11541)
lnAST	-0.00314	-0.04753***	-0.059121***	-0.002741	-0.048126***	-0.059695***
	(-1.455925)	(-6.199069)	(-7.606972)	(-1.259874)	(-6.265682)	(-7.656846)
ln LOAN/DEP	0.032374*	-0.03511	-0.002978	0.034005**	-0.032751	-0.003651
	(1.918243)	(-1.610511)	(-0.134713)	(2.008121)	(-1.500088)	(-0.16463)
lnBR	-0.014586***	-0.049207***	-0.044793***	-0.01498***	-0.047527***	-0.043475***
	(-4.021013)	(-5.659458)	(-5.20728)	(-4.111876)	(-5.47244)	(-5.04797)
R2	0.128373	0.433889	0.462027	0.124784	0.433441	0.458442
Adj.R2	0.123833	0.341811	0.369205	0.120226	0.34129	0.365002
H0: η=0	—	3.44562***	3.747688***	—	3.478292***	3.74425***
H0: λ=0	—	—	6.149345***	—	—	5.427566***
Schwartz	-4.441653	-3.948265	-3.949441	-4.437544	-3.947474	-3.942799
F	28.27776	4.71218	4.977579	27.37445	4.703591	4.906259
Obs.	966	966	966	966	966	966

Note: (i) each figure below the coefficients is t-value., (ii) *** significant at 1%, ** significant at 5%, * significant at 10%.
Source: Japanese Bankers Association, Financial Statements of All Banks.

Table 5.4, Table 5.5 and Table 5.6 show the results using the 'ln REV' for dependent variable.[83] The pooled model is rejected by hypothesis tests. Hence, our favoured inference is from the fixed effect model. Also, the significance and signs of CR and MS are the same regardless of whether we use 1-way or 2-way fixed effects model. From the insignificant coefficients of CR and the positive coefficients of MS, the fixed effect models clearly support the efficiency hypothesis.

[83] In these tables, the 1-way models in all cases are favoured from the results of Schwarz criteria, and selected for inference.

Table 5.4 Empirical results of SCP hypothesis for Japanese commercial banks, Dependent variable: lnREV

Asset	Normal	1-way	2-way	Normal	1-way	2-way
Constant	-1.858675***	19.9944***	20.48509***	-1.957745***	20.02501***	20.37433***
	(-3.475627)	(8.981678)	(9.052909)	(-3.636786)	(8.950964)	(8.944119)
CRA3	0.601832**	0.289113	-0.059701			
	(2.332151)	(1.237639)	(-0.108931)			
CRA5				0.829113***	0.249112	0.135789
				(2.7155)	(0.874258)	(0.236466)
MSA	9.962233***	37.46261***	37.97637***	11.05266***	37.6754***	38.02296***
	(9.492223)	(13.01219)	(13.05503)	(9.332202)	(13.11341)	(13.03415)
lnAST	0.857347***	-0.380429***	-0.430768***	0.849316***	-0.380337***	-0.430503***
	(21.75962)	(-2.662778)	(-2.914674)	(21.43729)	(-2.654446)	(-2.9129)
ln LOAN/DEP	0.937019***	0.027513	0.264943	0.90265***	0.018956	0.264213
	(3.041683)	(0.068559)	(0.637878)	(2.929725)	(0.047149)	(0.636143)
lnBR	-0.149283**	-0.93666***	-0.916963***	-0.140706**	-0.946855***	-0.912904***
	(-2.2482)	(-5.870161)	(-5.689867)	(-2.115362)	(-5.944727)	(-5.682744)
R2	0.827066	0.885484	0.886682	0.827413	0.885378	0.886688
Adj.R2	0.826165	0.866835	0.867107	0.826513	0.866712	0.867114
H0: η=0	—	3.25303***	3.259276***	—	3.224867***	3.21927***
H0: λ=0	—	—	1.241861	—	—	1.357981
Schwartz.	1.3658	1.879386	1.918716	1.363795	1.88031	1.918662
F	917.2968	47.48269	45.2954	919.522	47.43314	45.29814
Obs.	965	965	965	965	965	965

Note: (i) each figure below the coefficients is t-value., (ii) *** significant at 1%, ** significant at 5%, * significant at 10%.
Source: Japanese Bankers Association, Financial Statements of All Banks.

Table 5.5 Empirical results of SCP hypothesis for Japanese commercial banks, Dependent variable: lnREV

Deposit	Normal	1-way	2-way	Normal	1-way	2-way
Constant	-2.075273***	14.9362***	14.99003***	-2.157982***	15.05137***	15.29575***
	(-3.959094)	(7.205791)	(7.17313)	(-4.089769)	(7.23423)	(7.260825)
CRD3	0.507992**	0.250688	-0.283182			
	(2.388481)	(1.284128)	(-0.580321)			
CRD5				0.71471**	0.178416	-0.697161
				(2.560061)	(0.676501)	(-1.227097)
MSD	10.42745***	36.06777***	36.52029***	11.21092***	36.29219***	36.713***
	(9.65281)	(12.29137)	(12.31027)	(9.607218)	(12.38614)	(12.38777)
lnAST	0.904649***	0.062983	0.075017	0.902681***	0.059909	0.068105
	(24.19909)	(0.48117)	(0.560817)	(24.13966)	(0.455777)	(0.509199)
ln LOAN/DEP	0.945168***	0.451111	0.49983	0.908141***	0.451781	0.494914
	(3.072254)	(1.118314)	(1.193816)	(2.947028)	(1.116184)	(1.182858)
lnBR	-0.242226***	-1.289108***	-1.309836***	-0.243743***	-1.304304***	-1.306726***
	(-3.693374)	(-7.547254)	(-7.544803)	(-3.71818)	(-7.649226)	(-7.556932)
R2	0.827774	0.883548	0.884559	0.827925	0.883381	0.884723
Adj.R2	0.826877	0.864607	0.864641	0.827029	0.864413	0.864833
H0: η=0	—	3.05786***	3.050947***	—	3.036051***	3.040418***
H0: λ=0	—	—	1.030101	—	—	1.368875
Schwartz.	1.361568	1.895201	1.936283	1.360689	1.896634	1.934864
F	922.8153	46.64738	44.4099	923.7955	46.57176	44.48119
Obs.	966	966	966	966	966	966

Note: (i) each figure below the coefficients is t-value., (ii) *** significant at 1%, ** significant at 5%, * significant at 10%.
Source: Japanese Bankers Association, Financial Statements of All Banks.

Table 5.6 Empirical results of SCP hypothesis for Japanese commercial banks, Dependent variable: lnREV

Loan	Normal	1-way	2-way	Normal	1-way	2-way
Constant	-1.756547***	20.1307***	20.54019***	-1.862928***	20.10462***	20.29156***
	(-3.284929)	(9.180962)	(9.222042)	(-3.46331)	(9.139542)	(9.060871)
CRL3	0.590926**	0.248496	-0.006034			
	(2.145503)	(1.00138)	(-0.010484)			
CRL5				0.870867***	0.269666	0.451135
				(2.683509)	(0.907615)	(0.785487)
MSL	10.81828***	40.75684***	41.20801***	12.01857***	40.99063***	41.52782***
	(9.689274)	(13.55429)	(13.54178)	(9.514457)	(13.65823)	(13.53156)
lnAST	0.855505***	-0.366609***	-0.415033***	0.846918***	-0.365307***	-0.41438***
	(21.79115)	(-2.613231)	(-2.859857)	(21.45837)	(-2.600068)	(-2.857019)
ln LOAN/DEP	0.913736***	-0.025063	0.214925	0.882196***	-0.032246	0.212856
	(2.974443)	(-0.062832)	(0.520688)	(2.871907)	(-0.080742)	(0.515909)
lnBR	-0.159213**	-0.99974***	-0.976891***	-0.150842**	-1.006389***	-0.971753***
	(-2.411273)	(-6.284185)	(-6.081943)	(-2.282504)	(-6.33494)	(-6.064975)
R2	0.827802	0.886985	0.888151	0.828265	0.886961	0.888235
Adj.R2	0.826906	0.868603	0.868852	0.827371	0.868575	0.868951
H0: η=0	—	3.343452***	3.345329***	—	3.315231***	3.291594***
H0: λ=0	—	—	1.225293	—	—	1.33995
Schwartz	1.361404	1.86524	1.904677	1.358714	1.865455	1.903928
F	922.9983	48.25313	46.02202	926.0014	48.24141	46.06086
Obs.	966	966	966	966	966	966

Note: (i) each figure below the coefficients is t-value., (ii) *** significant at 1%, ** significant at 5%, * significant at 10%.
Source: Japanese Bankers Association, Financial Statements of All Banks.

The estimate results of market structure for Japanese commercial banks supported the efficiency hypothesis in the most robust calculations.[84] This does not mean necessarily that the city banks accounting the extremely high position of market share compete with regional banks and second regional banks on the same field. Although the city banks develop their branches in nationwide, they are actually arranged only on the main street and do not follow customers living in the local area. The regional banks and second regional banks which can catch those customers therefore can decide their own interest rate. However there are also other competitors such as credit associations and cooperatives even in the local area. Accordingly it is likely that commercial banks take the competitive behaviour and the market becomes the efficient structure.

In addition the result for efficiency hypothesis might suggest there are still customs of the cap loan-interest rate in the Japanese financial industry. There had been the rule that all financial institutions need to conform to the regulated interest rate by Bank of Japan until the financial system reform in the 1990s. Although such rule has been officially abolished after the reform, it could be

[84] This is base upon 1-way model of all markets in Table 5.4 - Table 5.6.

considered that those still remain as an unspoken rule. In fact, the interest rate by central bank is not decided for the profit of the particular banks but for the economic development of Japan, and therefore there is no space eventually for the collusive behaviour regarding interest rate setting. As a consequence, the financial institutions, which could successfully save their costs, have the high percentage of market share.[85] Therefore, it can be said that the effect of efficiency hypothesis is represented relatively stronger than that of SCP (collusive behavior) hypothesis.

5.5.2. Market structure of mutual financial institutions in Japan (financial statement data)

Table 5.7, Table 5.8 and Table 5.9 present the estimated results of SCP and efficiency hypothesis on Japanese credit associations and credit cooperatives. All data in this section have been taken from the financial statements of each institution. In these estimates, the value 1 plus ROA was employed as profitability measure.

First of all, in Table 5.7 to Table 5.9, the results of pooled estimation had a low R^2.[86] Also the results of F-tests of 'η=0' in 1-way model indicated that the cross sectional fixed effects model is favoured. In addition the results of Schwartz criteria showed that 1-way model is the most preferred model in all cases, having lower values. Therefore, the 1-way fixed effect model is mainly discussed in the following parts. In terms of the both left and right sides in Table 5.7, the same estimated results were found. In the 1-way model, although the coefficients of concentration ratio were significantly negative at 1%, those of market share were insignificant.

The point that the coefficient of concentration ratio is significantly negative was found in the estimated results on commercial banks. The fact that the increase of market share of top financial

[85] As for the other control variables, it was shown the profitability has negative relationship with the size of assets and the number of branches in the most of 1-way model. This result is different from the general expectation. It could be said the size of assets is associated with nonperforming loans, and therefore the large sized commercial banks still suffered from the recession. Also the number of branches would mean the impact of recession. Commercial banks still have some difficulties to cover the increasing fixed costs for new branches.

[86] The values of R^2 and $\overline{R^2}$ were almost zero in every case.

institutions connects to the decrease of profitability for all mutual institutions is different from the expectation in the collusive behaviour of SCP hypothesis. Mergers and consolidations since the 1990s make increase the expenditure for the nonperforming loan disposal and decrease the profitability, and it could induce the negative relations between concentration and performance. In fact, the recession in this period was so serious that mergers and consolidations in credit associations and cooperatives particularly had the meaning as relief merger. Therefore the most institutions had started the disposal of nonperforming loans immediately after their mergers and it causes the negative relations.

Table 5.7 Empirical results of SCP hypothesis for Japanese credit associations and credit cooperatives with financial statement data, Dependent variable: ln(1+ROA)

Asset	Normal	1-way	2-way	Normal	1-way	2-way
Constant	-0.0231	-0.15259**	-0.14638	-0.01713	-0.14469**	-0.15056
	(-1.4566)	(-2.524955)	(-0.129145)	(-1.026196)	(-2.387436)	(-0.131321)
CRA3	-0.34667***	-0.39013***	-0.00941			
	(-3.028927)	(-3.989246)	(-0.000517)			
CRA5				-0.28847***	-0.32209***	0.037735
				(-3.103851)	(-4.052873)	(0.003146)
MSA	-0.37097*	-0.37447	-0.53807	-0.37061*	-0.35491	-0.53807
	(-1.682091)	(-0.390407)	(-0.557888)	(-1.68054)	(-0.369902)	(-0.55789)
lnAST	0.002865***	0.009956***	0.008273**	0.002865***	0.009872***	0.008273**
	(3.317427)	(2.979257)	(2.430442)	(3.317305)	(2.95492)	(2.430441)
ln LOAN/DEP	0.0031	0.011128**	0.010983**	0.003066	0.011063**	0.010983**
	(1.079026)	(2.543007)	(2.507478)	(1.067339)	(2.52772)	(2.507479)
lnBR	-0.00182*	-0.0033	-0.00262	-0.00182*	-0.00326	-0.00262
	(-1.870629)	(-1.038463)	(-0.820359)	(-1.866593)	(-1.025867)	(-0.820357)
R2	0.006532	0.489343	0.490838	0.006655	0.489429	0.490838
Adj.R2	0.00519	0.376238	0.376831	0.005313	0.376342	0.376831
H0: η=0	—	4.300687***	n.a.	—	4.301076***	n.a.
H0: λ=0	—	—	n.a.	—	—	n.a.
Schwartz	-4.468141	-3.654985	-3.644615	-4.468265	-3.655153	-3.644615
F	4.866556	4.326437	4.305342	4.95883	4.32792	4.305341
Obs.	3707	3707	3707	3707	3707	3707

Note: (i) each figure below the coefficients is t-value., (ii) *** significant at 1%, ** significant at 5%, * significant at 10%. (iii) The hypothesis for fixed effects through time could not be tested.
Source: *Financial statement of national credit associations, Financial statement of national credit cooperatives.*

Even if two variables of assets, concentration and market share, are replaced with those of deposits or loans, almost identical results are achieved in Table 5.8 and Table 5.9, respectively. The 1-way model shows significantly negative concentration coefficient and the insignificant market share in all 1-way fixed effect estimates.

Table 5.8 Empirical results of SCP hypothesis for Japanese credit associations and credit cooperatives with financial statement data, Dependent variable: ln(1+ROA)

Deposit	Normal	1-way	2-way	Normal	1-way	2-way
Constant	-0.02474	-0.15746***	-0.11033	-0.01823	-0.14835**	-0.11573
	(-1.544181)	(-2.625583)	(-0.056913)	(-1.072067)	(-2.465697)	(-0.076737)
CRD3	-0.32474***	-0.376***	-0.59932			
	(-2.675551)	(-3.583896)	(-0.01934)			
CRD5				-0.27756***	-0.31644***	-0.33234
				(-2.812141)	(-3.710388)	(-0.021291)
MSD	-0.37863*	-0.42702	-0.59061	-0.37807*	-0.40066	-0.59058
	(-1.735035)	(-0.45219)	(-0.623088)	(-1.732606)	(-0.42418)	(-0.623063)
lnAST	0.002884***	0.010174***	0.00831**	0.002883***	0.010055***	0.00831**
	(3.342562)	(3.065052)	(2.460967)	(3.342563)	(3.031052)	(2.460952)
ln LOAN/DEP	0.003222	0.011453***	0.011044**	0.003165	0.011332***	0.011044**
	(1.119739)	(2.61319)	(2.518383)	(1.100089)	(2.585155)	(2.518387)
lnBR	-0.00183*	-0.00331	-0.00253	-0.00183*	-0.00325	-0.00253
	(-1.881264)	(-1.035739)	(-0.788883)	(-1.87542)	(-1.018195)	(-0.788888)
R2	0.006038	0.488851	0.49085	0.006239	0.489006	0.490851
Adj.R2	0.004695	0.375637	0.376847	0.004896	0.375826	0.376847
H0: η=0	—	4.296571***	n.a.	—	4.297461***	n.a.
H0: λ=0	—	—	n.a.	—	—	n.a.
Schwartz.	-4.467644	-3.654023	-3.64464	-4.467846	-3.654326	-3.64464
F	4.496267	4.317932	4.305564	4.6468	4.320607	4.305565
Obs.	3707	3707	3707	3707	3707	3707

Note: (i) each figure below the coefficients is t-value., (ii) *** significant at 1%, ** significant at 5%, * significant at 10%.
(iii) The hypothesis for fixed effects through time could not be tested.
Source: *Financial statement of national credit associations, Financial statement of national credit cooperatives.*

Table 5.9 Empirical results of SCP hypothesis for Japanese credit associations and credit cooperatives with financial statement data, Dependent variable: ln(1+ROA)

Loan	Normal	1-way	2-way	Normal	1-way	2-way
Constant	-0.02765*	-0.16947***	-0.1632	-0.02499	-0.16752***	-0.14688
	(-1.780809)	(-2.82498)	(-0.302055)	(-1.547005)	(-2.789398)	(-0.156065)
CRL3	-0.26191***	-0.29939***	0.108684			
	(-2.622965)	(-3.442939)	(0.013254)			
CRL5				-0.19427**	-0.22416***	-0.09004
				(-2.486066)	(-3.28156)	(-0.009802)
MSL	-0.34993*	-0.665	-0.80992	-0.35049*	-0.67904	-0.80993
	(-1.744232)	(-0.804679)	(-0.977608)	(-1.746859)	(-0.82103)	(-0.977612)
lnAST	0.002858***	0.010588***	0.008743***	0.00286***	0.010664***	0.008743***
	(3.340737)	(3.188472)	(2.587596)	(3.342731)	(3.209771)	(2.587577)
ln LOAN/DEP	0.0036	0.01209***	0.011711***	0.00365	0.012238***	0.011711***
	(1.245304)	(2.704932)	(2.618638)	(1.262197)	(2.738301)	(2.618628)
lnBR	-0.00184*	-0.0031	-0.00241	-0.00185*	-0.00314	-0.00241
	(-1.89416)	(-0.988591)	(-0.764979)	(-1.899197)	(-1.001521)	(-0.764973)
R2	0.006	0.488861	0.490946	0.005812	0.488679	0.490946
Adj.R2	0.004657	0.375649	0.376963	0.004469	0.375427	0.376963
H0: η=0	—	4.297078***	n.a.	—	4.295595***	n.a.
H0: λ=0	—	—	n.a.	—	—	n.a.
Schwartz.	-4.467606	-3.654042	-3.644827	-4.467417	-3.653686	-3.644828
F	4.467913	4.318103	4.307206	4.327445	4.314956	4.307208
Obs.	3707	3707	3707	3707	3707	3707

Note: (i) each figure below the coefficients is t-value., (ii) *** significant at 1%, ** significant at 5%, * significant at 10%.
(iii) The hypothesis for fixed effects through time could not be tested.
Source: *Financial statement of national credit associations, Financial statement of national credit cooperatives.*

In summary, it appears the market structure of credit associations and cooperatives in Japan follows neither the SCP nor the efficiency hypothesis because both coefficients of CR and MS were not significantly positive, which is to say that Japanese cooperative financial institutions can obtain higher profitability in conditions of lower market concentration. This trend does not fit the traditional hypotheses regarding market structure.

Table 5.10, Table 5.11 and Table 5.12 also refer to the results using the logarithmic total revenue (lnREV), respectively using the assets, deposits and loans. Firstly, the point is that in all three markets the figures of fit ($\overline{R^2}$), ranging from 0.97 to 0.99, are much higher than those using ln(1+ROA). Secondly, most of the coefficients for the dependent variable are statistically significant. For all three markets, it was shown that the 2-way model is the most preferred specification with regards to Schwartz criteria.

All the results in 2-way model (cross section and period fixed effect model) report the clear efficiency hypothesis result, representing the insignificant concentration ratio and the significantly positive market share. These results report that the market of mutual financial institutions is not dominated by the collusive behaviour of a few institutions. However, even so, it is difficult to conclude that the market power is performed successfully. The reason is that the behavioural purpose of mutual institutions as non-profit making institution might be connected with the market structure. In general it can be imagined that mutual financial institutions operate like monopolistic firm since their business area is restricted. On the other hand, however, as mutual financial institutions prior to the development of their local community, it appears that they do not choose the monopolistic or collusive behaviour. In fact they follow the policy by the central institutions for credit associations and cooperatives. As a result it can be said that the financial institution which succeeded to reduce their expenses could increase their market share and the efficiency hypothesis is supported.

As for the other control variables, all coefficients are positive and significant at the 1% level. It means when the increase of assets, the loan-to-assets ratio or the number of branches coincide with the higher profitability (revenue), which is consistent with the expectation.

Table 5.10 Empirical results of SCP hypothesis for Japanese credit associations and credit cooperatives with financial statement data, Dependent variable: lnREV

Asset	Normal	1-way	2-way	Normal	1-way	2-way
Constant	0.009571	7.033392***	5.458416	0.336164***	7.386386***	6.465577
	(0.078046)	(18.27813)	(0.887723)	(2.603903)	(19.17495)	(1.025252)
CRA3	-20.8663***	-17.6054***	-0.45066			
	(-23.54257)	(-28.08449)	(-0.00457)			
CRA5				-17.0084***	-14.4437***	-10.8475
				(-23.64788)	(-28.427)	(-0.164432)
MSA	9.593057***	10.04257	21.84158***	9.612023***	10.77944*	21.84114***
	(5.61275)	(1.620484)	(3.729411)	(5.627089)	(1.743043)	(3.729392)
lnAST	0.837121***	0.444175***	0.470953***	0.836986***	0.44009***	0.47095***
	(125.7043)	(20.90684)	(23.1357)	(125.7594)	(20.76665)	(23.13588)
ln LOAN/DEP	0.466805***	0.306476***	0.295533***	0.46659***	0.304547***	0.29553***
	(21.44496)	(10.91435)	(11.18696)	(21.44795)	(10.8712)	(11.18702)
lnBR	0.128707***	0.186424***	0.184374***	0.128915***	0.188482***	0.184377***
	(17.03846)	(9.090559)	(9.517273)	(17.07562)	(9.213983)	(9.51761)
R2	0.975422	0.991236	0.992279	0.975451	0.991279	0.99228
Adj.R2	0.975389	0.989295	0.990551	0.975418	0.989348	0.990551
H0: η=0	—	8.207589***	n.a.	—	8.256822***	n.a.
H0: λ=0	—	—	n.a.	—	—	n.a.
Schwartz.	-0.360712	0.088647	-0.024979	-0.361869	0.083638	-0.025008
F	29685.97	510.6898	574.1342	29721.19	513.2768	574.1515
Obs.	3746	3746	3746	3746	3746	3746

Note: (i) each figure below the coefficients is t-value., (ii) *** significant at 1%, ** significant at 5%, * significant at 10%.
(iii) The hypothesis for fixed effects through time could not be tested.
Source: *Financial statement of national credit associations, Financial statement of national credit cooperatives.*

Table 5.11 Empirical results of SCP hypothesis for Japanese credit associations and credit cooperatives with financial statement data, Dependent variable: lnREV

Deposit	Normal	1-way	2-way	Normal	1-way	2-way
Constant	0.160329	7.006532***	5.58309	0.539886***	7.462305***	4.503282
	(1.308254)	(18.6874)	(1.075196)	(4.146691)	(19.85377)	(0.589101)
CRD3	-23.6971***	-20.1709***	-2.15901			
	(-25.46163)	(-30.54541)	(-0.026058)			
CRD5				-19.2247***	-16.4861***	9.788345
				(-25.39526)	(-30.76881)	(0.123739)
MSD	9.059502***	14.90465**	23.25945***	9.094411***	15.48377***	23.25934***
	(5.41377)	(2.487923)	(4.041075)	(5.432523)	(2.588089)	(4.040865)
lnAST	0.839276***	0.455192***	0.47029***	0.838912***	0.447946***	0.47029***
	(127.5342)	(21.97123)	(23.28055)	(127.4372)	(21.66316)	(23.27943)
ln LOAN/DEP	0.455362***	0.298222***	0.293679***	0.45626***	0.296***	0.293676***
	(21.10465)	(10.8071)	(11.1104)	(21.14236)	(10.74213)	(11.10976)
lnBR	0.128499***	0.17978***	0.181519***	0.128815***	0.183362***	0.181521***
	(17.19181)	(8.890664)	(9.333068)	(17.22696)	(9.083884)	(9.332715)
R2	0.975934	0.991551	0.992286	0.975916	0.99158	0.992285
Adj.R2	0.975902	0.98968	0.990559	0.975884	0.989715	0.990558
H0: η=0	—	8.407801***	n.a.	—	8.462191***	n.a.
H0: λ=0	—	—	n.a.	—	—	n.a.
Schwartz.	-0.381769	0.052017	-0.025798	-0.381	0.048597	-0.025703
F	30333.61	529.9117	574.6088	30309.7	531.7422	574.5535
Obs.	3746	3746	3746	3746	3746	3746

Note: (i) each figure below the coefficients is t-value., (ii) *** significant at 1%, ** significant at 5%, * significant at 10%.
(iii) The hypothesis for fixed effects through time could not be tested.
Source: *Financial statement of national credit associations, Financial statement of national credit cooperatives.*

Table 5.12 Empirical results of SCP hypothesis for Japanese credit associations and credit cooperatives with financial statement data, Dependent variable: lnREV

Loan	Normal	1-way	2-way	Normal	1-way	2-way
Constant	-0.02534	6.774867***	5.829394	0.282342**	6.943876***	4.212749
	(-0.21431)	(18.24213)	(1.43283)	(2.300851)	(18.74959)	(0.788878)
CRL3	-20.0419***	-17.1874***	-7.38686			
	(-26.28496)	(-31.70463)	(-0.119283)			
CRL5				-15.9276***	-13.6634***	11.08879
				(-26.76297)	(-32.21418)	(0.212718)
MSL	8.124688***	10.88201**	16.46968***	8.115438***	11.80406**	16.47056***
	(5.298208)	(2.094425)	(3.266983)	(5.307329)	(2.279553)	(3.266964)
lnAST	0.840488***	0.459752***	0.475537***	0.841059***	0.465578***	0.475525***
	(129.2395)	(22.39334)	(23.4928)	(129.6867)	(22.76399)	(23.49084)
ln LOAN/DEP	0.443441***	0.291271***	0.287307***	0.440637***	0.291063***	0.287295***
	(20.5345)	(10.44981)	(10.64361)	(20.45486)	(10.48687)	(10.64251)
lnBR	0.129149***	0.188734***	0.189999***	0.128938***	0.185917***	0.190006***
	(17.34175)	(9.589066)	(9.927022)	(17.36334)	(9.483392)	(9.926773)
R2	0.976143	0.991718	0.992271	0.976279	0.991783	0.99227
Adj.R2	0.976111	0.989883	0.990541	0.976247	0.989964	0.99054
H0: η=0	—	8.553922***	n.a.	—	8.58359***	n.a.
H0: λ=0	—	—	n.a.	—	—	n.a.
Schwartz.	-0.390487	0.032084	-0.023943	-0.396194	0.024116	-0.02382
F	30605.76	540.671	573.5356	30785.2	545.0325	573.4641
Obs.	3746	3746	3746	3746	3746	3746

Note: (i) each figure below the coefficients is t-value., (ii) *** significant at 1%, ** significant at 5%, * significant at 10%.
(iii) The hypothesis for fixed effects through time could not be tested.
Source: *Financial statement of national credit associations, Financial statement of national credit cooperatives.*

5.5.3. Market structure of mutual financial institutions in each geographical area of Japan (financial statement data)

As for the market structure estimates for mutual financial institutions using the nationwide Japanese data of total revenue as dependent variable, it was found that the market follows the efficiency hypothesis. However, it might be difficult to employ the nationwide estimates as the final results for the organization because mutual financial institutions perform in smaller region-base.

In this section, in order to further examine the market structure of mutual financial institutions in Japan, the geographically segmentalized markets will first be analysed. Secondly, the relationship with the regional economy is considered by comparing the estimated results with some regional macroeconomic indices.

5.5.3.1. The geographical areas of Japan

There are 47 prefectures in Japan, which are grouped into seven areas in Table 5.13 for the purpose of analysing differences between geographical areas: Area 1 is North and North-East Japan (Hokkaidou and Touhoku); 2, Eastern Japan (Kantou, including Tokyo); 3, Mid-Eastern (Chubu, including Aichi); 4, Mid-Western (Kinki, including Osaka and Kyoto); 5, Western (Chugoku); 6, Southern (Shikoku); 7, South-West (Kyusyu and Okinawa). Tokyo, in Area 2, is the capital and also the largest business area (Osaka, in 4 is the second largest, and Aichi, in 3, the third largest).

Table 5.13 Geographical areas in Japan and Area code for estimation

Prefecture Code No							
1	Hokkaido	13	Kanagawa	25	Shiga	37	Kagawa
2	Aomori	14	Niigata	26	Kyoto	38	Ehime
3	Akita	15	Yamanashi	27	Oosaka	39	Kouchi
4	Yamagata	16	Nagano	28	Nara	40	Fukuoka
5	Iwate	17	Tokyo	29	Wakayama	41	Saga
6	Miyagi	18	Toyama	30	Hyogo	42	Nagasaki
7	Fukushima	19	Ishikawa	31	Tottori	43	Kumamoto
8	Gunma	20	Fukui	32	Shimane	44	Ooita
9	Tochigi	21	Shizuoka	33	Okayama	45	Miyazaki
10	Ibaragi	22	Gifu	34	Hiroshima	46	Kagoshima
11	Saitama	23	Aichi	35	Yamaguchi	47	Okinawa
12	Chiba	24	Mie	36	Tokushima		

Pref Code No		Area Code No.
1~7	North and North East area (Hokkaido and Touhoku)	1
8~13,17	East area (Kantou)	2
14~16,18~23	Middle East area (Chubu)	3
24~30	Middle West area (Kinki)	4
31~35	West area (Chugoku)	5
36~39	South area (Shikoku)	6
40~47	South West area (Kyusyu and Okinawa)	7

Considering the economic feature in each area, the following hypotheses could be constructed for the market conditions for mutual financial institutions.

Hypothesis 1: Regarding the market structure of mutual financial institutions, the efficiency hypothesis is supported in economically strong areas (e.g. Area 2, 3, and 4 including Tokyo, Aichi and Osaka, respectively). In contrast, the SCP hypothesis is supported in economically weaker areas (e.g. Area 5 and 6).

In economically dynamic areas there are many financial institutions serving small businesses, and collusive behaviour does not occur since the principle of market competition would operate efficiently. The efficient hypothesis would therefore be supported. In contrast, in economically weak area there would be few financial institutions due to the small number of customer firms. This would lead to imperfect market conditions and collusive behaviour, so the SCP hypothesis would be supported.

5.5.3.2. SCP and efficiency hypotheses for each geographical area in Japan

Empirical results for SCP and efficiency estimates for each area in Japan are shown in Table 5.14 and Table 5.15.[87] Table 5.14 shows the empirical results using ln(1+ROA) as the dependent variable. Table 5.15 shows the results employing lnREV. In those tables, (+), (–), and (0) indicate the sign of coefficients for variables.[88] As discussed in the previous part, the SCP hypothesis is supported in the case of CR>0 and MS=0. In contrast, if the coefficient of CR is equal to zero and that of MS is positive, the efficiency hypothesis is supported.

The estimated results appear to be mixed. Most of the cases using ln(1+ROA), except Area 5 and 6, followed neither the SCP hypothesis nor the efficiency hypothesis. In Area 5 the features of the efficiency hypothesis are found in all results except the cases of the concentration ratio in the pooled test. Nevertheless, in Area 6 the SCP hypothesis is represented only in the case of the deposit market using the 5-institutions concentration ratio with the 2-way fixed effect. In addition, as noted above, the estimate for Japan as a whole supports neither the SCP nor the efficiency hypothesis. Therefore the favoured models are selected in each area with respect to Schwartz criteria, and are denoted with heavy-line frame. The most of results did not support both hypotheses, except for the efficiency hypothesis in Area 5.

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87 See Appendix I.

88 (0) shows the coefficient was insignificant.

Table 5.14 Empirical results of coefficients on SCP / Efficiency hypotheses in Japanese geographical areas, Dependent variable: ln(1+ROA)

ln(1+ROA)		Area 1			Area 2			Area 3			Area 4		
		Normal	1-way	2-way	Normal	1-way	2-way	Normal	1-way	2-way	Normal	1-way	2-way
Asset	CR3	-	-	0	-	-	0	0	0	0	0	-	0
	MS	0	0	-	0	0	0	-	0	0	0	0	-
	CR5	0	-	0	-	-	0	0	0	0	0	0	0
	MS	0	0	0	-	0	0	-	0	0	0	-	0
Deposit	CR3	0	-	0	-	-	0	0	0	0	0	-	0
	MS	0	0	0	0	0	0	-	0	0	0	-	0
	CR5	0	-	0	-	-	0	0	0	0	0	0	0
	MS	0	0	0	-	0	0	0	0	0	0	-	0
Loan	CR3	0	0	0	0	0	0	0	0	0	-	-	0
	MS	0	0	0	0	0	0	-	0	0	0	-	0
	CR5	0	0	0	0	-	0	0	0	0	0	-	0
	MS	0	0	0	0	0	0	-	0	0	0	-	0

		Area 5			Area 6			Area 7			Japan		
		Normal	1-way	2-way	Normal	1-way	2-way	Normal	1-way	2-way	Normal	1-way	2-way
Asset	CR3	0	0	0	-	0	0	0	0	0	-	-	0
	MS	0	+	+	-	0	0	0	0	0	-	0	0
	CR5	0	0	0	-	0	0	0	0	0	-	-	0
	MS	0	+	+	-	0	0	0	0	0	-	0	0
Deposit	CR3	0	0	0	0	0	0	0	0	0	-	-	0
	MS	0	+	+	-	0	0	0	0	0	-	0	0
	CR5	0	0	0	0	0	+	0	0	0	-	-	0
	MS	0	+	+	-	0	0	0	0	0	-	0	0
Loan	CR3	0	0	0	0	0	0	0	0	0	-	-	0
	MS	0	+	+	-	-	-	0	0	0	-	0	0
	CR5	0	0	0	0	0	0	0	0	0	-	-	0
	MS	0	+	+	-	-	-	0	0	0	-	0	0

Note: The mark, ▨, means Efficiency hypothesis. The mark, ■, means SCP hypothesis.

As shown in Table 5.15, the estimated results in which the dependent variable was changed into lnREV support the efficiency hypothesis in Area 2, 5, and 7. Although there are to some extent the same trends in Areas 1 and 6 it is difficult to say that these areas strongly support the efficiency hypothesis. The results do not completely support the efficiency hypothesis in the other areas. The results could change depending on the degree of fixed effects. In the results for the asset and deposit markets of Area 3, the SCP hypothesis was supported.

The results for Area 3, 5 and nationwide Japan showed that the coefficients of CR are positive although those of MS are significantly negative. It indicates that there is a certain level of market discipline because market share has a positive impact to profitability. Therefore it is possible to interpret that the efficiency hypothesis is partially supported efficiency hypothesis in these areas. In contrast, there were different results on the other markets in Area 3, 5 and 7 that the coefficients of both CR and MS showed positive sign. This might mean that large institutions can also influence to the behaviors of other small financial institutions although there is some level of market discipline in this market. However, with regard to the geographical restrictions in credit associations and cooperatives, it could be said that the central associations set out implicitly the upper limit of loan interests, and the limit affects to the profitability of individual credit associations and cooperatives.

The heavy-line frame in tables indicates the favoured results by Schwartz criteria. However, these results also report the mixed features depending on geographical area. That is, some areas such as Area 1, 2, 5, and 7 support efficiency hypotheses, some one such as Area 3 follow SCP hypothesis. In contrast Area 4 and 6 did not cover both hypotheses, and Area 5 and 7 have both features.

Table 5.15 Empirical results of coefficients on SCP / Efficiency hypotheses in Japanese geographical areas, Dependent variable: lnREV

lnREV		Area 1			Area 2			Area 3			Area 4		
		Normal	1-way	2-way	Normal	1-way	2-way	Normal	1-way	2-way	Normal	1-way	2-way
Asset	CR3	-	-	0	-	-	0	-	-	+	-	-	0
	MS	-	-	0	0	0	+	+	-	0	-	0	0
	CR5	-	-	0	-	-	0	0	-	+	-	-	0
	MS	-	-	0	-	0	+	+	-	0	-	-	0
Deposit	CR3	-	-	0	-	-	0	-	-	+	-	-	0
	MS	-	0	0	0	0	+	+	-	0	-	0	0
	CR5	-	-	0	-	-	0	0	-	+	-	-	0
	MS	-	-	0	-	0	+	+	-	0	-	-	0
Loan	CR3	-	-	0	-	-	0	-	-	0	-	-	0
	MS	-	0	0	0	0	+	+	-	0	-	-	-
	CR5	-	-	0	-	-	0	-	-	+	-	-	0
	MS	-	0	+	-	0	+	+	-	+	-	-	-

		Area 5			Area 6			Area 7			Japan		
		Normal	1-way	2-way	Normal	1-way	2-way	Normal	1-way	2-way	Normal	1-way	2-way
Asset	CR3	-	-	0	-	-	0	-	-	+	-	-	0
	MS	-	+	+	0	0	0	0	0	+	+	0	+
	CR5	-	-	+	-	0	0	-	-	+	-	-	0
	MS	-	+	+	0	+	0	-	0	+	+	+	+
Deposit	CR3	-	-	0	-	-	-	-	-	+	-	-	0
	MS	-	+	+	-	0	0	0	0	+	+	+	+
	CR5	-	-	+	-	-	0	-	-	+	-	-	0
	MS	-	+	+	-	0	0	-	0	+	+	+	+
Loan	CR3	-	-	0	0	-	-	-	-	0	-	-	0
	MS	-	0	+	-	-	0	-	0	+	+	+	+
	CR5	-	-	0	-	-	0	-	-	0	-	-	0
	MS	-	+	+	-	-	0	-	0	+	+	+	+

Note: The mark, , means efficiency hypothesis. The mark, , means SCP hypothesis. The mark, , means partial efficiency hypothesis. The mark, , means both SCP and efficiency hypothesis

The above results show that there are areas that conform to the SCP hypothesis and those that conform to the efficiency hypothesis. However, it is difficult to arrive at a conclusion regarding the relationship between the regional features and the supporting hypothesis. Here, it is examined the hypothesis1 whether the efficiency hypothesis is supported in economically strong areas.[89] The economic conditions in the geographical area have some strong impacts on the management of mutual financial institutions, and these could change the market structure in the area. The following two figures are indicated in Table 5.16: (1) nominal GDP as an indicator of the size of the economy

[89] The main industrial areas in Japan are mostly located in Area 2, 3, and 4. (Area2, Tokyo; Area 3, Nagoya; Area 4, Osaka).

and (2) the ratio of GDP growth (year-by-year) as an indicator of change in economic conditions.[90] [91]

Table 5.16 Economic conditions and results of market structure

Area Code	Area Name	Area GDP ratio (Ave.)	Area Nominal GDP (Ave.) [1]	Market structure results	
				ROA	REV
Area 1	North & North East	-0.00763	7,616,850	—	Effi (Weak)
Area 2	East	0.002483	26,591,878	—	Effi
Area 3	Middle East	0.005168	10,070,070	—	SCP
Area 4	Middle West	-0.00451	12,567,800	—	—
Area 5	West	-0.00021	5,859,038	Effi	Effi
Area 6	South	-0.00861	3,484,358	—	—
Area 7	South West	-0.00079	5,943,747	—	Both
Japan	Nationwide	-0.00025	10,826,573	—	Effi

Source: Cabinet Office, Government of Japan, Statistics: Annual Report on Prefectural Accounts (only Japanese).
http://www.esri.cao.go.jp/jp/sna/toukei.html#kenmin
Note: (1) Million JPY.

The nominal GDPs in Area 2, 3 and 4 are relatively larger than the others, meaning these areas are greater in size. The empirical results for these areas show that the market structures differ in accordance with the profitability measure, return on assets (ROA) or revenue (REV). In other words, the market structures of these areas respectively follow the efficiency hypothesis, the SCP hypothesis, or neither. The results therefore imply there is no relationship between economic scale and market structure.

Also, in terms of the GDP year-by-year ratio there is not significant relationship with market structure. Although it was expected that movements in the short and medium-term might affect the market structure, significant relevance could not be found. Even if the GDP ratio has a positive value the efficiency hypothesis is not necessarily supported, and even if the ratio shows negative the SCP hypothesis was not necessarily followed.

To sum up, it was not possible to find a clear result supporting hypothesis 1 namely that market structure depends on regional economic conditions. However, it is difficult to emphatically deny hypothesis 1 due to the fact that economic indices such as prefectural GDP are too large to

[90] With respect to the nominal GDP, it is the averaged value in the period 1999-2005.
[91] The ratio of GDP is measured in prefectural and irregular base (every 2-3 years). Therefore it was difficult to add this variable into the panel data estimation.

consider the cooperative financial institutions. The cooperative financial institutions are based at the level of city, town or village.

5.6. Conclusion: Market structure of financial industry in Japan

This chapter has discussed the Structure-Conduct-Performance (SCP) and efficiency hypotheses in order to analyse the features of the cooperative financial institutions. The SCP hypothesis is the approach through which the influence of market structure on firms' performance is examined. (Goddard *et al.* (2001)) If the banking industry is nearing a monopolistic situation the degree of competition would decline and collusive behaviour would be taken by those banks. Consequently, a reinforcement of regulation on the part of the government would be likely in order to prevent abuses of market power by a small number of firms. In contrast, a method developed by members of the Chicago school, such as Demsetz (1973), is the efficient hypothesis. According to the Chicago school the positive relationship between concentration and profitability does not necessarily reflect collusive behaviour by several firms: it shows merely that large firms come to earn high profits by performing efficiently. According to this concept the profitability measure is affected not by market concentration but by market share, because the efficient firms could increase their market share and earn high profits even in a competitive and low-concentration market. This idea implies that the governmental regulation and intervention are inappropriate policies since they might impose penalties on efficient firms and discourage the proper functioning of the market mechanism.

According to the market structure hypothesis of credit associations and credit cooperatives in Japan, the empirical results present a clear feature on the efficiency hypothesis in almost all estimations. In fact, there were no significant results from the equation using return on asset as the dependent variable, but the cases using the logarithm of total revenue supported the efficiency hypothesis. However on the other hand it is also necessary to make smaller the analyzing market size since the mutual financial institutions focus their businesses only on a certain range of geographical area.

In response to the above issue the Japanese market was divided into seven geographical areas and estimates were made for each one. The point is that the comparisons are made with not by-prefecture but by-regional area. The reason is that there are not enough datasets in some prefectures to make estimates. From the estimated results it is found that Areas 3 and 7 support the SCP hypothesis and Areas 2 and 5 mainly follow the efficiency hypothesis. To sum up, it was discovered indirectly that the mutual financial institutions have a different market structure by area, and that the market is segmentalized.

However, the next issue was that of determining the main factor affecting market structure. In general, two components were considered as having the greatest importance on market structure for local financial institutions: (1) the financial status of the main customers, and (2) how active the financial institutions in the market. In order to examine customers' financial status, we compared the macroeconomic indices in each area with the estimated results for market structure. The question of whether or not the economically thriving areas support the efficiency hypothesis was investigated – and it was found that the regional economic indices and the estimated results are not significantly matched. Therefore there was no clear conclusion that economic conditions in a local area affect the market structure of cooperative financial institutions.[92]

It is necessary to analyse the activeness of financial institutions, as a factor affecting market structure. If the assumption that financial institutions pursue profit maximization is not accepted, the market might show ambiguous results. The mutual financial institutions prioritise the development of the local community over their profits and it is therefore considered that the non-competitive market causes ambiguous results. In the next chapter, in order to support this point, the market competition of mutual financial institutions is analyzed.

[92] One of the reasons is that the market is segmentalized beyond the level of prefecture – for example into cities, towns and villages.

Chapter 6 Market competitiveness of mutual financial institutions: Panzar-Rosse H statistics

Chapter 4 established the need to examine the features of the market (transaction lending based area or relationship lending based area) in order to consider the importance of mutual financial institutions, and Chapter 5 analyzed market structures in order to consider the features of the market. If the market confirms with the SCP hypothesis, consisting of only a few institutions, the mutual financial institutions in the area have high importance. However, even if the SCP hypothesis is not supported, it does not necessarily mean that the mutual financial institutions do not make any contribution, for it is possible for them to contribute to the area by utilizing the relationship information.

This chapter will analyze the degree of market competition so as to examine if the activities of mutual financial institutions following the relationship information are independent from those of the other institutions, and if these activities lead to profitability. The analysis of market competition will take a non-structural approach, in contrast with the structural approach for the market structure hypotheses in Chapter 5. Concretely, this research focuses on the Panzar-Rosse approach (Panzar and Rosse (1987)), which suggests that the market becomes a monopoly if the service offered by financial institution is independent and originate, and the degree of competition decreases. In contrast, the market is competitive and the level of competition increases if their services are similar in the market.

6.1. The Panzar-Rosse approach

6.1.1. Panzar-Rosse H-statistics

The competitive behaviour of banks is conducted from the comparative static properties of a reduced-form revenue equation according to Panzar and Rosse (1987). They assume banks would operate in long-term equilibrium, while bank performance is also affected by the action of the other market participants. Their model presumes that the price elasticity of demand (e) would become greater than 1, and that there is the homogeneous cost structure. In order to calculate the output quantity and the number of banks in equilibrium, it is assumed that bank profits are maximized. Thus, banks attempt to maximize profits by conducting business at that point where marginal revenue becomes equal to marginal cost, as follows.

$$R'_i(x_i, n, z_i) - C'_i(x_i, w_i, t_i) = 0$$

x_i is i-th banks' output, n is the number of banks, w_i is a vector of factor input price of i-th bank, z_i is a vector of exogenous variable for shifting the revenue equation of bank, and t_i is a vector of exogenous variable for shifting the cost function of bank. In equilibrium, this relation means that bank profit would become zero at the market level.

$$R^*_i(x^*, n^*, z_i) - C^*_i(x^*, w, t) = 0$$

The variables marked with the asterisk* donate the value in the equilibrium condition. The competition power in the market is measured as the ratio of the change in the factor of input price (∂w) by reflecting the equilibrium revenue (∂R^*_i). Panzar and Rosse (1987) defined the 'H-statistic', which is the sum of the elasticity of the reduced revenue function with regard to the factor prices, as the measure for competition.

$$H = \sum_{k=1}^{m} \left(\frac{\partial R_i^*}{\partial w_{ki}} \right) \left(\frac{w_{ki}}{R_i^*} \right)$$

(6.1)

The figure of H-statistics is located between $-\infty$ and 1. If the market is monopolistic the value of H is smaller than 0. Values between 0 and 1 indicate monopolistic competition, and a value of 1 indicates perfect competition.

Panzar and Rosse (1987) argue that an appreciation of input prices makes marginal costs increase, and makes the equilibrium quantity and the revenue decrease substantially in monopoly conditions. The H-value, therefore, would become 0 or negative. Furthermore, Panzar and Rosse (1987) examine other cases. In cases of monopolistic competition, perfect competition or oligopoly, the H-value becomes positive, which means the revenue equation for individual banks depend on the decisions of actual or potential rivals. In the case of monopolistic competition or oligopoly, the analysis is based on the comparative static properties of the Chamberlain equilibrium model. In the equilibrium condition of this model, interdependence affects the structural revenue function, and the bank's profit finally becomes zero as the conditions of entry and withdrawal are unlimited. Under these assumptions the H-value becomes smaller than 1 in the case of monopolistic competition. If the H-value is positive, it means that banks are in the monopolistic competition and cannot maximize profits. That is, output prices are reduced as banks offer more than the optimum amount of products. In the case of perfect competition the H-value becomes 1. Under certain conditions both marginal cost and average cost increase without changing the optimum amount of individual banks' output. If this condition occurs in perfect competition and some banks withdraw from the market, the remaining banks would individually face increase demand. This increased demand leads to higher prices and revenue, which are equal to the increase of cost, and the H-value finally become 1.

6.1.2. Equilibrium test for Panzar-Rosse H statistics

In the measurement of H statistics, it is assumed that the market attains long-term equilibrium. In a competitive capital market at the point of equilibrium, the risk-adjusted return is uniformized between banks, and it is therefore considered that the input prices should not be correlated statistically with the rate of return. In contrast, if the market is not in a state of equilibrium, the increase (decrease) in the input price makes the rate of return drop (rise) immediately. The change of input price would be strongly correlated with the rate of return. Whether or not the market is in a state of equilibrium can therefore be worked out by replacing the bank revenues to the return on assets (ROA) and calculating the E statistics in the equation.[93] In other words, if the E statistic is smaller than 0 (E stat < 0), it means the market is in 'dis-'equilibrium, and if it is equal to 0 (E stat = 0) it represents market equilibrium. (Shaffer (1982), Molyneux, Lloyed-Williams and Thornton (1994), Molyneux, Thornton and loyd-Williams (1996), Classens and Laeven (2004) and Matthews, Murinde and Zhao (2006))

6.2. Development of the Panzar-Rosse approach

Shaffer (1983) considers whether the features of long-term equilibrium described in Rosse and Panzar (1977) are applicable to short-term equilibrium. In other words, according to the perspective of Rosse and Panzar, in the case of a long term competitive market the entry and withdrawal of firms could take place in accordance with changes in factor prices. The latter are caused by shifts in the consumer demand curves face by individual firms, even if the market demand curves are stable. However, in the case of monopoly and a non-contestable market, this is not the case. That is, in the case of Chamberlain monopolistic competition and monopoly, entry and withdrawal would take place in accordance with changes in factor prices even if the condition of demand curves were stable (unshifted). (Panzar and Rosse (1982)) With regard to the theory by Panzar and Rosse, Shaffer (1983) analyses whether it is possible to use the Lerner index for assessing short-term market conditions, in cases where only factor prices change before entry and withdrawal take place. Shaffer found that the Lerner index at firm-level is independent of both market share and the conjectural variation in the short term.[94]

Then Shaffer (1982) uses the Panzar-Rosse approach for estimating samples of unit bank in New York, assuming it is possible for a dependent variable such as total revenue to influence independent variables such as interest and other costs.

$$lnTR=a_0+a_1lnPL+a_2lnPK+a_3lnPF+a_4lnAST+a_5lnMKT+a_6[(C+D)/DEP]+a_7[(C+I)/LOANS]$$

[93] The E statistic is defined as the sum of the input-price coefficient in which the dependent variable is the rate of return. (e.g. Matthew *et al.* (2006))

[94] However, Shaffer (1983) insists that these factors do not necessarily reveal the Lerner index at the industry level.

where MKT is a market interest rate, (C+D)/DEP is the ratio of cash and charges from depository institutions to total deposits, (C+I)/LOANS is the ratio of commercial loans to total loans. PL, PK, PF stand for the input prices, and the other indices represent proxies of the other variables which have an impact on equilibrium revenues. Total assets are used to take the concept of scale economies into consideration. And MKT is a proxy of total local demand. The variables (C+D)/DEP and (C+I)/LOANS are applied to accurately understand the differences in the corresponding actions and the business mix.

As the effect of loan losses is not considered in Shaffer's regression, Nathan and Neaven (1989) include these impacts in the estimation of the H statistics since the loan losses would be an important factor in bank profits. In fact, Nathan and Neaven (1989) assert that it is better to deduct the loan losses from total revenues. They did not, however, find that the loan losses had an important impact on the H statistics. In other words, although two kinds of estimation (with and without loan-losses) are carried out, significant results are not found. The estimated equation in Nathan and Neaven (1989) is as follows:

$$lnTR = a_0 + a_1 (lnPF) + a_2 (lnPK) + a_3 (lnPL) + a_4 (lnAST) + a_5 (lnBR) + a_6 D6$$

where TR is total revenue, with the loan losses deducted; PF is fund price per unit (interest expenditure / total deposit); PK is capital price per unit (nonpersonal expenses / number of branches); PL is labour price per unit (wage and salary expenses / number of employees); AST is total assets, BR is the number of branches / total branches in the system; and D6 is a dummy variable, for which the 6 large banks are 1 and the other banks are 0.

In their estimated equation, three indices are employed to take the impact of scale economies into account. The first is total assets and the second is the relative number of branches. Thirdly, D6 is used for the 6 largest banks in Canada as a dummy variable in order to separate them from the other banks. If effects of scale were accounted for in total assets and the number of branches, the coefficient of D6 would be significant.

As a further development Shaffer (1982) defines physical capital per unit, including other properties such as rentals and leases, as the proportion of nonpersonal expenses to the aggregate balance sheet amount of premises. However, as the owners of the bank rented quarters often associate with the capital corporation, the actions of rental contracts for the properties are sometimes decided administratively not as market prices but as transfer prices. For offsetting these effects, therefore, Nathan and Neave (1989) use the total nonpersonal expenses of individual banks divided by the number of domestic branches. In other words, the estimate of average nonpersonal cost per branch is represented as the proxy of the property price per unit.

DeBandt and Davis (2000) provide a significant improvement on the specification of variable and functional form. Firstly, regarding the specification of functional form they emphasize that the banking industry is not a general industry like manufacturing but instead an industry with individual characteristics, which is in line with the argument of Panzar and Rosse (1987). The estimation by Panzar and Rosse (1987) about the H statistics requires an assumption that banks are treated as single product firms. This assumption corresponds with the idea in intermediation theory that banks are observed as financial intermediaries. In other words, it is assumed that the nature and level of competition in the loan market is completely independent from those in the deposit market. In each case the inputs are (a) financial capital which is proxied by several kinds of bank debts, (b) labour, measured by the total number of staff, (c) the other inputs. In terms of each input, DeBandt and Davis (2000) consider that there are bank-specific input prices in which banks do not necessarily play the role as the price-taker in the factoring market or local factor market.

Secondly, DeBandt and Davis (2000) argue the point that it is better to use total income as the dependent variable in modern empirical approaches, although only gross interest income is used in the traditional approach. The reason is that there are some banks in which the discrimination between interest income and non-interest income is not relative, due to competition being too intense. Thirdly, it is also asserted that there is an important cross-subsidization between loans and other non-interest services which is not included in the traditional approaches –particularly under conditions of strong bank regulation.[95]

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[95] DeBandt and Devis (2000) considered banks as the firms offering (i) two kinds of service in the interest revenue approach; loans and investments, or (ii) three kinds of service in the total revenue approach; loans, investments and

Next, in terms of the functional form of the model there are a variety of specific forms of equation in the general banking literatures. Molyneux *et al.* (1994) and Bikker and Groeneveld (1998) in particular employed the ratio of interest revenues to total amount of balance sheet as an endogenous variable. On the other hand, Nathan and Neave (1989) use the logarithm of interest revenues. According to DeBandt and Davis (2000) the latter option is the most appropriate since the ratio of interest revenue to total assets might provide the price equation. There is an issue that the possibility of homogeneity might be induced even in the logarithmic specification. Therefore, DeBandt and Davis (2000) estimate the following function using a set of banking panel data in order to respond to the issue of synchronism:

$$lnR_{it}=\sum\alpha_j \, ln\, w_{ji,t} + \sum\beta k lnS_{kit} + \sum\gamma_{it} X_{nit} + \varepsilon_{it} \quad (6.2)$$

where $t=1, \ldots, T$, and T are the number of observed periods, and $i=1, \ldots, I$, and I the total number of banks. Thus the subscripts *i* and *t* mean i bank and t period. R_{it} is gross interest revenues or total gross revenues. In their case, banks have three kinds of inputs ($j=3$), therefore w_{it} represents the three dimension vector (*c.f.* for measuring the impact of the other type of inputs, the unit wage cost per employee, interest payment on debt, and the other types of cost). S_{it} is the scale economy variable, which means the level of bank operation. This figure includes equity and fixed assets. Finally, X_{it} is an exogenous vector of bank specific variables. This variable has a possibility to shifting the schedule of cost and revenue. At this point, they use a proportion of loans as asset, a proportion of deposit plus the deposit as the debt in the money market. The scale variable has a positive effect to revenues, while the sign of coefficient on a set of variables is ambiguous. That is, a higher share of loans in total debt to deposit or assets indicates the share of retail businesses in a market with a lower level of competition. On the other hand, the balance sheet variables in the year-end just offer the noisy proxy variables in the actual banking transactions. In the general case, ε_{it} includes the systematic and bank-specific factors for the time change.

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other services.

DeBandt and Davis (2000) insist that some attention needs to be paid for using the equation (6.2) in the empirical evidence. In the empirical studies on banking competition, although cross-sectional results are generally employed, the implicit assumptions in this case are that all banks have accessed to the same factoring market and only the scale of operations differs. They argue that the dimension of the time-series is crucial, and that it irregular results might arise from continuing the regression of the equation (6.2) with the OLS in every year (t=1, … , T). As a result they asserted that it is desirable to focus on the pooled sample regression.

Following this theory, firstly, DeBandt and Davis (2000) estimate the equation (6.2) by OLS. In the equation the pooled year-data of banks are accepted and the constant term is incorporated. They implicitly presume that all observed figures are independent, then they consider that it is important to test whether the omitted bank-specific variables or time-series factors (for instance, total number of demand-supply shocks) influence the estimation. Thus they discuss the estimation index to express the fixed effect. In fact, they use a variety of intercepts ($\alpha=\alpha^i$, $i=1, \ldots.I$) as well as time-dummy (DUt, $t=1, \ldots T\text{-}1$). Although this is connected to their primary conclusion, they consider that the factor prices are partially dependent on time and create some problems with multicollinearity. They therefore inform both results, with and without time-dummy variables. As a consequence they reported the 'between' index which summarizes the cross-sectional dimension (for instance the OLS about 'group average value', or the average of time for the individual banks in sample periods).

DeBandt and Davis (2000) assert that it is important to assess whether competitive conditions change over the period. As a result, by presuming that the H statistic is dependent on the quadratic time-trend (namely, $H_t=H_0+\beta_t+\gamma_{t2}$, $t=1, \ldots., T\text{-}1$), they estimate the constraint form of (6.2). In fact, the assumption is accepted by imposing the presumption that all factor prices follow the same trend, $\alpha_{it}-\alpha_{i0}=\alpha_{it}-\alpha_{j0}$. However, they employ some kinds of flexible functional forms including many competitive conditions and a small number of competitive conditions. In this case time-trend dummy variables are available in the regression analysis to control not only the costs for the specific factors but also all other shocks affecting to the equation.

As a result, DeBandt and Davis (2000) insist that it is important to assess whether or not a banking system is balanced in order to confirm whether Panzar-Rosse's statistics offer a useful conclusion. This insistence is especially meaningful in the case of perfect competition and monopolistic competition (*H>0*). However, as many researchers have written, in the long-term condition of monopoly, $H \leq 0$, it needs to be ensured whether input prices are correlated with the profitability of the industry.

6.3. Model specification: H statistics in the Panzar-Rosse approach

With regard to the H statistic of the Panzar-Rosse approach, the model is specified as follows (Panzar and Rosse (1987), Nathan and Neave (1989) and DeBandt and Davis (2000)):

$$\ln R = \alpha_0 + \alpha_1 \ln PL + \alpha_2 \ln PK + \alpha_3 \ln PF + \alpha_4 \ln S + \alpha_5 \ln X + \varepsilon \tag{6.3}$$

where R is the revenue of banks, PL is the input price of labour, PK is the input price of capital, and PF is the input price of financial fund. These three input prices are used as endogenous variables, and the sum of the coefficients of these three variables is defined as the H statistic. In fact, PL employs the ratio of personnel costs to the number of employees as the proxy. The ratio of the nonpersonal expenses to the total cost of personal property and fixed property could become a proxy of PK, and the cost of raising funds to total costs (including deposits, the CD, debt loan, and credit) would be a proxy of PF. Bank-Specific Factors are additional explanatory variables, and reflect the gap such as risk, cost, size, and bank structure. The ratio of risk capital funds to asset, of loans to total asset, or of nonperforming loans to total loans is considered as a risk factor.

On the other hand, the exogenous variables are the two latter parts, S and X. S donates bank size, and the logarithm of total assets is used in much of the previous literature. Therefore this study also uses the logarithm of total assets as the market-size variable. And the figures stating the special characters of each financial institution are put in as the proxy of X. The determinants of X are considered the difference of risks, deposit mix, and organizational structures. In this study, the risk factor uses the ratio of loan loss reserves to total assets, and the deposit-mix factor employs total deposits to total assets.

From the above developments, the model of the H-statistic by accordance with the Panzar-Rosse approach with regard to the Japanese mutual financial institutions is derived as the following revenue functions (Equation (6.4))[96]:

$$\ln REV = \beta_0 + \beta_1 \ln P_L + \beta_2 \ln P_K + \beta_3 \ln P_F + \beta_4 \ln AST + \beta_5 \frac{LLR}{AST} + \beta_6 \frac{LOAN}{DEP} + \beta_7 \ln BR + \varepsilon \quad (6.4)$$

where:

REV = total revenue,
P_L = Price of Labour; (Personnel Expenses / Number of Employees)
P_K = Price of Capital; (Nonpersonal Expenses / Fixed Asset)
P_F = Price of Fund; (Interest Expenses / Deposit)
AST = total bank assets,
LLR = Loan Loss Reserves,
$LOAN$ = total loans,
DEP = total deposit,
BR = the number of branches,
ε = random error

Here, the H statistic is calculated as $H=\beta_1+\beta_2+\beta_3$.

In addition, the estimated equation for the market equilibrium is defined as follows (Equation (**6.5**)). Here, the new dependent variable ROA refers to the return on assets. The E statistic is calculated as $E=\gamma_1+\gamma_2+\gamma_3$.

$$\ln(1+\pi) = \gamma_0 + \gamma_1 \ln P_L + \gamma_2 \ln P_K + \gamma_3 \ln P_F + \gamma_4 \ln AST + \gamma_5 \frac{LLR}{AST} + \gamma_6 \frac{LOAN}{DEP} + \gamma_7 \ln BR + \varepsilon \quad (6.5)$$

96 As for commercial banks, the following equation is estimated due to the data restriction:

$$\ln REV \ or \ (1+\pi) = \gamma_0 + \gamma_1 \ln P_L + \gamma_2 \ln P_K + \gamma_3 \ln P_F + \gamma_4 \ln AST + \gamma_5 \frac{DEP}{AST} + \gamma_6 \frac{LOAN}{DEP} + \gamma_7 \ln BR + \varepsilon$$

As in the case of the SCP and efficiency hypotheses, the empirical test for the H statistic also incorporates the fixed effect into the error term. It is possible to estimate more accurately by including the institution-specific fixed effect and the period-specific fixed effect.

6.4. Data and sources

The samples for commercial banks were collected from Japanese Bankers Association, about 120 banks, including city banks, regional banks and second regional banks, 2000-2007. Those for mutual financial institutions are based on 300 credit associations and 200 credit cooperatives over the 1999-2005. As for the mutual institutions, two types of data are employed: (i) from the annual financial statement for each institution; and (ii) from the Bankscope database.

6.5. Empirical results for the H statistics adopting the Panzar-Rosse approach

6.5.1. Competitiveness of commercial banks in Japan

Table 6.1 shows the results of the H statistics for Japanese commercial banks. The value of H statistics is defined as the sum of logarithmic labour price (lnPL), capital price (lnPK) and fund price (lnPF), and it is located in the fourth section from the bottom, denoted H-stat. The columns below the H statistics show the result of tests on the null hypothesis, 'H stat = 0' or 'H stat =1', respectively.[97] All coefficients of input prices are significantly positive at the 1% level, except for that of lnPK in 2-way model.[98] The H statistics defined as sum of the coefficients of input prices are 0.77 in pooled model,

97 These hypothesis tests are carried out in order to confirm statistically that the H stat is between 0 and 1.

98 Fixed effect model is solid when random / fixed effects are correlated with the explanatory variables whereas

0.96 in 1-way model and 0.89 in 2-way model. Of particular, the results of fixed effects model indicate relatively high values. As the perfect competition is defined in the case that the value of H statistics is equal to 1, it appears that the market of Japanese commercial banks is in the monopolistic competition with highly competitive level.[99] As for three input prices, the labour price has the largest values. It is found that the personnel expenditure per person has the most direct response to the revenue in commercial banks as the profit making firm.[100] With respect to Schwartz criteria, it can be said that the 2-way model is favoured for inference. Therefore the market Japanese commercial banks is monopolistic competitive and its competitiveness indicates 0.89.

With respect to the other control variables, in particular, the total assets and the number of branches have the positive relations and it shows that developing the size of business and the network in the local community has the great impact to revenue and it is consistent of our expectation in the competitive market. In contrast the portfolio risk measures DEP/AST and LOAN/DEP were both insignificant and it means that there is no significant increase of revenue even if commercial banks offer loans actively. It is likely from the fact that the Japanese economy is still in the severe recession. It seems both difficult to improve their management from supply and demand side.

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random effect model is not.

99 In particular, the 1-way model does not reject the null hypothesis H=1. It represents the market of Japanese commercial banks is in the highly competitive situation.

100 The coefficients of labour price in mutual financial institutions are from 0.23 to 0.30 and it is definitely smaller than the case in commercial banks.

Table 6.1 Empirical results of H statistics of Japanese commercial banks

	Normal	1-way Fixed Effects	2-way Fixed Effects
Constant	-3.08926***	-0.35987	-2.4467***
	(-14.94342)	(-0.616691)	(-3.819876)
lnPL	0.575322***	0.724048***	0.773258***
	(26.21454)	(39.06437)	(36.38103)
lnPK	0.075128***	0.129291***	0.043615
	(5.602692)	(4.624164)	(1.432702)
lnPF	0.121034***	0.104572***	0.07651***
	(20.23387)	(21.31115)	(6.807797)
lnAST	0.831508***	0.639786***	0.747483***
	(56.03221)	(12.80847)	(14.50247)
DEP/AST	0.681803***	0.075059	0.23314
	(6.55528)	(0.510585)	(1.56855)
LOAN/DEP	0.360887***	-0.03683	0.03271
	(7.358159)	(-0.519166)	(0.467602)
lnBR	0.089017***	0.223964***	0.146865***
	(3.949588)	(4.920039)	(3.212348)
R^2	0.988831	0.9955	0.995869
R^2 adj.	0.988749	0.994752	0.995141
H_0: $\eta=0$	—	9.391174***	10.49507***
H_0: $\lambda=0$	—	—	9.794196***
H-stat	**0.771484**	**0.957911**	**0.893383**
H_0:H=0	F(1, 961)=	F(1, 830)=	F(1, 823)=
	854.6183***	808.1692***	676.6703***
H_0:H=1	F(1, 961)=	F(1, 830)=	F(1, 823)=
	74.98115***	1.560261	9.637284***
Schwartz.	-1.360444	-1.339989	-1.375819
F	132.2825	23.24709	23.16073
Obs.	969	969	969

Note: (i) t-values in parenthesis, (ii) *** significant at 1%, ** significant at 5%, * significant at 10%.

Source: Japanese Banking Associations.

Table 6.2 shows the result for E-statistics, denoted E-stat, which is used for determining the long-term equilibrium condition of market. The E statistics are calculated as the sum of the coefficients of lnPL, lnPK, and lnPF in the equation using '1 plus ROA' as the dependent variable. It can be concluded that the market is in the long-term equilibrium if the statistic is zero. Conversely, if E statistics is not significantly different from zero, it means the market does not reach long-term equilibrium. In the case of an inequilibrium market condition it can be said that the value of H statistics is .temporal and the degree of competitiveness will be changed in the future.

In fact all three values of E statistics (pooled, 1-way and 2-way model) regarding commercial banks are statistically rejected from the null hypothesis that is E≠0. Hence, the market is not in equilibrium. It appears that there are still some impacts of economic recessions in the 1990s in commercial banking industry. Hence, it suggests that the degree of market competition indicated in Table 6.1 may change in the future. To sum up, from Table 6.1, all three models reject H=0. Also, the favoured model with regards to Schwartz criteria, 2-way model, rejected H=1 and the value of H stat indicates 0.89. Hence, as a result it is possible to interpret that the market competitiveness of Japanese commercial banks is 0<H<1 and it is monopolistic competitive market as the temporal result.

Table 6.2 Empirical results of E statistics of Japanese commercial banks

	Normal	1-way Fixed Effects	2-way Fixed Effects
Constant	0.032235***	0.069242***	0.035887**
	(6.661044)	(5.064376)	(2.341422)
lnPL	0.005365***	0.00618***	0.006995***
	(10.44225)	(14.23095)	(13.75387)
lnPK	0.001416***	0.003235***	0.002102***
	(4.509896)	(4.938583)	(2.885881)
lnPF	0.002613***	0.002205***	0.001642***
	(18.66372)	(19.17607)	(6.107227)
lnAST	-0.00144***	-0.00299**	-0.00129
	(-4.135597)	(-2.555779)	(-1.043051)
DEP/AST	0.016614***	0.009708***	0.01279***
	(6.824101)	(2.81849)	(3.595967)
LOAN/DEP	0.009448***	0.001788	0.002952*
	(8.229152)	(1.076096)	(1.763358)
lnBR	-0.00036	-0.00022	-0.00147
	(-0.672376)	(-0.206948)	(-1.338856)
R^2	0.49072	0.794458	0.803172
R^2 adj.	0.48701	0.760283	0.768493
H_0: η=0	—	9.362771***	9.340186***
H_0: λ=0	—	—	5.205016***
E-stat	**0.009394**	**0.01162**	**0.01074**
H_0:E=0	F(1, 961)= 231.2238***	F(1, 830)= 216.6295***	F(1, 823)= 170.7842***
Schwartz.	-8.869753	-8.847491	-8.841136
F	132.2825	23.24709	23.16073
Obs.	969	969	969

Note: (i) t-values in parenthesis, (ii) *** significant at 1%, ** significant at 5%, * significant at 10%.
Source: Japanese Banking Associations.

6.5.2. Competitiveness of mutual financial institutions in Japan (financial statement data)

Table 6.3 shows the results of Panzar-Rosse H-statistics for Japanese credit associations and credit cooperatives in the case of non-fixed effect, 1-way fixed effect and 2-way fixed effect. The result indicates that almost all coefficients are statistically significant. It is found that both fixed effects regarding cross-section and period are significant at the 1% level. The H statistics of Japanese mutual financial institutions for all three specifications are located between 0.40 and 0.44, therefore showing that the market is in a state of the monopolistic competition.[101] However the magnitudes of competition for mutual institutions are not as large as that for commercial banks. This is useful results in order to discuss the feature of organizational form. That is, the commercial banks as profit-making firm compete strongly for their own profit while the mutual financial institutions do not necessarily make decisions only for their benefit but for the social welfare in their local community. The alteration of the input price in mutual institutions is not more strongly inductive to their performance than commercial banks.

On the other hand, the control variables (LLR/AST and LOAN/DEP) for portfolio risk were insignificant and the negative relations. As customers of mutual financial institutions are smaller and have larger credit risks than those of commercial banks, the actively loan offering might generate the negative impact for revenue. It is implied that commercial banks should take more careful monitoring for borrowers.[102]

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101 The favoured model from Schwartz criteria is 2-way. Hence, its result (0.40) is more robust.

102 It was also considered as another factor that the period for the data sample is corresponding to the disposal of nonperforming loans. Hence it is not possible to conclude only from this result that the mutual financial institutions need to stop offering loans.

Table 6.3 Empirical results of H statistics of Japanese credit associations and credit cooperatives from financial statement data [103]

	Normal	1-way Fixed Effects	2-way Fixed Effects
Constant	-1.64544***	5.623717***	5.147581***
	(-10.51226)	(16.03517)	(14.40197)
lnPL	0.301633***	0.227377***	0.264318***
	(14.30121)	(10.14453)	(11.99685)
lnPK	-0.00974**	0.053484***	0.042495***
	(-2.22965)	(5.534378)	(4.53227)
lnPF	0.149397***	0.130542***	0.091581***
	(36.85187)	(35.60727)	(9.998939)
lnAST	0.761308***	0.398024***	0.390716***
	(113.1015)	(23.29977)	(23.41997)
LLR/AST	0.114634**	0.006119	0.12355
	(2.01729)	(0.067069)	(1.396745)
LOAN/DEP	0.030407***	-0.03562***	-0.03379***
	(3.197414)	(-4.336607)	(-4.221577)
lnBR	0.256949***	0.294339***	0.30274***
	(31.27792)	(16.06079)	(17.04172)
R^2	0.977849	0.992117	0.992677
R^2 adj.	0.977807	0.99037	0.991037
H_0: $\eta=0$	—	8.253539***	8.799704***
H_0: $\lambda=0$	—	—	38.987264***
H-stat	**0.441294**	**0.411404**	**0.398394**
H_0:H=0	430.2431***	311.0903***	295.5554***
H_0:H=1	689.6436***	636.7747***	673.9641***
Schwartz.	-0.462981	-0.019771	-0.080374
F	23528.68	567.9831	605.2778
Obs.	3739	3739	3739

Note: (i) t-values in parenthesis, (ii) *** significant at 1%, ** significant at 5%, * significant at 10%

Table 6.4 shows the value of the E statistics corresponding to Table 6.3. As the figures of E statistics in all estimations could not reject the null hypothesis that 'E-stat=0', it is found that the Japanese market of mutual financial institutions is in long-term equilibrium, and therefore the result 'monopolistic competition', in Table 6.3 is valid inference for its long term state.

The result that the market is steady is understandable as the fact that the reformation in the mutual financial industry after the bubble burst has almost completed. In other word, it is likely that the market of mutual institutions is converged earlier to the number of equilibrium institutions than

[103] Some control variables in this estimation are different from those of commercial banks. This is because the data resource for commercial banks (Japanese Bankers Association) does not present the data of loan loss reserve (LLR).

that of commercial banks. Despite the decrease of financial institutions after the financial reformation, it is likely to be there were not the actual deteriorations of financial services to customers due to the successful business transfer to the other institutions. Accordingly it would occur independently of the decrease of institutions that the market of mutual institutions went to the equilibrium state steadily.

Table 6.4 Empirical results of E statistics of Japanese credit associations and credit cooperatives from financial statement data

	Normal	1-way Fixed Effects	2-way Fixed Effects
Constant	0.015734	0.031601	0.007568
	(0.724282)	(0.550983)	(0.125152)
lnPL	-0.00482	-0.0027	-0.00057
	(-1.616464)	(-0.739208)	(-0.154481)
lnPK	0.000362	0.001302	0.00092
	(0.60704)	(0.823994)	(0.580721)
lnPF	0.000445	0.000286	-0.0009
	(0.807115)	(0.480051)	(-0.582005)
lnAST	0.002158**	0.000133	-7.00E-05
	(2.312503)	(0.047467)	(-0.024823)
LLR/AST	-0.00665	-0.10966***	-0.10256***
	(-0.754337)	(-4.619211)	(-4.322727)
LOAN/DEP	-0.00385***	-0.00236*	-0.00237*
	(-2.978)	(-1.719487)	(-1.721433)
lnBR	-0.00114	6.63E-05	0.000442
	(-1.009081)	(0.022173)	(0.14776)
R^2	0.006741	0.490759	0.495006
R^2 adj.	0.00486	0.377855	0.38182
H_0: η=0	—	4.33213***	4.355283***
H_0: λ=0	—	—	4.239917***
E-stat	**-0.004011**	**-0.001113**	**-0.000553**
H_0:E=0	1.790599	0.085638	0.020118
Schwartz.	-4.463113	-3.655907	-3.650971
F	3.58364	4.346713	4.373399
Obs.	3704	3704	3704

Note: (i) t-values in parenthesis, (ii) *** significant at 1%, ** significant at 5%, * significant at 10%

6.5.3. Competitiveness of mutual financial institutions in Japan (Bankscope data)[104] [105]

Table 6.5 and Table 6.6 show the empirical results of Panzar-Rosse's H-statistics and the long-term equilibrium test (E stat) for Japanese credit associations and cooperatives based on Bankscope data respectively. In these estimations the main difference from the case of financial statement data is that the price of capital was changed into the ratio of 'Other Administrative Expenses and Other Operating Expenses' to 'total assets'.

The H statistics are represented in the fourth section from the bottom in Table 6.5. Although the value of H-stat is 0.64 in the pooled effect, it decreases remarkably to 0.575 in the 1-way fixed effect model and to 0.51 in the 2-way model. These three values are all significantly different from H=0 and H=1 in 1% level, respectively. The most preferred model is 2-way model with regards to Schwartz criteria and it can be interpreted as robust result. It can therefore be concluded that credit associations and cooperatives are in the monopolistic competitive market. There is a difference that H stats of Bankscope are relatively higher than those of financial statement. However it could be said in both estimations that commercial banks are in the higher level of monopolistic competitive market than mutual financial institutions.

As for the other control variables, it is found that the logarithmic asset (lnAST) is positively related to total revenue, which suggests the scale merit has a significant effect on the cooperative financial institutions. As the ratio of loan loss reserves to gross loans (LLR/GRSLOAN) is used as the variable for risky behaviour, we expected it would exhibit a negative relationship with total revenue, but the result showed a positive relationship. The ratio of total deposits to total assets is employed as the measure of bank performance. As the increase of this figure means the growth of the expenses in the total balance, it is expected to be a negative number. The result was in line with this expectation.

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104 This section uses the following estimated equation due to the data restriction:

$$\ln REV or (1+ROA) = \delta_0 + \delta_1 \ln P_L + \delta_2 \ln P_K + \delta_3 \ln P_F + \delta_4 \ln AST + \delta_5 \frac{LLR}{GRSLOAN} + \delta_6 \frac{DEP}{AST} + \delta_7 \ln BR + \varepsilon$$

where: REV = total revenue, ROA= the return on assets, P_L = Price of Labour; (Personnel Expenses / Number of Employees), P_K = Price of Capital; (Other Administrative Expenses and Other Operating Expenses / Total Asset), P_F = Price of Fund; (Interest Expenses / Deposit), AST=total bank assets, DEP = total deposit, $LOAN$= total loans, LLR = Loan Loss Reserves, $GRSLOAN$ = Total gross loans, and BR = number of branches, and ε=random error.

105 The part of numerator in Price of Capital (PK) is calculated as follows; Other Administrative Expenses and Other Operating Expenses = Total Operating Expenses – Personnel Expenses – Loan Loss Provisions.

Table 6.5 Empirical results of H statistics of Japanese credit associations and credit cooperatives with Bankscope data

	Normal	1-way Fixed Effects	2-way Fixed Effects
Constant	-0.631405***	-0.239914***	-1.777894***
	(-4.782953)	(-0.974212)	(-5.48283)
lnPL	0.259295***	0.287602***	0.32601***
	(14.0167)	(15.74347)	(16.32063)
lnPK	0.253802***	0.159356***	0.151382***
	(29.01441)	(18.06289)	(18.06202)
lnPF	0.12668***	0.128344***	0.03586***
	(35.30635)	(35.13737)	(5.153545)
lnAST	0.853778***	0.866786***	0.917918***
	(124.7072)	(47.92072)	(41.93366)
LLR/GRSLOAN	0.008539***	0.005051***	0.00568***
	(7.589169)	(3.737209)	(4.413847)
DEP/AST	-0.519362***	-1.284971***	-1.186113***
	(-4.657328)	(-6.373412)	(-6.173646)
lnBR	0.16603***	0.006673	-0.020813
	(21.78269)	(0.356798)	(-1.075757)
R^2	0.983202	0.993612	0.994363
R^2 adj.	0.983159	0.99223	0.993125
H_0: η=0	—	F(482,2260)= 7.641567***	F(482,2254)= 8.901942***
H_0: λ=0	—	—	F(488,2254)= 50.00472***
H-stat	**0.639777**	**0.575301**	**0.513253**
H_0:H=0	F(1, 2742)= 1018.154***	F(1, 2260)= 870.1503***	F(1, 2254)= 567.3448***
H_0:H=1	F(1, 2742)= 322.7756***	F(1, 2260)= 474.204***	F(1, 2254)= 510.2608***
Schwartz.	-1.142734	-0.721575	-0.829262
F	22927.24	718.9037	803.1922
Obs.	2750	2750	2750

Note: (i) t-values in parenthesis, (ii) *** significant at 1%, ** significant at 5%, * significant at 10%

In the market competition test the significant H statistics could be found, but if the market is not in equilibrium it is difficult to conclude the value of H statistics as the final result of market competition. Thus, the results of the equilibrium test in Table 6.6 indicate the E-statistics for all specifications. However the F-tests (η=0 and λ=0) significantly rejected pooled OLS and favoured particularly the 1-way fixed effect model with regards to Schwartz criteria. The 1-way fixed effect model indicated -0.266 and it significantly reject the hypothesis E=0 at the 1% level. Hence, the evidence suggests that the market is not in equilibrium and it is difficult to say that the result of H statistics of 2-way model, 0.51, in Table 6.5 is available as a final result. In other words, the result that Japanese credit associations and cooperatives are in the monopolistic competitive market has moved significantly and it is not stable.[106]

Table 6.6 Empirical results of E statistics of Japanese credit associations and credit cooperatives with Bankscope data

	Normal	1-way Fixed Effects	2-way Fixed Effects
Constant	2.316747***	2.145545	5.308016***
	(4.696912)	(1.573746)	(2.779088)
lnPL	0.198152***	0.041028	-0.028384
	(2.826574)	(0.406467)	(-0.239911)
lnPK	-0.130194***	-0.323123***	-0.31113***
	(-3.793688)	(-6.269437)	(-5.986621)
lnPF	0.002997	0.015924	0.039216
	(0.22061)	(0.804871)	(0.979633)
lnAST	0.03264	0.366338***	0.180626
	(1.268226)	(3.653386)	(1.410886)
LLR/GRSLOAN	-0.023581***	-0.046493***	-0.041729***
	(-5.080337)	(-5.684217)	(-5.04634)
DEP/AST	-4.310465***	-8.901956***	-9.299583***
	(-10.3369)	(-7.690717)	(-7.983086)
lnBR	-0.029418	-0.191122*	-0.077286
	(-1.031087)	(-1.851629)	(-0.692762)
R^2	0.101376	0.314664	0.321391
R^2 adj.	0.098925	0.153854	0.15974
H_0: η=0	——	F(482,2084)= 1.345593***	F(482,2078)= 1.302494***
H_0: λ=0	——	——	F(488,2078)= 1.380569***
E-stat	**0.070955**	**-0.26617**	**-0.300298**
H_0:E=0	F(1, 2566)= 0.854768	F(1, 2084)= 5.951714**	F(1, 2078)= 5.402601**
Schwartz.	1.44088	2.640496	2.648937
F	41.35395	1.956739	1.988175
Obs.	2574	2574	2574

Note: (i) t-values in parenthesis, (ii) *** significant at 1%, ** significant at 5%, * significant at 10%

6.5.4. Competitiveness of mutual financial institutions in each geographical area of Japan (financial statement data)

In Chapter 5 it was found that although there are some markets of the mutual financial institutions in Japan that conform to the efficiency hypothesis, while some other areas follow the SCP hypothesis. In cases where the structure of whole market is not clear, it is expected that the market in each area is segmentalized into small regions. In such a segmentalized market of small regions, financial

106 This result is different from the estimation of financial statement data.

institutions offer specialized services for its area, and therefore the level of market competition will decrease. To discuss this point, firstly, the H statistics are measured for each local area in Japan and the differences of competition between areas are examined. However, as noted in Chapter 5, it is not necessary for the mutual financial institutions to raise their profits even if they offer the services appropriately. The reason is that the economic condition of their customers directly affects the profitability of the financial institutions. Thus, secondly, the relationship with regional economy is considered by comparing the empirical results to some indices for the regional economy.

6.5.4.1. Panzar-Rosse H statistics for each geographical area in Japan

Table 6.7 represents the classification of 7 areas in Japan[107], and Table 6.8 indicates the results of H and E statistics estimates for each area in Japan.[108] The upper rows for each area in Table 6.8 show the values of the H statistics, representing market competitiveness, and the lower rows represent the results of market equilibrium test with E statistics. It is defined that the E statistics becomes equal to 0 statistically in the case of long-term market equilibrium. In this case the null hypothesis E=0 can be acceptable (not rejected) and the mark 'A' is displayed in Table 6.8. And if the market is in equilibrium, the values of H statistics can be understood as long-period competitiveness. In contrast, when the E value is not significant the null hypothesis E=0 is statistically rejected, and the mark 'R' is displayed. Consequently, as the market has not attained market equilibrium, the values of H statistics must be assessed as temporal result of competitiveness.[109]

107 This classification is same as Table 5.13 in chapter 5.

108 See Appendix II.

109 As in the case of market structure of Japanese geographical area, the favoured results for Schwartz criteria are indicated with heavy-line frame.

Table 6.7 Geographical area in Japan and area code for estimation

Prefecture Code No							
1	Hokkaido	13	Kanagawa	25	Shiga	37	Kagawa
2	Aomori	14	Niigata	26	Kyoto	38	Ehime
3	Akita	15	Yamanashi	27	Oosaka	39	Kouchi
4	Yamagata	16	Nagano	28	Nara	40	Fukuoka
5	Iwate	17	Tokyo	29	Wakayama	41	Saga
6	Miyagi	18	Toyama	30	Hyogo	42	Nagasaki
7	Fukushima	19	Ishikawa	31	Tottori	43	Kumamoto
8	Gunma	20	Fukui	32	Shimane	44	Ooita
9	Tochigi	21	Shizuoka	33	Okayama	45	Miyazaki
10	Ibaragi	22	Gifu	34	Hiroshima	46	Kagoshima
11	Saitama	23	Aichi	35	Yamaguchi	47	Okinawa
12	Chiba	24	Mie	36	Tokushima		

Pref Code No	Geographical category	**Area Code No.**
1~7	North and North East area (Hokkaido and Touhoku)	**1**
8~13,17	East area (Kantou)	**2**
14~16,18~23	Middle East area (Chubu)	**3**
24~30	Middle West area (Kinki)	**4**
31~35	West area (Chugoku)	**5**
36~39	South area (Shikoku)	**6**
40~47	South West area (Kyusyu and Okinawa)	**7**

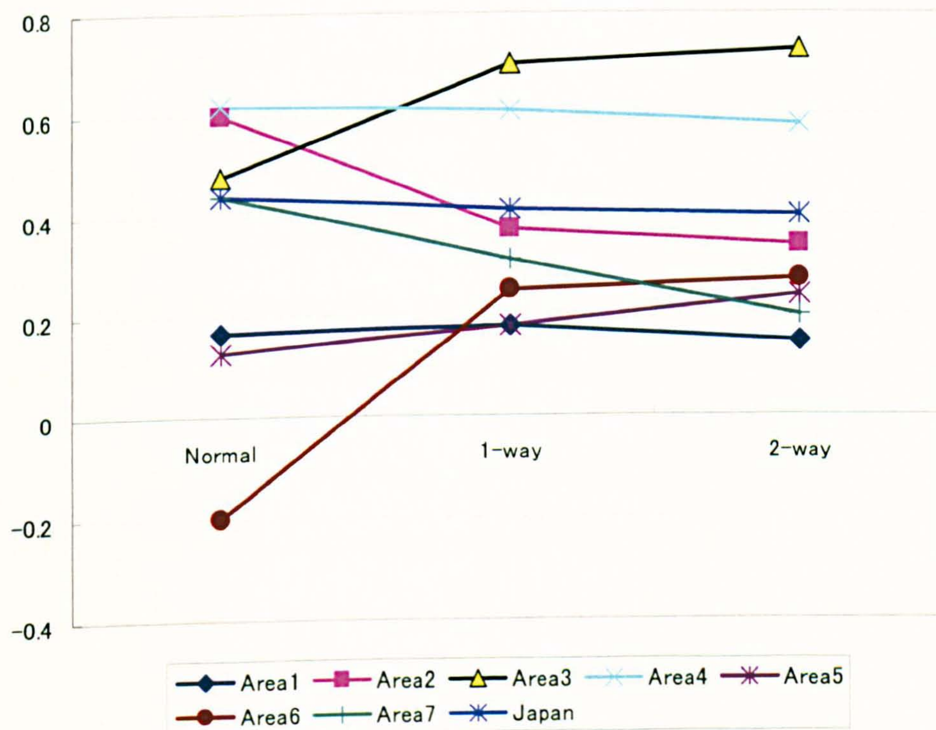
Table 6.8 Panzar-Rosse H statistics results for each geographical area in Japan

	Area 1			Area 2			Area 3		
	Normal	1-way	2-way	Normal	1-way	2-way	Normal	1-way	2-way
H-stat	0.17	0.18	0.15	0.60	0.37	0.34	0.48	0.70	0.73
E-stat	A	R	R	A	A	A	A	A	A
	Area 4			**Area 5**			**Area 6**		
	Normal	1-way	2-way	Normal	1-way	2-way	Normal	1-way	2-way
H-stat	0.62	0.61	0.58	0.13	0.18	0.24	-0.20	0.25	0.27
E-stat	A	R	A	A	A	A	A	A	A
	Area 7						**Japan**		
	Normal	1-way	2-way				Normal	1-way	2-way
H-stat	0.44	0.31	0.20				0.44	0.41	0.40
E-stat	R	A	A				A	A	A

Note: 'A' indicates E=0 is acceptable, but 'R' does it should be rejected.

Firstly, as with the estimation of E statistics with favoured model being framed with heavy line, the main feature is that only Area 1 rejected the null hypothesis E=0, which is to say the market in this area of cooperative financial institutions does not reach equilibrium. In Area 1 the estimates of 2-way model are relatively low level, indicating 0.15. Although the market is in monopolistic competition, the degree of monopoly does not seem to be strong. In terms of the fixed effect estimation for the other areas, almost all results of H statistics show more than 0.20 and the market equilibrium condition is accepted. It is therefore implied that the necessary competition level could be 0.20 for long-term market equilibrium.[110]

Figure 6.1 Panzar-Rosse H statistics results for each geographical area in Japan



Secondly, as for the regional character of H statistics, depending on the fixed effect results, there are three groups. The first group includes Area 3 and 4, and the competition level of these areas is relatively high (more than 0.5). The second group includes Area 1, 5, 6 and 7, and has relatively lower competition in both 1-way and 2-way. The third group includes Area 2, and the competition level ranges between 0.34 and 0.37 – lower than the first group but higher than the second.[111]

110 However, the score in the 1-way model in Area 5 was less than 0.20 (0.18) regardless of the market equilibrium.

111 As the assessment of competition is based on the subject view by writer, it is also possible to determine that the competition level in Area 2 is low.

6.5.4.2. Implication of the market competitiveness with economic condition in geographical area in Japan

In the previous section it was found that the degrees of competition differed significantly due to geographical location. What is the determinant factor of these differences? A hypothesis will be considered as follows.

Hypothesis 2: For mutual financial institutions, market competition is high (competitive) in areas that are more vibrant economically and low (monopolistic) in areas that are less vibrant.

In any economically vibrant area there are a relatively large number of financial institutions available to serve small businesses, but in rural areas the number of financial institutions is relatively small: it is therefore understandable that competition increases in the former and decreases in the latter.

Some indices are shown in Table 6.9 in order to examine the relationship between market competition and regional economic conditions. The following indices are used as the average value of regional economy in each area; (i) the number of firms/mutual financial institutions, (ii) small firms/all firms, (iii) the number of mutual financial institutions/prefecture, (iv) prefectural GDP ratio (year-by-year), and (v) nominal GDP in each area.[112]

112 The numbers of small firms are offered by Small and Medium Enterprise Agency in 2001, 2004 and 2006.

Table 6.9 Market competitiveness results and selected local economy indices

Area Code	Area Name	No. of Firms in mutual institution (Ave.)	Small firm ratio (Ave.)	No. of mutual institutions in prefecture (Ave.)	Area GDP ratio (Ave.)	Area Nominal GDP (Ave.) [1]	Market Competitiveness (favoured model only)
Area 1	North & North East	6043.43	0.9970	13.43	-0.00763	7,616,850	0.15 Low
Area 2	East	13614.21	0.9961	12.36	0.002483	26,591,878	0.34 Middle
Area 3	Middle East	10119.07	0.9948	17.80	0.005168	10,070,070	0.73 High
Area 4	Middle West	13052.01	0.9964	9.88	-0.00451	12,567,800	0.61 High
Area 5	West	6701.58	0.9974	8.63	-0.00021	5,859,038	0.18 Low
Area 6	South	11464.49	0.9978	3.86	-0.00861	3,484,358	0.27 Low
Area 7	South West	8282.93	0.9973	8.36	-0.00079	5,943,747	0.31 Low
Area Japan	Nationwide	10123.06	0.9963	11.42	-0.00025	10,826,573	0.40 Middle

Sources: Cabinet Office, Government of Japan, Statistics: Annual Report on Prefectural Accounts (only Japanese). http://www.esri.cao.go.jp/jp/sna/toukei.html#kenmin
Small and Medium Enterprise Agency (only Japanese). http://www.chusho.meti.go.jp/koukai/chousa/chu_kigyocnt/index.htm
Notes: Sahding refers to areas with medium-sized or large-sized value. (1) Million JPY.

Some figures in Table 6.9 are consistent with the feature of market competition. The figures of market competition in area 2, 3, 4 and nationwide indicate medium or high value. Also, nominal GDPs in these areas show relatively higher value. This means areas with more vibrant economies have greater market competition, making it possible to say that hypothesis 2 is supported by results. Also, the ratio of small firms to all firms represents some of the same features as nominal GDP. As the cooperative financial institutions in Japan mainly target small/medium firms and individuals, financial institutions compete hard to acquire customers if the ratio is small. In particular, the areas having a ratio of less than 0.996 have higher market competition. Nevertheless, it might be necessary to improve the interpretation of hypothesis 2 as the important point is not the number of small firms but the ratio of small firms.

The other indices showed mixed results. Areas with a large number of firms to one cooperative financial institution cover Area 2, 3 and 4. A large economy means there will be numerous borrowers, which makes the cooperative institutions offer many loans. Therefore the figure is basically consistent with hypothesis 2. However, although Area 6 has a larger number of firms for each institution, its degree of competition is relatively low. In addition, with regard to the average number of cooperative institutions in a prefecture, although it is expected that larger numbers of institutions will cause higher competition, this is not applicable to the character of Area 1. Also, the trend of GDP ratio does not necessarily follow with market competition.

To sum up the above results, it is difficult to conclude that the size of regional economy is relevant to the level of market competition. In particular, the indices based on the short or medium period do not have any significant effect due to the time lag to market. However, the long-term based economic conditions such as economic scale and small firm ratio do have some impact on the degree of market competition.

6.6. Conclusion: Market competitiveness of financial industry in Japan

In this chapter the Panzar-Rosse approach has been estimated in order to investigate the degree of competition faced by the cooperative financial institutions. The approach is based on the comparative static properties of reduced-form revenue function. The greater H-statistics from this function mean stronger and more perfect competition, while lower statistics indicate market conditions closer to monopoly. In addition, the range $0<H<1$ means the monopolistic competition. In Chapter 5 we found results supporting mainly the efficiency hypothesis in the estimations for mutual financial institutions. There were also however several ambiguous features, for instance, some signs for the coefficients of concentration ratio were opposite to expectation in efficiency hypothesis. Hence this chapter focused on the Panzar-Rosse H statistics in order to analyze the market structure from another approach.

Firstly, the results of H statistics for mutual financial institutions show that the cooperative financial institutions in Japan exist in a state of monopolistic competition. In fact, the empirical result using the dataset from financial statements indicates 0.40, and that from Bankscope does 0.51. On the other hand commercial banks reported significantly higher competitiveness in spite of the results in the disequilibrium state. Hence it is possible to conclude in total that the levels of competitiveness between commercial banks and mutual financial institutions are significantly different.

Nevertheless, as credit associations and credit cooperatives do not offer their services on a nationwide scale, it is assumed that their markets are segmentalized in each local area. Therefore, secondly, the analysis of market competition moves to the local area, although in fact comparisons are made not by prefecture but by region area, the reason being that in some prefectures there are not enough datasets. The first conclusion was that the degrees of competition are significantly different depending on geographical area – particularly in cases of the greater competition found in Areas 2, 3 and 4. In general, two components are expected to be the factors determining market competition in the segmentalized and small-sized market: (1) the economic condition of their main customers, and (2) the degree of specialization of their services. In terms of the first component, some economic indices of the local area are examined as the proxy of their main customers: small firms and individuals. The result suggested that market competition is not greatly affected by short and medium-term economic conditions, but instead long-term economic indices such as nominal GDP have some significant impacts. Accordingly, the degree of competition becomes higher in the large economic area, and it suggests that the relationship-based information does not become valuable. In contrast, in the small economic area, it was shown that the services offered by cooperative financial institutions are more important. The result shows that the cooperative financial institutions are particularly important in local areas in which the large commercial banks generally do not offer their services.

There are also some problems regarding this analysis, however. The first issue is that the analysis at the prefectural level is too wide for the credit associations and credit cooperatives as these institutions are generally based at city, town or village level. The conclusion in this chapter is therefore inferential, and a smaller-sized grouping would be required for clarifying the characteristics of mutual financial institutions. The second issue is that the banking industry should be included in the analysis. In fact, many commercial banks such as city banks, regional banks and second regional banks participate in the actual loan and deposit markets, and it would be necessary to include these in order to examine the actual market structure and market competition.[113]

[113] However it is not applicable to estimate these different financial institutions all together. There seems to be some points which should be adjusted such as the difference of company form or tax difference.

Chapter 7 Cost structure of mutual financial institutions: Cost efficiency and Economies of scale

It is clear that some evidence has accumulated from the previous chapters. The first result shows that the mutual financial industry in Japan supports not only SCP but also the efficiency hypothesis depending on the dataset (original data from financial statements of individual institutions or Bankscope data). Thus it was difficult to conclude whether the cooperative financial institutions belong to the collusive market or to the efficient market, one of the reasons being that the market seems to be segmentalized in each local area. It seems in the segmentalized market that the profitability of each institution is not properly influenced by some changes in concentration ratio or market share on a nationwide scale. The second result from the Panzar-Rosse H-statistics is that the market conditions the mutual financial institutions in Japan face are those of strong monopolistic competition. This result is consistent with the feature that cooperative financial institutions limit their customers into a certain range of members. That is, the original cooperative financial institutions still have some abilities to control product prices due to geographical advantage and long-terms relationships, even if another nearby institution gets the price of services down.

The previous sections with respect to market structure indirectly showed that the market of mutual financial institutions is segmentalized at the level of local area. In the theory of microeconomy it is argued that the monopolistic market causes low management efficiency in companies due to the relative lack of market pressure. The next question, therefore, is whether the cost efficiency of mutual financial institutions is lower than that of commercial banks. This chapter will employ the concept of cost structure in order to analyze the management efficiency. In fact, the following topics are considered: (i) cost efficiency (X efficiency) and (ii) scale economy.

7.1. Background to the theory of management efficiency

7.1.1. Relationship between management efficiency of individual banks and market efficiency (competitiveness)

In the previous chapter, the impacts of market condition to profitability in financial institutions were discussed. It seems, however, to be too crude to assess market performance only in terms of profitability. Management efficiency will therefore be introduced as another measure of market performance. If market conditions are competitive and appropriate management policies are taken by banks, greater management efficiency of banks should be indicated. It is expected that market structure has an impact on individual management efficiency through the degree of market pressure.

It is also important to note that the direction of the impact between market structure and bank efficiency can be reversed. If the profitability (performance) of banks is low, banks might change their management strategies (conduct), and then this change could improve market structure. In particular, in the case of geographically segmentalized market such as that of mutual financial institutions, it is possible that a change in management efficiency in individual banks has an impact on market structure.[114, 115]

7.1.2. Four approaches to the input and output indices in management efficiency

This section will consider the concept of input and output in the banking industry. In general the basic operation of banks is to hold deposits from depositors and to supply loans to borrowers: in other words, unlike manufacturers, banks do not produce some form of physical output. In terms of the indices of input and output, therefore, there are different approaches in previous literatures.[116]

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114 See Figure 5.1.

115 Although the name, efficiency, is employed for both market efficiency and management efficiency, these are basically different concepts. Market efficiency in this section means the Pareto efficiency of micro economics.

116 In addition, as banking industry actually offers a wide range of services, some researchers suggest that it is a

There are, in fact, four approaches to the activities of banking industry, and the measures of input and output differ according to which approach is adopted.

a. The production approach

In this approach the banking industry is treated as 'manufacturing industry' producing various kinds of deposit and loan accounts from capital and labour. This approach considers the number of transactions conducted within a certain period of time as output. The flow data of these transactions, however, are not generally used as those are proprietary. As a result, some other figures, such as the number of deposit accounts, loans accounts or the number of transactions for each product tend to be used as output.[117]

b. The intermediation approach

The intermediation approach considers the banking industry as an entity intermediating funds between savers and investors. It employs, therefore, the total value of loans, investments and other assets as a measure of output, with the inputs being labour, capital and deposits. As this approach considers deposits as input, the interest on deposits is treated as a kind of cost which means a kind of operational cost. (Sealey and Lindley (1977))[118]

According to Berger and Humphrey (1997) the both above-approaches are imperfect since these are not follow either transaction process or fund transfer from lender to borrower, which are the basic functions of banks as financial institutions.

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fundamental question to specialize inputs and outputs only in several services.

117 Humphrey (1985) uses the number of deposit accounts and loan accounts as output of financial institutions.

118 Gilligan and Smirlock (1984) employ either the total amount of ordinary and time deposits or that of securities and loans.

Each approach, however, does have advantages. The production approach, for instance, is convenient for assessing the efficiency of each branch, since the behaviour of branch managers is not affected by the quality of management in the bank as a whole.

In contrast, the intermediation approach is useful for estimating the efficiency of financial institutions as a whole since it includes interest expenditures as being between half and two-thirds of the total costs of financial institutions. In addition, this approach is useful for estimating the best frontier efficiency of the profitability in financial institutions because the minimization of total costs is essential for profit-maximization.

c. The value-added approach

The value-added approach was developed from the intermediation approach. It assumes that financial institutions gain (or lose) some market values by offering financial intermediation services to customers. It assumes, therefore, that all items on both sides of the balance sheet should be regarded as output.

Berger and Humphrey (1992) insist that both deposits and loans would create some significance for banks and that these should be included as output.

d. The user cost approach

The user cost approach argues that output should be decided according to whether final products become 'revenue'. That is, if returns on assets become higher than the opportunity costs of those assets, or if financial costs from liabilities are lower than the opportunity costs of those capitals, the user cost approach considers its product as financial output. (Hancock (1985))

With respect to the four approaches, most researchers basically agree with the point that loans and the other assets of financial institutions would be considered as output. However, not all researchers agree regarding the role of deposits, the reason being that deposits have been sometimes employed as part of interest payments and it therefore has a characteristic of an input.

On the other hands it is also true that deposits possess some of the features of an output, as increasing the amount of deposits means increasing the growth of liquid assets, the safe custody of funds and the payment services. It is therefore possible to use the deposit values as the proxy of those services. (Berger and Humphrey (1997))

Several studies settle this problem by considering both characteristics of deposits as input or output. In fact, the deposit interests are accepted as part of expenditure (input), while the amount of deposits is dealt with as output because banks can connect them to commission businesses. (Berger and Humphrey (1991)) These studies suggest that it is a sensitive issue to use 'deposit' in the measurement of operating efficiency. As the estimate depends to great extent on the definition of output, it is particularly important to carefully consider such issues in the model.

7.2. A theoretical perspective of management efficiency

This chapter will discuss the theoretical concepts of the management efficiency. However, firstly it is worth noting that there are some implicit assumptions in economics regarding the theory of this efficiency. There is an assumption that individual firms pursue profit-maximising behaviour. This assumption has been implicitly accepted in the previous literatures on the economies of scale and scope, and there has been discussion as to whether the scale or the product mix of financial services should be expanded. Nevertheless, as there is some doubt about this assumption, some other points, such as the extent to which banks exhibit profit seeking behaviour, have been considered since the late 1970s. In the first half of this chapter, therefore, the theory of product efficiency will be analyzed. In the second half, the economies of scale will be considered.

7.2.1. Technical efficiency and price (economic) efficiency

There was an argument in favour of product efficiency before the suggestion of X-efficiency by Leibenstein (1966). Based on the theory of Farrell (1957), product efficiency is defined as the sum of two factors such as technical efficiency and price (economic) efficiency.

1. Technical efficiency refers to the ability to avoid the part of wastes, and it is achieved when firms' total outputs is equal in size to total inputs. Technical inefficiency means the diseconomy that takes place when an inappropriate volume of input factors goes into the production processes. The volume of inputs is decided in the competitive market as the marginal product value becomes equal to the input price.[119]

2. Economic efficiency represents the ability to choose the optimal set of inputs in the case of prevailing input prices. In other words, economic inefficiency indicates the points which are out of the production possibility frontier, in which firms cannot produce maximum outputs despite optimal inputs. The main reasons are organizational failures such as deficiencies in planning on the part of management and the wasted expenses by staffs.

Next, these two economies will be explained, using Figure 7.1 introduced by Farrell. In order to facilitate understanding the linear homogeneous Cobb-Douglas production function is assumed as:

$$Y = AK^{a}L^{1-a} \tag{7.1}$$

where L and K are labour inputs and capital inputs, respectively. Character A represents constant numbers. The linear homogeneousity means the Y value will be multiplied by n when K and L are multiplied by n. Transforming the above Cobb-Douglas function we can obtain:

[119] Debreu (1951) and Farrell (1957) supplied a definition for the technical inefficiency as '1 – (the largest geometrical decrease of all inputs in producing a specific product'. If this index is equal to 1, it means the technical efficient. In contrast, if it is smaller than 1, it means technically inefficient.

$$1/A = (K/Y)^a (L/Y)^{1-a}$$

(7.2)

On the Figure 7.1, the P-P curve represents the relationship between labour and capital per unit of production, namely, the combinations between K/Y and L/Y. These relationships fulfil the conditions in (7.2)

With total cost as C, and the prices of K and L as p and w respectively, the cost function can be written as

$$C = pK + wL$$

(7.3)

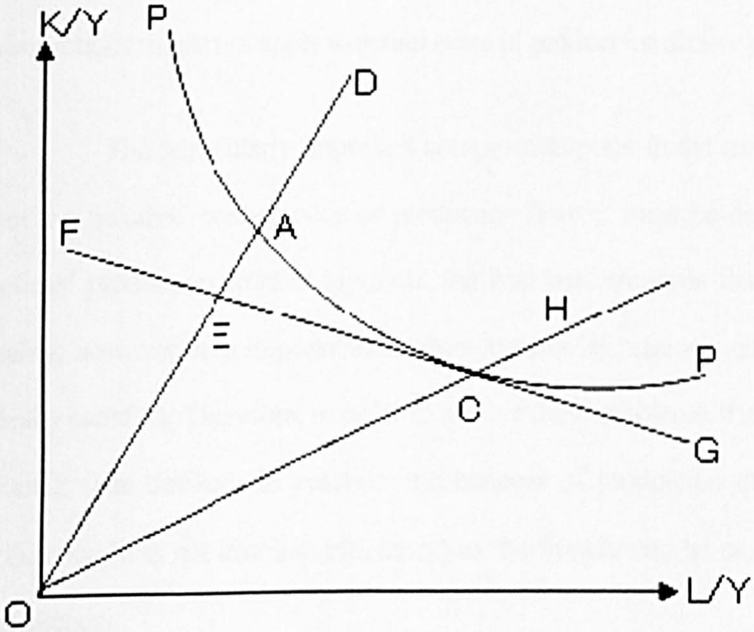
When both sides of this equation are divided by pY and transformed, the following equation can be expressed as

$$K/Y = 1/p \cdot C/Y - w/p \cdot L/Y$$

(7.4)

This is shown as the F-G line in Figure 7.1. The slope of this line is a ratio of prices between K and L, $(-w/p)$. The lower positions of the line represent smaller costs. Calculated the minimum K and L in the prevailing Y, point C is the most efficient. The F-G line should be tangential to the line P-P at point C.

Figure 7.1 The Farrell measures of technical efficiency and price (economic) efficiency.



Source: Farrell (1957), p.254.

It is assumed that the P-P line represents technically efficient production. On the other hand, all points on the line connecting the original point and point C are price (economic) efficient. For instance, point A and H are technically efficient and price efficient respectively. And production at point D is technically and price inefficient. In order to represent the degree of inefficiency, point A is taken as a bench mark. It is technically efficient as it is located on the P-P line. Moreover, price inefficiency at point A is at the same level as at point D. The degree of technical inefficiency at point D, therefore, shows as OA/OD and that of price inefficiency shows as OE/OA. Thus the sum of both inefficiencies can be expressed as follows:

$$OA/OD * OE/OA = OE/OD \tag{7.5}$$

7.2.2. Cost efficiency (X-efficiency)

This section will consider the methods of measurement of product inefficiency. As noted in the previous sections, product inefficiency represents flaws in the application of techniques and inputs that are absent at the theoretically optimal point. It is suggested, however, that some theoretical assumptions might not apply to actual cases of product inefficiency.

The particularly important compromise-point in the measurement of product efficiency is that the 'relative' best-practice or production frontier must be derived. In general the points on the optimal production frontier represent the best performances that firms can theoretically attain. In reality, however, it is impossible to observe them because we cannot assess for all conditions to be ideally satisfied. Therefore, in order to resolve these problems, the theory of the relative best-practice frontier was devised. In practice, the concept of production efficiency is interpreted as relative efficiency (it is not absolute efficiency) as the frontier can be derived from the dataset collected by researchers.[120]

7.2.2.1. What is X-efficiency?

Leibenstein (1966) linked the concept of product efficiency with the theory of corporate governance and pointed out that the degree of interior inefficiency of company is much larger than the inefficiency due to failings in the allocation of resources.

Leibenstein (1966) defined X inefficiency as the diseconomies inside the business organization. That is, inefficiency is recognized as the gap between minimum costs and actual costs for producing the prevailing output. It is therefore possible to say that X inefficiency actually indicates the sum of technical inefficiency and price (economic) inefficiency. [121] (Berger, Hunter and Timme (1993), p.228) The X inefficiencies are therefore measured as the relative inefficiency in the actual dataset samples such as costs, products and productive factor prices. In fact, the degree of X inefficiency of individual firms is measured as the distance of the point from the efficiency frontier.[122]

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120 Another issue is about index which should be chosen in the estimation of the best practice frontier. In theory, it is possible to employ all kinds of cost and profit measures as output individually. However in the case that the firms offer multiple products, it is difficult to use the data of specific product as output. Berger and Mester (1997) suggested some conditions in order to analyse the efficiency of financial institutions.

121 Price inefficiency is almost equal to allocative inefficiency. (Berger *et al.* (1993))

122 In fact, X inefficiency is caused from the excess costs by inaccurate management of manager and by irrational

The main problem with the econometric measurement of X inefficiency is how to distinguish it from the stochastic random error in the estimated equation of cost function. To solve this issue, two estimation methods are mainly employed – the non-parametric approach and parametric approaches – depending on the specification process of the inefficiency from the total error.

The non-parametric approach denies the stochastic errors and uses only the concept of inefficiency. In contrast, the parametric approach measures X inefficiency by comparing each sample with samples on the frontier after removing the stochastic errors. Non-parametric approaches refer to Data Envelop Approach (DEA), and parametric approaches include the Stochastic Frontier Approach (SFA), the Thick Frontier Approach (TFA) and the Distribution-Free Approach (DFA).

Firstly, non-parametric approaches such as DEA state that all gaps from the estimated frontier represent the inefficiencies by supposing that there are no stochastic errors. In the DEA, however, there are some disadvantages suggested by researchers. For instance, the DEA is often influenced by actual random errors when the researchers set banks on the efficient frontier, and it cannot make statistical estimations.

In the parametric approach the SFA[123] uses inefficiency and random error as component errors. Thus it divides its component errors by making some assumptions regarding the features of inefficiency and random error.[124] In most cases of the maximum-likelihood method it is assumed that the inefficiency and the random error follow the asymmetric half normal distribution and the symmetric normal distribution respectively. In fact, the Stochastic Frontier Approach supposes two-sided disturbance for random error and the asymmetric one-sided disturbance for inefficiency, and estimates only the value of inefficiency. In addition, it generally employs the two error components model to separate the random error from inefficiency. For example, if the cost function is defined as follows:

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organization.

123 Berger *et al* (1993) and Berger, Leusner and Mingo (1997) represent SFA as econometric frontier approach.

124 The parametric approach is distinguished into deterministic and stochastic approach, depending on the definition of inefficiency. The deterministic approach defines all residuals between observed value and estimated values as inefficiency. In contrast the stochastic approach divides the residuals into the inefficiency part and stochastic random error part. There is an issue in the deterministic approach that all incomplete factors could be included as inefficiency. Therefore the Stochastic Frontier Approach (SFA) is generally accepted because it can incorporate the uncontrollable factors for firms as stochastic variable.

$$ln\, C = ln\, C\,(y_i, p_i, B_i) + v + u$$
$$\text{for } i=1, \ldots, N \tag{7.6}$$

where C is total cost, p is production factor price, y is volume of production, and B is a vector of parameter. And u represents an error term of inefficiency that is independent from the random error, v. There are two main methods for estimating inefficiency: (i) when the distribution of u is not specialized. The estimate is made on the assumption that v is independent from samples or divergent over time, (ii) when the inefficiency of the sample observations as the conditional expectation is calculated after the estimations of B and E=v+u. However, as noted before, the distribution of the inefficiency term needs to be specialized for the estimation of inefficiency.

The TFA is assumed, after dividing into four groups according to the size of assets and deposits, deviations from predicted costs within the lowest average-cost quartile of banks show random errors, and deviations from the highest random error to the lowest quartile represent inefficiency.

On the other hand, the DFA can measure average inefficiency under the assumption of the stochastic error being divergent over time on average. In other words, although the maximum likelihood methods have a disadvantage in the form of the strong assumption of distribution, the DFA was suggested to solve this problem. As the DFA defines the over-time divergence of the random error, all the remaining errors are interpreted as indicating inefficiency on the part of the banks. At this time, the total cost function is defined as:

$$ln\, TC = ln\, C\,(y, p) + ln\, u + ln\, v$$

As with the stochastic frontier approach, the DFA also deals with ln u and ln v as the component error. The u value is stable over time, thus the average value of the residual error is given as the estimation of ln v. The estimated inefficiency can be expressed as follows:

$$INEFF = 1 - exp\,(min\,(ln\,u) - ln\,u) \tag{7.7}$$

where the term min (ln u) shows the minimum value of the logarithm of u, ln u.

In these studies on the banking efficiency, different results might be arrived at, depending on the inputs and outputs. As noted in 7.1.2, however, researchers do not necessarily share the same opinions regarding input and output.

7.2.2.2. Previous literature on X-efficiency

The main objectives of the US studies of scale and scope economies were to find the best functional form. In contrast, the studies on the cost efficiency of banks focused on the issue of which part of the equation should be taken to be the optimal efficient frontier. Berger and Humphrey (1997) carried out 130 survey researches in which they examined five major techniques, data on at least 21 countries and four types of financial institutions (commercial banks, savings banks, credit unions, and insurance companies). They divided these studies into the parametric approach and non-parametric approach.

In general, it is shown by many literatures that the empirical results derived from the parametric approach are similar to those attained through the non-parametric approach. However, it appears the non-parametric methods might produce slightly lower estimated values than the average efficiency values and would be more dispersed.

Berger and Humphrey (1997) found that the efficiency value of the US banks was almost 0.72 on average, in the case of DEA and non-parametric method. The standard deviation of efficiency is 0.17, and the efficiency values are located between 0.31 and 0.72. Using the parametric approach, the standard deviation is 0.06 and the average efficiency value is 0.84, and it ranged between 0.61 and 0.95. As they pointed out, however, the efficiency values in individual firms in the parametric methods are not necessarily similar to those in the non-parametric method, even if the averaged efficiency levels are same. It showed that the confidence intervals of efficiency estimation for individual banks or branches were significant.

Berger and DeYoung (1997) measured the cost efficiencies of the US commercial banks, using the Fourier-flexible functional form, which was regarded as being superior to the traditional translog functional form. The result showed that the average value of cost efficiency was about 0.92, a slightly higher value than in the previous findings. In addition they estimated the impact of the cost efficiencies on the nonperforming loans and found there was a negative relationship.

Berg, Forsund, Hjalmarsson and Suominen (1993) analyzed the efficiency of the banking industries in Finland, Norway, and Sweden with the DEA method. The levels of efficiency in Finland and Norway were found to be higher than in Sweden.

Pastor, Pérez, and Quesada (1997) examined the productivity, efficiency and technical differences by using the non-parametric methods for eight European countries in 1992. They found that France (0.950) and Spain (0.822) and Belgium (0.806) had the most efficient banking sectors, while the UK (0.537), Austria (0.608) and Germany (0.650) had the least efficient.

Allen and Rai (1996) analysed 194 banks of 14 OECD countries over the period 1988-92, employing the SFA and DFA methods. They found there was around 27.5% inefficiency in the largest country and suggested the reason was the prohibition of functional integration between commercial and investment banks.

The European Commission (1997) estimated the pooled time-series cost frontier for the all major banking sectors in EU. On the basis of their estimates the study showed average product inefficiency of around 20%, and in the estimates for individual countries it found that the banks in Luxemburg were the most efficient at 0.88.

Pastor and Lozano (1997) considered whether environmental differences rather than banking techniques might influence efficiency, including different environmental conditions by DEA. The results showed that the average value of efficiency is relatively higher. Consequently, they distinguished European countries into three groups: the highest efficiency group included Denmark, Spain, Germany, Luxemburg, and France (1.00-0.88); the second group included Netherlands, Belgium, the UK, and Portugal (0.69-0.56); and the lowest group included Italy (0.35).

Altunbas, Gardner, Molyneux and Moore (2001) applied the Fourier-flexible functional forms in estimating the stochastic cost frontier obtained by the estimation of economies of scale, production inefficiency and technical changes. From the estimates for each country it was shown that the relative inefficiencies in Austria, Denmark, Finland, Italy and the UK increased over time, and that average inefficiency was around 25% of total costs. However, it was suggested inefficiency changed more drastically than economies of scale, depending on the country, the size of the banks, and the time.

Fries and Taci (2005) examined the cost efficiency of 289 banks in 15 post-communist countries in Eastern Europe. They investigated the difference of cost efficiency depending on the ownership form, using the SFA. Consequently, although there are some exceptions in individual banks, it was found that private banks are significantly more efficient than state-owned banks, and they also found that banks with foreign ownership have higher cost efficiencies than those with domestic ownership.

There are a small number of studies on the inefficiency of Japanese banks, published since the latter half of the 1980s, as well as the studies on scope economies. The product efficiency of the banking sector has frequently been a topic for discussion since the publication of the special issue (Vol.2/3) of Journal of Banking and Finance in 1993. (Hori and Yoshida (1996), Honma, Jinmon and Teranishi (1996) and Fukuyama (1993)) Kasuya (1989) divided commercial banks in Japan into three groups (city banks, regional banks and second regional banks) and measured cost inefficiency for each group using SFA. The averaged value of cost inefficiency in the 1970-80s was ranged from 4% to 12% and the following results on inefficiency are also found; city banks < regional banks < second regional banks. Harimaya (2003) estimated cost inefficiency of all commercial banks in Japan in 1989-1991 using SFA and found the similar results to Kasuya (1989). However as for the relation between three groups, the results were different.[125, 126]

As for the research regarding mutual financial institutions, Fukuyama (1996) investigated input- and output efficiency of credit associations with DEA and found there is 6% inefficiency respectively. He argued that these inefficiencies are caused mainly by pure technical inefficiency, and scale inefficiency is not strongly connected with the whole inefficiency.

Fukuyama (1999) measured cost inefficiency for credit cooperatives with DEA, and found there is about 25-40% technical inefficiency (X inefficiency). In addition, he found that the foreign-owned cooperatives (particularly by Koreans) have more efficient than Japanese cooperatives.

Minegishi (2003) also estimated cost inefficiency of credit associations with DEA and found there were about 17-50% cost inefficiency to the current income. It was found, with regards to cost inefficiency, that the value of credit associations is larger than that of second regional banks but that of credit associations in urban area is smaller than that of second regional banks.

Tsutsui (2004) focused on the ratio of general expense to deposits for regional banks, credit associations and cooperatives. However he could not find an explicit difference between them since there are differences with respects to the return to scale in financial industry.

Harimaya (2008) examined the relationship of the announcement by Japanese government about relationship lending to management efficiency as for regional banks, second regional banks, credit associations and cooperatives. The results with SFA indicated that every financial industry has high cost efficiency over 90%. However there was a downward trend only on credit cooperatives with regards to the time series movement.

Horie (2010) analyzed the management efficiency of credit associations from 2005 to 2007, dividing them into four groups depending on business region. He found the economic conditions in

125 In addition Kodaira (1997) estimated the cost inefficiency of commercial banks in Japan with DEA.

126 As the similar research, Fujino (2004) measured cost inefficiency of commercial banks. In order to examine the geographical difference, he estimated the best frontier not of cost function but of product function, and concluded that there is significant management inefficiency in regional banks.

each business region have some impacts on management efficiency of credit associations.

The main problem in these studies, however, is that it is difficult to interpret the estimated results. It is possible to see the efficient banks in estimated samples, but it is not appropriate to compare samples directly between different business categories. For example, when comparing city banks with regional banks, it is difficult to decide which elements to compare – either the frontier functions or the degree of inefficiency, which is represented as the divergence from the frontier function.[127] As a result it has not yet been possible to arrive at firm conclusions in the studies of inefficiency.

7.2.2.3. Estimation equation in this chapter: X efficiency

In this chapter the econometric method is employed to measure the X efficiency of financial institutions. This econometric method includes two kinds of measurement: the X efficiency from the cost functional estimation, and that from the stochastic cost frontier estimation. This stochastic frontier method was invented by Aigner, Lovell and Schmidt (1977). Its advantages are that it can respond to uncontrolled shocks in the cost function and that it is more stable than the Data Envelop Approach (DEA). In this method, the total observed costs of financial institutions are separated into three categories (the part of cost efficient frontier, the random error and the X inefficiency) in the estimated model. In fact, the general logarithm functional forms are accepted for the stochastic cost frontier as follows:

$$\ln C_n = f\left(\ln Y_{i,n}, \ln w_{j,n}\right) + \varepsilon_n \tag{7.8}$$

where C_n is the total costs of the nth firm, $Y_{i,n}$ is the i-th output product of the n-firm, $w_{j,n}$ is the j-th input price of the n-firm. Additionally, following Hunter and Timme (1995), the error term, ε, has two

127 The former case needs to adjust the size difference of the business category for the scale economies since the sizes of commercial banks and regional banks are significantly different.

components as follows:

$$\varepsilon_{i,t} = \ln(\mu_{i,t}) + \ln(v_i)$$

(7.9)

The first component, $\ln(\mu_{i,t})$, represents an effect of an uncontrollable random factor, while the second component, $\ln(v_i)$, indicates an impact of a controllable factor, namely cost efficiency.[128] It is assumed that the μ follows the symmetric normal distribution, and that v follows the independent half-normal distribution. In addition the term ($\ln(v_i)$) indicating cost efficiency is assumed to be orthogonal to the regressors of cost function. The entire random error term $\varepsilon_{i,t}$ will be estimated for each banks and each year. Both the parameter for cost function and the random error term ($\ln(\mu)$) in this estimation are influenced by the alternation on every year, but are distributed with a zero mean over time. On the other hand the efficiency term ($\ln(v)$) can hold in a certain level despite the time passage.

For the estimation of cost efficiency ($\ln(v_i)$) it is needed to make average value of the error term (ε) by bank over year (n years).[129] By carrying out this process, the estimates for $\ln(v_i)$ can be calculated. Hence, the efficiency value for each bank is represented as follows:

$$EFFI_i = exp[ln(v_{min}) - ln(v_i)]$$

where $\ln(v_{min})$ means the minimum value for $\ln(v_i)$. On this equation, the value in the most efficient bank is 1, and all other banks take efficiency between 0 and 1.

As suggested in Hunter and Timme (1995), it is possible to calculate additional measure for efficiency by using the truncated distribution for $\ln(v_i)$. In this distribution, the banks in the class of (1-q)th takes the value 1 on efficiency, while the bank in the class below the q-th shows the same efficiency value as the banks in the q-th class. In this case, the efficiency value for the q-th class is assumed as follows:

128 The first component assumes the change over time, while the second component does to be distributed with zero over time.

129 That is, $\ln(v_i) = \sum_{t-1}^{n} \varepsilon_{i,t} / n$.

$$EFFI_i = \exp[\ln(v_{1-q}) - \ln(v_q)]$$

$\ln(v_{1-q})$ and $\ln(v_q)$ indicate the estimates of $\ln(v)$ for the $(1-q)$th bank and the q-th bank, respectively.

In this paper the standard translog cost function is employed for estimation and this assumes the non homothetic translog cost function with multiproduction and the second order expansion. In fact, cost function is defined as follows:

$$C = C(P_L, P_F, P_K, Y_{LOAN}, Y_{SECURITY})$$

then, taking the logarithm of both sides and the Taylor expansion, the translog cost functional equation is shown as follows:

$$\ln C = \alpha_0 + \sum_{i=1}^{3} \alpha_i \ln P_i + \sum_{i=1}^{2} \beta_j \ln Y_j + \frac{1}{2} \sum_i \sum_k \gamma_{ik} \ln P_i \ln P_k$$
$$+ \frac{1}{2} \sum_j \sum_h \delta_{jk} \ln Y_j \ln Y_h + \sum_i \sum_j \sigma_{ij} \ln P_i \ln Y_j + \varepsilon_{i,t}$$
$$(j,k = 1,2,3, \quad and \quad j,h = DEP, SECURITY)$$

(7.10)

In this paper, the case that two outputs (loans and securities)[130] are produced with three inputs (labour, physical capital and financial fund) is considered. On this equation the conditions of homogeneity, symmetry and summation are applied, and in addition, all coefficients for cross-production term are considered as zero. The cost function is transformed as follows:

130 This research follows the idea on the intermediation approach that financial institutions transform deposits and purchase the fund for loans and other assets. Therefore total loans and securities are included as output in the equation.

$$
\begin{aligned}
\ln C = {} & \alpha_0 + \alpha_L \ln P_L + \alpha_F \ln P_F + \alpha_K \ln P_K + \beta_{LOAN} \ln Y_{LOAN} + \beta_{SECU} \ln Y_{SECU} \\
& + \frac{1}{2}\left(\gamma_{LL} \ln P_L \ln P_L + 2\gamma_{LK} \ln P_L \ln P_K + 2\gamma_{LF} \ln P_L \ln P_F + \gamma_{KK} \ln P_K \ln P_K \right. \\
& \left. + 2\gamma_{KF} \ln P_K \ln P_F + \gamma_{FF} \ln P_F \ln P_F \right) \\
& + \frac{1}{2}\left(\delta_{LOAN,LOAN} \ln Y_{LOAN} \ln Y_{LOAN} + 2\delta_{LOAN,SECU} \ln Y_{LOAN} \ln Y_{SECU} + \delta_{SECU,SECU} \ln Y_{SECU} \ln Y_{SECU}\right) \\
& + \left(\sigma_{L,LOAN} \ln P_L \ln Y_{LOAN} + \sigma_{L,SECU} \ln P_L \ln Y_{SECU} + \sigma_{K,LOAN} \ln P_K \ln Y_{LOAN} \right. \\
& \left. + \sigma_{K,SECU} \ln P_K \ln Y_{SECU} + \sigma_{F,LOAN} \ln P_F \ln Y_{LOAN} + \sigma_{K,SECU} \ln P_F \ln Y_{SECU}\right) + \varepsilon_{i,t}
\end{aligned}
$$

(7.11)

7.3. A theoretical perspective of economies of scale

This section discusses economies of scale – a theory that examines whether the scale of production is appropriate given the assumption that firms seek to maximize profits.

7.3.1. What are the economies of scale?

There are said to be significant economies of scale if costs per unit of production decrease as output increases, within a certain range of output. In general, the cost increase per unit of production makes the degree of return decrease related to the output increases. It is important to examine whether the potential reduction in costs by changing the scale of production is available. To make a maximum profit with a minimum average cost, firms need to find and produce their services at the point of constant returns to scale. At this point it appears that any change of output causes an equi-proportionate change.

The features of multiproduct banks make the analysis of economies of scale difficult. In fact there are two concepts regarding the economies of scale: (i) how much does the total cost change if all products are equally changed by k times?, and (ii) how much does the total cost change if one specific product is changed by k times, in cases where all other products remain constant?

With respect to case (i), in the definition, the economies of scale are associated with the fact that all output productions are increased proportionately in the case of the constant product mix. In other words, by using Baumol's concept of Ray Average Cost (RAC), economies of scale can exist in the following situations:

$$C(kQ)/k < C(tQ)/t \qquad for\ k > t \tag{7.12}$$

where $Q = Q(Q_1, ... Q_n)$ is a vector of output, C ( ) is a cost function, and k and t are measures of the scale of output. (Baumol (1977, 1982) and Baumol Panzar and Willig (1982))

With respect to (ii), the concepts of RAC and the multiproduct economies of scale show the quantities of the entire product mix change proportionately. Firms, however, can change the quantity of a single product. To define the economies of scale for the specific product it is necessary to understand the concept of the incremental cost. The incremental cost (IC_i) for product i at a vector of output Q^* is an additional cost when the production of $Q_i = Q_i^*$, instead of $Q_i = 0$, is required. That is,

$$IC_i(Q^*) = C(Q_1^*, ... Q_i^*, ... Q_n^*) - C(Q_1^*, ... Q_{i-1}^*, 0, Q_{i+1}^*, ... Q_n^*) \tag{7.13}$$

The degree of economies of scale for a single specific product is measured as the ratio of average incremental costs to marginal cost.

7.3.2. Previous literature on economies of scale

There are many previous empirical studies on economies of scale. One of the main focuses of these studies was to find the functional forms for the correct measurement. In fact, most studies had estimated the economies of scale by using a simple statistical model in the 1950s[131], while more

131 See Alhadeff (1954), and Schweiger and McGee (1961).

sophisticated econometric methods have been adopted since the second half of the 1960s. The main issue at the time was how to include the concept of the 'multiproduct' of banks in the cost estimation model. As a solution the Cobb-Douglas cost functional equation has often been employed in the field of US banking studies.

Benston (1965), for example, used the Cobb-Douglas cost function and measured economies of scale in the banking industry. The results showed that there are some economies of scale but they are not so large. However, Bell and Murphy (1968), who employed a similar approach, found evidence of significant economies of scale in most banking services, and the fact that branch banking spends more costs than unit banking. In the 1970s, most of the literature showed an interest in the impact of technical innovations and developments on the economies of scale in the banking industry. Schweitzer (1972), Murphy (1972a, b), Daniel, Longbrake and Murphy (1973), Kalish and Gilbert (1973), Longbrake and Haslem (1975), and Mullineaux (1975, 1978) all found evidence of constant returns to scale.

Some researchers cast doubts on the above conclusions in the 1980s, however, taking the view that the Cobb-Douglas functional forms were insufficient due to them having too many restrictions. For instance, the Cobb-Douglas function cannot presume the U-shaped average cost curves, and is not appropriate for measuring economies of scope. Most previous researchers insisted that the Cobb-Douglas function form could represent the product-specific cost function. However, the Cobb-Douglas cost function is not adequate for the banking industry since banks generally supply multiple services. Therefore, the cost functional forms have been improved and the translog cost functional forms have mainly been employed.

Murray and White (1983) examined the production structures of the Canadian credit unions and found the existence of economies of scale using the translog cost function.

Also, Gilligan, Smirlock and Marshall (1984) analyzed the economies of scale of the banking industry with translog function form. They discussed the nature of banking costs using the 714 banks in the USA, concluding that economies of scale are not a significant characteristic in the industry. Instead they found evidence of scale diseconomies in the case of product-specification.

McAllister and McManus (1993) also employed the translog cost function and calculated the economies of scale in US banks. They measured this according to the amount of assets, finding in every case that there were economies of scale in small banks and scale diseconomies in large banks. Nevertheless, they pointed out that there are some statistical problems in the traditional translog function form. After solving these problems they found different evidence that the banks with less than about 500 million dollars in total assets have significant economies of scale and the larger banks tend to have constant returns to scale.

There have been fewer studies of economies of scale in European banking, and their main focus is not the functional forms as in the US studies, but the differences of economies of scale between European countries.

In terms of economies of scale in large banks, they seem to exist to a greater extent in Europe than in the US banks. Dietsh (1993) expanded his previous research and measured the scale and scope economies of French commercial banks: using 343 samples in 1987, he found strong evidence of economies of scale over the entire range of products. In contrast, the results in the small banks are mixed, with the evidences varying greatly depending on country, period, and other factors.

Casu and Girardone (2002) found that there are small amounts of economies of scale in the Italian banking market.

Gough (1979) and Barnes and Dodds (1983) used data regarding building societies (BS) in the UK for the period 1972-79 and 1970-78 respectively, estimating the linear average cost functions. Both studies concluded that there were no economies of scale in the BS. Hardwick (1989, 1990), however, insisted that there was evidence of economies of scale in the relatively small BS.

McKillop and Glass (1994) applied a hybrid translog cost function to measure overall economies of scale, product-specific economies of scale and scope economies. Data were obtained from the annual returns of the 89 national, regional and local BS in 1991. They found evidence of significant economies of scale from the samples of both national and local building societies, and of constant returns to scale from that of the regionally based building societies. However, Drake (1995) employed the translog multiproduct cost functions and tested for the expense-preference behaviour of the UK building societies. However, he did not find evidence of scale and scope economies.

Several studies analyzed the differences of scale and scope economies across the European banking market. Molyneux *et al.* (1996) applied the hybrid cost functions to measure scale and scope economies in France, Germany, Italy and Spain and concluded there were significant differences of cost characteristics across these countries. However, these economies are broadly distributed in terms of the level of bank products in each country.

The European Commission (1997) also examined the cost features in many European banking sectors, focusing on the potential impacts of Single Market Programme (SMP). They found significant evidence of economies of scale or diseconomies. As most of economies of scale are found particularly in small banks in Germany and France, they concluded that the SMP brought about potential effects of economies of scale for smaller banks.

Studies on economies of scale in Japanese banks had been conducted in the first half of the 1970s. At that time most researchers normally assumed a single product and employed the Cobb-Douglas cost function without factor price, namely, $\ln C = a + b \ln L$, by the cross-sectional method. As representative literatures at that time we can take Nishikawa (1972), Tamura (1972) and Rouyama and Iwane (1973) which found there was a small level of economies of scale in the Japanese banking industry in the 1960s but that the degree of economies of scale in the city banks was larger than that in the regional banks. As the studies at that time were carried out in order to object to the bank consolidation policy by the government, these studies concluded that the degree of economies of scale in Japanese banks was very minor.

Since the 1980s, many researchers have tried to estimate the economies of scale in banking industry. Some studies in this period, such as Kuroda and Kaneko (1985) Noma and Tsutsui (1987), tried to improve the estimation methods, to use the translog functional form and to establish the causes of economies of scale. However, their conclusion that there is small level of economies of scale in Japanese banking sector was almost identical to that reached in the 1970s.

The literature in the 1990s, after the bubble burst, exhibits some different features. In this period the studies were carried out in order to support the rationalization of financial industry by merger and acquisition. Most financial institutions desired to enhance their profitabilities and to strengthen the management bases through increasing their sizes. The Financial Service Agency (FSA) also supported the merger of financial institutions for the fast recovery from the financial crisis. From these social backgrounds most researchers had focused on the issues of whether mergers led to greater profitability and of how financial institutions should conduct consolidations.

Fukuyama (1993) analyzed the economies of scale of commercial banks from cross-section data samples in 1990, employing the nonparametric approach. From the classification with respect to asset size it was found that smaller banks had economies of scale, while larger banks had constant returns to scale. However, the results with the revenue size showed that features of economies of scale were also exhibited by medium and large sized banks.

There was also some literature examined the economies of scale of credit associations. (Fukuyama (1996), Fujino (2002) and Inoue (2003)) Fukuyama (1996) used the nonparametric approach and found significant scale diseconomies for about half the credit associations (53%) with input-based measures, and in more credit institutions (about 63%) with the output-based measures. Fujino (2002) measured the economies of scale in ten geographical districts in Japan and discovered the significant economies of scale. However, he could not find a clear geographical trend and suggested that the appropriate size of credit associations is different in every district. Inoue (2003) found economies of scale through estimating the production function. Like Fujino (2002) he segmentalized into ten districts, and concluded that economies of scale have a greater impact in rural than in the urban areas.

As for the impact of economies of scale in credit cooperatives, Muramoto (1994) discussed the issue using the Cobb-Douglas cost function, finding that there were significant economies of scale. He also found that smaller credit cooperatives experienced greater economies of scale than larger credit cooperatives.

7.3.3. Estimation equation in this paper: Economies of scale

As is the case of cost efficiency, this chapter also employs the translog cost function form to estimate the economies of scale. The degree of economies of scale is calculated from the value of output elasticity.

$$SE = \sum_i \frac{\partial \ln C}{\partial \ln Y_i} \qquad (i = 1,2) \tag{7.14}$$

By transforming into the translog cost function using three inputs and two outputs, the economies of scale will exist when

$$\begin{aligned} SE &= \frac{\partial \ln C}{\partial \ln Y_{LOAN}} + \frac{\partial \ln C}{\partial \ln Y_{SECU}} \\ &= \left(\beta_{LOAN} + \delta_{LOANLOAN} \ln Y_{LOAN} + \delta_{LOANSECU} \ln Y_{SECU} + \sigma_{L,LOAN} \ln P_L + \sigma_{K,LOAN} \ln P_K + \sigma_{F,LOAN} \ln P_F\right) \\ &\quad + \left(\beta_{SECU} + \delta_{LOANSECU} \ln Y_{LOAN} + \delta_{SECUSECU} \ln Y_{SECU} \right. \\ &\quad \left. + \sigma_{L,SECU} \ln P_L + \sigma_{K,SECU} \ln P_K + \sigma_{F,SECU} \ln P_F\right) < 1 \end{aligned} \tag{7.15}$$

In other words, the overall economies of scale will exist in the case that total costs do not increase as much as the level of the increase of all kinds of outputs.[132]

[132] For instance, if the increase of total costs is smaller than twice in spite of the doubled outputs' increase, it indicates the existence of economies of scale.

7.4. Empirical results for cost efficiency and economies of scale

This section discusses the empirical results for X-efficiency (cost efficiency) and the economies of scale, looking first at commercial banks, then credit associations, then credit cooperatives. On the bases of these results the differences between profit making firm (commercial banks) and non-profit making firms (mutual financial institutions) will be analysed.

7.4.1. Cost efficiency and economies of scale of commercial banks in Japan

a. Cost efficiency of commercial banks

One of the objectives of this study is to explain the economic circumstances surrounding the financial institutions for small and medium sized firms. Since 2000 the government has announced several important measures to improve the functions of relationship based lending method to all private financial institutions. It is important, therefore, to consider the features of cost efficiency and the economies of scale, allowing for the effect of these measures.

The announcements by the government derive from the fact that the financial crisis of the 1990s, traditional economic policy has not proved sufficient in countering recession. That is, in order to achieve economic recovery since the 1990s, the government has decided not only to support industrial companies but also to reconstruct the financial institutions as the lender of funds. The announcements by the government have been issued three times – in 2003, 2005 and 2007 – and have been executed in stages to improve the financial system for small and medium companies and to ensure the profitability in financial institutions for small firms. In this study the effects of announcements of 2003 and 2005 on the cost structure of financial institutions are discussed.

Firstly the average cost efficiency for commercial banks in Japan was 0.530 during the period 2000-07 and there was around 47% inefficiency in their total costs. Although commercial banks should strive to achieve profit maximization, there is large percentage of cost inefficiency. Commercial banks originally employed a lending method based on the financial statement because they conduct many transactions with a wide range of customers. It is likely, therefore, that the cost inefficiency arises from the issues in this lending method employed.

Considering the time series change since 2000 that the announcement for promoting the relationship lending method, Table 7.1 shows that average cost efficiency values declined from 0.59 in 2000 to 0.47 in 2007. As the downward trend can be seen before the first announcement in 2003, it may be supposed that one of the factors determining cost inefficiency in commercial banks is the issues of management method. It appears that with respect to the improvement of the cost structure in commercial banks, the conventional economic policy used to counter the recession in the 1990s did not have a significant impact.[133] Even after the announcement in 2003, the degree of decline in cost efficiency was not reduced over the following four years – in fact it increased. It may be concluded, therefore, that the announcement policies have not been accepted by commercial banks or that there is not enough power in the lending policy to improve the cost structure.

The differences of decreasing trend between city banks, regional banks and second regional banks indicate that the range in city banks is 11% while those in regional banks and second regional banks are 12% and 12% respectively. Regional and second regional banks focusing on small and medium firms have a greater downward trend in cost efficiency than that of the city banks. Although the announcements by the government are required for financial institutions to create a close relationship with their customers in order for the soundness and profitability of financial institutions, in fact that method has not been accepted by individual commercial banks. In terms of the cost efficiency in two kinds of local banks, it was found that the downward trend for regional banks was greater than that for second regional banks. The average cost efficiency of regional banks in 2000 (58.0%) was to fall 12% by 2007 (46.0%). In contrast, the cost efficiency of second regional banks in 2000 (59.7%) fell by 11.7% down to 2007 (48.0%). The decline in the cost efficiency of regional banks is greater than that for second regional banks.[134] Although these two types of banks take same

133 Fujino (2004) indicated that there were decreasing trend of efficiency in the 1990s, from the empirical results of product efficiency of regional banks in 1994-2000.

134 It is also shown in the results of standard deviation that the difference in cost efficiency has been spread. In fact, the

organizational form as stock company, it is likely that second regional banks can adopt the relationship lending method smoothly due to their smaller targeting business area. The result that after the announcements the cost efficiency of second regional banks has improved more than that of regional banks is consistent with the findings of Harimaya (2008).

Table 7.1 Time series movement of the cost efficiency of Japanese commercial banks from 2000 to 2007

	All banks	Standard Deviations	City	Regional	Second
2000	0.5886***	(0.0572)	0.621***	0.5799***	0.5975***
2001	0.5734***	(0.0582)	0.6057***	0.5637***	0.5839***
2002	0.5556***	(0.0603)	0.59***	0.5472***	0.5678***
2003	0.5389***	(0.0616)	0.5739***	0.5303***	0.5513***
2004	0.5219***	(0.0628)	0.5575***	0.5131***	0.5345***
2005	0.5046***	(0.0640)	0.5407***	0.4957***	0.5174***
2006	0.4856***	(0.0634)	0.5236***	0.478***	0.4967***
2007	0.4678***	(0.0646)	0.5062***	0.4601***	0.4794***

Note: *** refers to the fact that it is significantly different from 1 at 1% level with t-value, ** significant at 5% and * significant at 10%, respectively.

If the downward trend in cost efficiency is caused by economic recession in the local community or by the weakness of the transaction based lending method, what kind of commercial banks have those features strongly? Or what commercial banks should use the relationship lending method?

Table 7.2 indicates the average cost efficiencies of commercial banks in Japan, which are grouped according to the size of their assets. The result shows that the medium-sized commercial banks with 1-2 trillion JPY have the greatest cost efficiency. This group consists of large second regional banks and medium-sized regional banks. The groups with larger than average values are those of 0.5-2.0 trillion yen and 4.0-6.0 trillion yen and it is shown that the medium-sized commercial banks have relatively high cost efficiency. In contrast the relatively large class commercial banks, with 6-8 trillion yen, have the lowest efficiency. This group consists mainly of the large regional banks. The 8+ trillion yen class, consisting mainly of city banks, also displays lower cost efficiency. It

values of standard deviation were 0.057 in 2000 and 0.065 in 2007.

appears, therefore, that commercial banks with large assets have relatively lower cost efficiency. It is defined that the most efficient company can produce the greatest outputs in same inputs. As for commercial banks, it therefore means that small and large banks supply their services more inefficiently, given the same quantity of inputs. The reason for the lower cost efficiency of small commercial banks is that they must focus on small and medium-sized customers, whether by relationship lending or transaction lending. In other words, the lower cost efficiency value of small commercial banks might be connected to the fact that they need to carefully assess the risk their customers present. Large commercial banks might be able to assess customer risk rapidly because their customers constitute a relatively smaller risk. However, the risk-assessment process could become complicated due to the fact that the size of commercial banks is large, and a large amount of extra expenses is required. The fact that the cost efficiency of small and large-sized commercial banks is volatile is also indicated by the distribution of standard deviation with three groups (0-0.5 trillion, 4.0-6.0 trillion and 8.0 trillion+) having a higher than average value of standard deviation by all commercial banks.

Table 7.2 Average cost efficiency of commercial banks by asset size (2000-2007)

Asset size (in 100 million JPY)	Number of observations	Cost efficiency (Ave.)	Standard Deviation
0-4999.9	84	0.5153***	(0.0898)
5000-9999.9	172	0.5335***	(0.0668)
10000-19999.9	206	0.5508***	(0.0664)
20000-39999.9	266	0.5247***	(0.0666)
40000-59999.9	102	0.5404***	(0.0763)
60000-79999.9	32	0.4935***	(0.0531)
80000+	68	0.4924***	(0.0864)
All	930	0.5296***	(0.0730)

Note: *** refers to the fact that it is significantly different from 1 at 1% level with t-value, ** significant at 5% and * significant at 10%, respectively.

Table 7.3 shows cost efficiency according to geographical location. The average values in the period 2000-2007 indicate that all areas range between 0.50 and 0.55 and there are not large differences. However, it is likely that the cost efficiencies in Area 3 and 6 are relatively small by around 0.50. The lowness of cost efficiency means that commercial banks in these areas produce smaller outputs than in the other areas, even with the same quantity of inputs. It is expected that these differences in cost efficiency relate to the geographical economic conditions because both regional banks and second regional banks follow the policy by the same department of the government, and offer the same kinds of financial services. Figure 7.2 (Table 7.28) shows the time series changes of cost efficiency in each geographical area. Area 3 and 6 had the greatest downward trends in cost efficiency. After all, it could be said that the economic conditions in Area 3 and 6 are particularly strict and these conditions contribute to lower cost efficiency. However the standard deviations of average cost efficiency in Area 3 and 6 are not strongly high and with respect to the degree of movement in 2000-2007, Area 3 and 6 were relatively stable.

In contrast, areas with particularly high cost efficiency are 1, 2, 4 and 7. Also, with respect to the results regarding the time series movements, these areas indicated a lesser decreasing trend in cost efficiency. This shows that commercial banks in these areas can decline the decreasing pressure of cost efficiency by the economic recession.[135] In these areas, Area 2, 4 and 7 include the main industrial areas in Japan and Area 1 also includes one of the largest tourism areas. Therefore it appears that with respect to the cost efficiency of commercial banks, there are some other factors at work apart from the relationship lending policy.

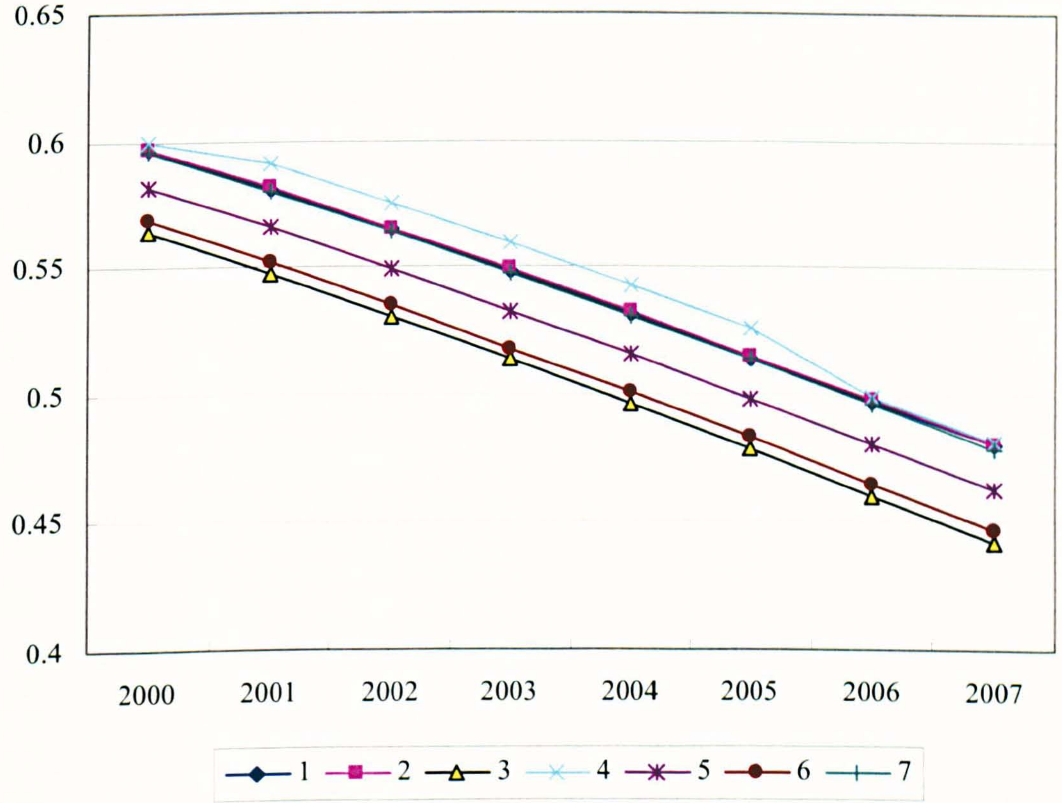
Table 7.3 Cost efficiency of commercial banks (without city banks) in geographical area

Area	Cost efficiency (Ave.)	Regional banks	Second regional banks
1	0.5397***	0.5421***	0.5364***
2	0.5398***	0.5288***	0.5522***
3	0.5041***	0.5009***	0.5088***
4	0.5482***	0.5593***	0.5310***
5	0.5232***	0.4953***	0.5653***
6	0.5084***	0.4759***	0.5409***
7	0.5380***	0.5168***	0.5697***
All	0.5297***	0.5210***	0.5417***

Note: *** refers to the fact that it is significantly different from 1 at 1% level with t-value, ** significant at 5% and * significant at 10%, respectively.

135 Although the gap between the greatest efficiency in Area 4 and the lowest one in Area3 decreased until 2005, it has reduced gradually. This might indicate that there was not a significant impact on the announcement in 2003, but there was in 2005. In other words, it is possible that the cost structure of commercial banks changed after the announcement in 2005.

Figure 7.2 Time series movement of cost efficiency in each geographical area



What is the main factor in the cost efficiency of commercial banks? Regional and second regional banks offer financial services at the prefectural level, and therefore the economic conditions of their customers could have some impact on the cost structure of financial institutions through the repayment of loans. Therefore the prefectural GDP is considered as a proxy for the economic condition of local companies, and the impact of this variable on the cost efficiency of local commercial banks is discussed.

Table 7.4 and Table 7.5 indicate the prefecture-based cost efficiency and standard deviation for commercial banks and the averaged prefectural GDP growth, respectively.[136] The prefectures with particularly high cost efficiency are Tochigi (9), Nara (28), Wakayama (29) and Nagasaki (42), all with more than 0.60. In contrast, the lowest cost efficient prefectures, with less than 0.50, are Kanagawa (13), Toyama (18), Shizuoka (21), Kyoto (26), Tottori (31), Ehime (38) and Fukuoka (40).

136 The figures of city banks were excluded from the calculation for average value. The reason is the city banks offer their services nationwide. It is inappropriate for the prefectural comparison.

However, there is not a significant relationship between these results and prefectural GDP growth. In other words the economically active areas with a higher GDP growth ratio do not necessarily represent higher values of cost efficiency, and vice versa. On the basis of these results it appears economic growth at the prefectural level is not closely connected with the cost efficiency of commercial banks, even if regional and second regional banks focus on the local customers. [137]

Table 7.4 Cost efficiency and standard deviation of commercial banks (without city banks) in each prefecture

Code	Cost efficiency (Ave.)	Standard Deviation	Code	Cost efficiency (Ave.)	Standard Deviation	Code	Cost efficiency (Ave.)	Standard Deviation
1	0.5265	(0.0480)	21	0.4559	(0.0475)	41	0.5502	(0.0399)
2	0.5626	(0.0622)	22	0.5229	(0.0447)	42	0.6137	(0.0834)
3	0.5514	(0.0520)	23	0.5059	(0.0433)	43	0.5793	(0.0890)
4	0.5302	(0.0467)	24	0.5519	(0.0686)	44	0.552	(0.1101)
5	0.5166	(0.0595)	25	0.5155	(0.0566)	45	0.5361	(0.0422)
6	0.5596	(0.0401)	26	0.4834	(0.0439)	46	0.5058	(0.0802)
7	0.552	(0.0400)	27	0.5336	(0.1110)	47	0.5189	(0.0416)
8	0.5715	(0.0600)	28	0.636	(0.0359)			
9	0.6422	(0.0344)	29	0.628	(0.0722)			
10	0.5932	(0.0579)	30	0.5143	(0.0427)			
11	0.4954	(0.0435)	31	0.4493	(0.0518)			
12	0.5019	(0.0459)	32	0.5191	(0.0445)			
13	0.4365	(0.0740)	33	0.5429	(0.0423)			
14	0.5456	(0.0422)	34	0.5741	(0.0788)			
15	0.4978	(0.0434)	35	0.531	(0.0714)			
16	0.5408	(0.0429)	36	0.4937	(0.0609)			
17	0.524	(0.0537)	37	0.5209	(0.0471)			
18	0.4771	(0.0449)	38	0.485	(0.0656)			
19	0.4917	(0.0436)	39	0.534	(0.0436)			
20	0.5205	(0.0600)	40	0.4787	(0.0626)			

Note: All values with regard to cost efficiency are significantly different from 1 at 1% level in t-value.

137 There are some factors affecting the cost structure, such as asset size, the number of branches and the local economic conditions.

Table 7.5 Prefectural GDP growth in Japan between 1998 and 2005

Code	GDP growth (Ave.)	Code	GDP growth (Ave.)	Code	GDP growth (Ave.)
1	-0.0103	21	0.0077	41	-0.0028
2	0.0018	22	-0.0013	42	-0.0077
3	-0.0052	23	0.0102	43	0.0015
4	-0.0043	24	0.0144	44	-0.0003
5	-0.0075	25	0.0100	45	-0.0037
6	-0.0025	26	0.0048	46	-0.0003
7	-0.0028	27	-0.0039	47	0.0089
8	-0.0044	28	-0.0037		
9	0.0030	29	0.0028		
10	-0.0040	30	-0.0063		
11	0.0048	31	-0.0037		
12	0.0027	32	-0.0046		
13	0.0003	33	0.0000		
14	-0.0087	34	0.0069		
15	0.0047	35	-0.0005		
16	-0.0045	36	-0.0001		
17	0.0065	37	-0.0028		
18	-0.0039	38	-0.0083		
19	-0.0043	39	-0.0106		
20	-0.0034	40	0.0007		

Source: Cabinet Office, Government of Japan, Statistics: Annual Report on Prefectural Accounts (only Japanese).
http://www.esri.cao.go.jp/jp/sna/toukei.html#kenmin

b. Economies of scale of commercial banks

The idea of economies of scale is that increasing the scale of production size through merger and consolidation induces decreasing costs and increasing profits. This study indicates the existence of economies of scale in cases where the estimated result of output elasticity is less than 1. As shown in Table 7.6, the average value of output elasticity for all commercial banks is 0.729. This means there is approximately 27% of cost-reducing effect in commercial banks in Japan. The degree of economies of scale is same as that of previous literature, and it is likely to be consistent with the point that there are significant economies of scale in commercial banks.

In terms of the output elasticity of commercial banks, the time series movement in the period 2000-2005 decreased from 0.740 to 0.723, indicating that the degree of economies of scale increased slightly.[138] It is widely considered that commercial banks' lending services for small and medium businesses gradually became stable following the announcement by the government. Also,

[138] This is different result from Harimaya (2008).

the period between 2000 and 2005 is the time that there were many mergers in commercial banks, utilizing the stock-holding company. In general it is likely to be that the cost-reducing effects are absorbed by the merger. However it appears those mergers are almost carried out in order to accelerate disposal of nonperforming loans and to prevent bankruptcy. Stable banks needed to accept the nonperforming loans of other unstable banks, and therefore, the cost-reducing effects became large by increasing their size of production.[139]

The upward trend continued until 2006, and then the economies of scale become small.[140] Since the financial crisis in the 1990s, financial institutions have been obliged to write off nonperforming loans and in the meantime some commercial banks have tried to conduct mergers in order to stabilize their management. This situation has peaked after the change of making the financial holding companies by city banks in 2000-2003. As the nonperforming loan problem has been solved gradually, it appears the decrease of small banks bring about the depletion of cost-reducing effects.

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139 There is not strong effect from economic depression to economies of scale. In general the economic recession can be responsible for small cost-reducing effect through the decrease of small banks. However the estimated results showed the opposite feature, regardless of the economic recession in Japan. It appears the other conditions had strong impact on the estimates.

140 The total amount of loans of commercial banks changed over from downside to upside in this year.

Table 7.6 Time series movement of economies of scale for Japanese commercial banks from 2000 to 2007[141] [142]

	Output elasticity (Ave.)	Standard Deviations
2000	0.7399***	(0.0359)
2001	0.7325***	(0.0186)
2002	0.7313***	(0.0187)
2003	0.7270***	(0.0176)
2004	0.7246***	(0.0160)
2005	0.7229***	(0.0160)
2006	0.7245***	(0.0181)
2007	0.7261***	(0.0190)
2000-2007	0.7286***	(0.0215)

Note: *** refers to the fact that it is significantly different from 1 at 1% level with t-value, ** significant at 5% and * significant at 10%, respectively.

As shown in Table 7.7, middle sized commercial banks with 4-6 trillion yen shows the largest value of output elasticity, and the other groups having both small and large assets indicated small values. In particular the class with 2-4 trillion yen shows the smallest value. Therefore this size of commercial banks has the largest cost-reducing effect from economies of scale.

However, as a general trend it is possible that the economies of scale decrease depending on the asset size. It is interesting that this trend is consistent with the results in most previous literature. Although these literatures examine the economies of scale of financial institutions depending on asset size, it is shown that the economies of scale of small-sized institutions become higher than that of large institutions. (Hunter and Timme (1995)[143], Humphrey and Vale (2004)[144], Van Cayseele and Wuyts (2007)[145], and Kitasaka (1994)[146])

141 The megamergers by Mitsui-Sumitomo bank and Saitama Risona bank were executed in 2002. It appears this effect caused the abnormal value. In order to see the entire feature of commercial banks, these estimates for Mitsui-Sumitomo and Saitama Risona bank are excluded in Table 7.6

142 Output elasticity is measured from the estimated results of stochastical frontier and individual data for financial institutions. See also 7.3.3.

143 Hunter and Timme (1995) discussed commercial banks in the USA.

144 Humphrey and Vale (2004) examined Norwegian banks.

145 Van Cayseele and Wuyts (2007) analyzed the settlement bank in Europe.

146 Kitasaka (1994) looked as insurance companies in Japan.

Table 7.7 Economies of Scale of commercial banks with respect to asset size (2000-2007)[147]

Asset size (in 100 million JPY)	Number of observations	Output elasticity (Ave.)	Standard Deviations
0-4999.9	84	0.7289***	(0.0143)
5000-9999.9	172	0.7302***	(0.0286)
10000-19999.9	206	0.7310***	(0.0189)
20000-39999.9	266	0.7244***	(0.0171)
40000-59999.9	102	0.7345***	(0.0169)
60000-79999.9	32	0.7323***	(0.0113)
80000+	66	0.7315***	(0.0231)
All	928	0.7292***	(0.0204)

Note: *** refers to the fact that it is significantly different from 1 at 1% level with t-value, ** significant at 5% and * significant at 10%, respectively.

With respect to the estimated results depending on geographical location, Table 7.8 shows that commercial banks in Area 1 and 7 have higher than average economies of scale (lower than average output elasticity). There are relatively smaller effects of economies of scale in Area 2-6. Divided into regional banks and second regional banks, Area 1, with high economies of scale shows that both kinds of commercial banks have higher economies of scale. In contrast, Area 3-6, with low economies of scale, indicates that second regional banks particularly have lower economies of scale. These results suggest that economies of scale in regional banks become relatively larger than those of second regional banks since mergers are brought about mainly in second regional banks in local area such as Area 3-6. It is expected that the mergers will continue, particularly in regional banks, in spite of the economic recovery period.

147 Like Table 7.6, some economies of scale, such as Mitsui-Sumitomo bank and Saitama-Risona bank, displayed abnormal values and were therefore excluded from the analysis.

Table 7.8 Economies of scale of commercial banks (regional banks and second regional banks) in geographical area

Area	All bank, Output elasticity (Ave.)	All bank, S.D.	Regional, Output elasticity	RB, S.D.	2nd Regional, Output elasticity	2nd RB, S.D.
1	0.7180***	(0.0134)	0.7153***	(0.0122)	0.7217***	(0.0142)
2	0.7300***	(0.0253)	0.7384***	(0.0154)	0.7293***	(0.0249)
3	0.7314***	(0.0134)	0.7289***	(0.0149)	0.7350***	(0.0099)
4	0.7348***	(0.0352)	0.7290***	(0.0143)	0.7395***	(0.0198)
5	0.7339***	(0.0143)	0.7296***	(0.0145)	0.7394***	(0.0122)
6	0.7308***	(0.0176)	0.7183***	(0.0148)	0.7433***	(0.0094)
7	0.7256***	(0.0143)	0.7226***	(0.0131)	0.7303***	(0.0149)
All	0.7286***	(0.0215)	0.7261***	(0.0157)	0.7326***	(0.0175)

Note: *** refers to the fact that it is significantly different from 1 at 1% level with t-value, ** significant at 5% and * significant at 10%, respectively.

Figure 7.3 shows the time series movement in each geographical area. As the small value of output elasticity indicates the large economies of scale, Area 1 has continuously been the largest economies of scale. However this area has only increased its economies of scale since 2006, and it is possible that commercial banks in this area have different cost structures from other areas. If the increase of economies of scale is caused by the disposal of nonperforming loans through mergers, it appears that Area 1 has not yet completed to dispose nonperforming loans.

Although Area 5 had low average economies of scale during the period 2000-2007, Area 2, 3, 4 and 6 have almost the same cost structure because these areas show similar movement of economies of scale. After a continuous increase of economies of scale up to 2005, the trend in these areas has become downward. Therefore it could be said that trend of mergers in commercial banks have completed the first stage.

Figure 7.3 Time series changes of output elasticity

The movement of standard deviation in Figure 7.4 shows that Area 2 changed significantly from 0.032 in 2000 to 0.022 in 2007. Area 2, including Tokyo (17), is the largest business area, with many commercial banks. In this area it is shown that the restructuring of financial system is executed properly and the differences of economies of scale between individual commercial banks gradually converge. In contrast the standard deviations in Area 1, 4 and 6 have increased, and the differences have widened. The average GDP growth in these three areas between 2000 and 2007 is negative and it appears that the delay in restructuring of commercial banks due to the recession is responsible for the differences of economies of scale between individual banks.

Figure 7.4 Time series changes of standard deviations of output elasticity

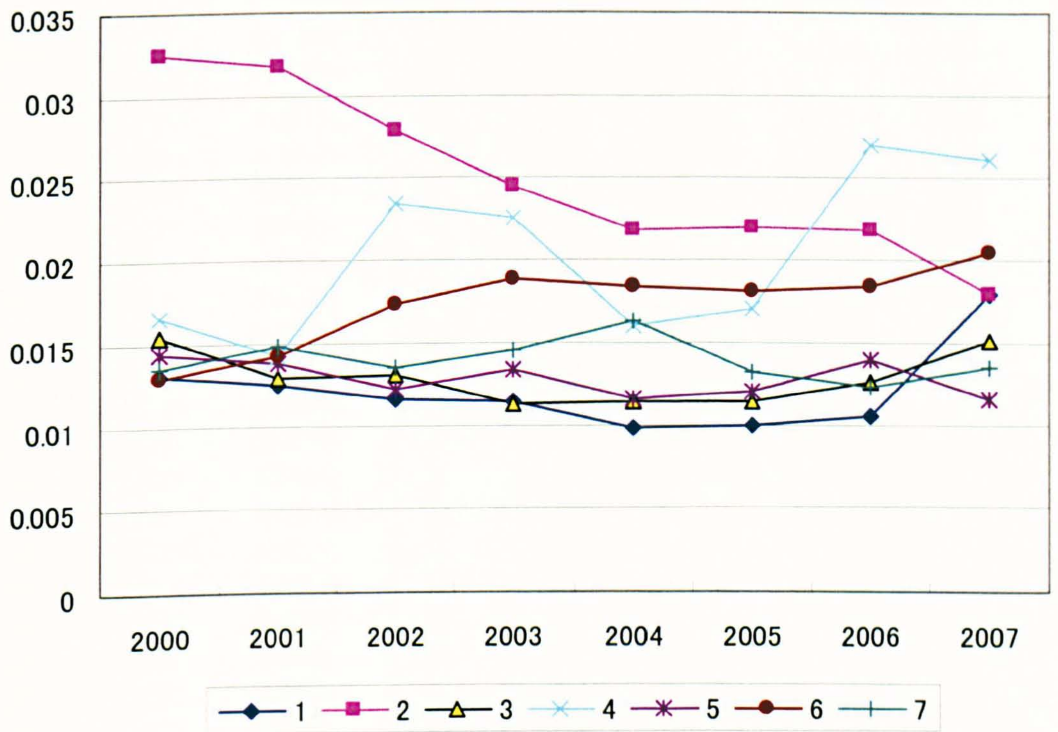


Table 7.9 shows the estimated results of output elasticity and the standard deviations at the prefectural level. Despite the large business area, Tokyo (17), Aichi (23) and Osaka (27) did not display high economies of scale; 0.726, 0.735 and 0.732 respectively.[148] Tochigi (9) shows the lowest economies of scale and the cost elasticity is 0.752. In contrast, the prefectures with high economies of scale are located in Area 1 (excluding Hokkaido (1)) and Saga (41) and Miyazaki (45). The GDP growth in these prefectures is not necessarily high. However, it is expected that commercial banks in these prefectures have not deteriorated as they decide to merge with other banks.

As for standard deviation, Tokyo (17) and Shiga (25) show a high degree of volatility. It is likely to be the case that in Tokyo the high number of banks affects the increase of standard deviation. In contrast there are only two commercial banks (excluding branches of city banks) in Shiga and therefore it is suggested that some unexpected economic changes might happen in this local area.

148 As with cost efficiency, the results for city banks were eliminated because they have a nationwide network.

Table 7.9 Output elasticity and standard deviation of commercial banks (without city banks) in each prefecture

Code	Output elasticity (Ave.)	Standard Deviation	Code	Output elasticity (Ave.)	Standard Deviation	Code	Output elasticity (Ave.)	Standard Deviation
1	0.7331	(0.0115)	21	0.7247	(0.0126)	41	0.7285	(0.0070)
2	0.7093	(0.0107)	22	0.7368	(0.0104)	42	0.7168	(0.0108)
3	0.7138	(0.0067)	23	0.735	(0.0091)	43	0.7323	(0.0228)
4	0.719	(0.0161)	24	0.7288	(0.0057)	44	0.7231	(0.0185)
5	0.708	(0.0123)	25	0.7305	(0.0285)	45	0.7128	(0.0065)
6	0.7175	(0.0073)	26	0.7255	(0.0038)	46	0.7323	(0.0069)
7	0.7173	(0.0085)	27	0.7324	(0.0192)	47	0.7317	(0.0103)
8	0.734	(0.0066)	28	0.7348	(0.0049)			
9	0.7523	(0.0204)	29	0.7425	(0.015)			
10	0.7351	(0.0104)	30	0.7368	(0.0162)			
11	0.7419	(0.0058)	31	0.7242	(0.0108)			
12	0.7332	(0.0144)	32	0.7222	(0.0128)			
13	0.7279	(0.0113)	33	0.7399	(0.0089)			
14	0.7214	(0.0134)	34	0.737	(0.0109)			
15	0.7359	(0.0068)	35	0.7415	(0.0157)			
16	0.7403	(0.008)	36	0.7257	(0.0228)			
17	0.7262	(0.0331)	37	0.7367	(0.0079)			
18	0.7321	(0.0138)	38	0.7408	(0.0119)			
19	0.7332	(0.007)	39	0.7201	(0.0168)			
20	0.7332	(0.0191)	40	0.7272	(0.0131)			

Note: All values with regard to output elasticity are significantly different from 1 at 1% level in t-value.

c. Analysis on the cost structure of commercial banks

In Japan the period since 2000 is considered as the transition stage from financial crisis to the economic recovery. In addition financial banks have started focusing not only on large companies but also on small and medium businesses having excellent skills in this period. The announcements for the relationship lending method in 2003 and 2005 are published following that historic background. This section discussed the impacts of these changes to cost structures in commercial banks.

In terms of cost efficiency, the average value has declined since 2000 and it was not found the result that the economic recovery affect the cost structure significantly. In addition there was not strong evidence that commercial banks could dissolve the bias toward large companies as the impacts of the announcement by the government were not represented in the estimated results. However the degree of decreasing trend of cost efficiency in second regional banks was slightly smaller than that in regional banks and it was shown partially that the adoption of relationship lending method have had some impacts to the cost efficiency improvement.

The estimated results of another cost structure, economies of scale, show that the time series movements of economies of scale were connected with the processing status of disposal of nonperforming loans, rather than economic conditions. Also, in this period, the reformation after the announcements of relationship lending was implemented coincidentally and it is also suggested that the policy change by commercial banks toward small and medium business lending induced the improvement of economies of scale in many areas.

7.4.2. Cost efficiency and economies of scale of credit associations in Japan

a. Cost efficiency of credit associations

In the previous section it was shown that the cost efficiency of commercial banks has declined since the announcement of relationship lending. Commercial banks such as regional banks focus on the region being relatively large area such as prefecture, and mainly employ the transaction-based lending method, using financial statements in order to assess the credit-worthiness of borrowers. The name 'regional banks' gives the impression that they attach great importance to the networks within the local community. However, the evidence suggests that commercial banks cannot actually collect proper information regarding the local community and they are in trouble due to the shift to relationship-based lending.

Can this aspect of commercial banks by mutual financial institutions? Credit associations and cooperatives in particular have taken their customers only from people belonging (residing or managing company) to the community. As mutual financial institutions receive deposits from members and offer loans to members, they can collect a lot of information since customers become their members. Mutual financial institutions therefore have already accumulated the skills for collecting information. In fact, credit associations and cooperatives can collect information for loan-offering, such as that regarding local economic circumstances, by having conversations with customers coming to deposit money. Accordingly it is expected that the announcements by the government are not the reason for the trouble, and that the mutual financial institutions might show better estimated results than commercial banks.

On the other hand credit associations suffer more severe impacts from economic recession than commercial banks. To survive the recession, credit associations have attempted to improve their management through mergers and business collaborations with nearby credit associations. This movement has been visible since the 1990s, when the financial crisis occurred. It is also useful, therefore, to consider the impacts of recession and/or mergers on cost structures.

Table 7.10 shows that the average cost efficiency for credit associations in the period 1999-2005 is 0.74 – a figure about 20% higher than that for commercial banks (0.53). Although the best practice frontiers for each industry are different, it is hard to compare the two figures. However, most credit associations, on average, seem to be near the best practice frontier. In addition the average standard deviation of commercial banks is 0.073, while that of credit associations is 0.06. The range of distribution of credit associations is smaller than that of commercial banks, and the nature of high cost efficiency is likely to be same in nationwide. The reason might be that the relationship-based lending has already worked properly and credit associations could obtain many prime customers at low costs. With respect to low standard deviations for credit associations, the first reason seems to be that the commercial banks include three kinds of bank – such as city banks, regional banks and second regional banks – for the estimate. As three kinds of commercial banks with different features are combined, the variance of commercial banks might become large. The second is that credit associations are limited in terms of the content of their business contents because they are non-profit making organizations In other words credit associations cannot invest in high risk bonds and need to offer loans to the local customers with a certain level of stability. Therefore it appears that credit associations are required to examine loan conditions more carefully than commercial banks, and high cost efficiencies are distributed over a small area.

As shown in Table 7.10, the cost efficiencies in time series deceased from 0.76 in 1999 to 0.71 in 2005.[149] On the other hand, the standard deviations have increased slightly from 0.055 in 1999 to 0.063 in 2005, which means the cost efficiency totally decreased and the differences between upper and lower institutions are expanded. The economy of Japan in this period reached its lowest point in 2003 and has started recovering since 2004. The amount of total loans also increased in the period 2004-2005. Although there have been these signs of economic recovery, the cost efficiencies of credit associations are decreasing. It is likely that there are some endogenous factors such as system change or mergers in credit associations. For instance, it seems the announcements by the government in 2003 and 2005 led to many system changes, and credit associations conducted mergers continuously as one of the changes. Table 7.10 also shows the number of samples and the average amounts of total assets, and suggests that the amount of total assets per association increased drastically due to the mergers and consolidations. It suggests that the system changes and mergers caused the decrease in the cost efficiencies of credit associations, just as in the case of commercial banks.

However the extent of decrease in cost efficiency is significantly smaller than that of commercial banks.[150] The decrease for credit associations in the period 1999-2005 is about 4.8% (from 0.762 in 1999 to 0.714 in 2005), and the reason for this small change probably that the mergers were completed smoothly or that the system changes were executed more efficiently than in the case of commercial banks. It could be said that there were no serious troubles in credit associations regarding cost efficiency because they had employed the relationship lending method before the announcements by the government.

149 Harimaya (2008), who described above, shows that the cost efficiency of credit associations had decreased until 2003, since when it has increased or been stable. The extent of cost efficiency in his research is slightly higher than the results in our estimation; from 0.906 to 0.912.

150 The cost efficiency of commercial banks fell about 12% from 0.59 in 2000 to 0.47 in 2007.

Table 7.10 Time series movement of cost efficiency for Japanese credit associations from 1999 to 2005

Year	Cost efficiency (Ave.)	Standard deviations	Number of observations	Average total asset (billion JPY)
1999	0.7621***	(0.0548)	385	277.8
2000	0.7542***	(0.0557)	370	295.9
2001	0.7464***	(0.0572)	348	316.0
2002	0.7381***	(0.0571)	325	338.9
2003	0.7308***	(0.0598)	305	365.9
2004	0.7230***	(0.0613)	297	382.2
2005	0.7145***	(0.0630)	291	398.1
1999-2005	0.7400***	(0.0602)	—	—

Note: *** refers to the fact that it is significantly different from 1 at 1% level with t-value, ** significant at 5% and * significant at 10%, respectively.

Table 7.11 shows the estimated cost efficiency depending on asset size. It indicates that the group with less than 100 billion yen has higher cost efficiency. The cost efficiencies become higher in the classes 600 billion to 1 trillion yen. However, the cost efficiency in the group of more than 1 trillion yen becomes larger again. It is possible that the smaller sized assets groups are more cost efficient. In the case of commercial banks, the medium-sized group has the highest cost efficiency. Commercial banks clearly have different cost structures from credit associations. For the credit associations, on the basis of the relationship with local customers, it suggests that the important point is not to increase asset size but to maintain close and frequent communications with customers.[151] Nevertheless as the standard deviation in the smallest group becomes large, it is not possible to say that all small associations can create close relationships. There are some prerequisites for creating better relationships, such as dedicating a great deal of time.

151 It is expected that the economies of scale do not affect cost efficiency.

Table 7.11 Average cost efficiency of credit associations by asset size (1999-2005)

Asset size (in 100 million JPY)	Number of observations	Cost efficiency (Ave.)	Standard Deviation
0-499.9	146	0.7673***	(0.0810)
500-999.9	433	0.7767***	(0.0603)
1000-1499.9	356	0.7353***	(0.0604)
1500-1999.9	280	0.7382***	(0.0533)
2000-2999.9	322	0.7273***	(0.0492)
3000-3999.9	218	0.7229***	(0.0545)
4000-5999.9	228	0.7191***	(0.0581)
6000-9999.9	193	0.7192***	(0.0498)
10000+	144	0.7333***	(0.0304)
All	2320	0.7400***	(0.0602)

Note: *** refers to the fact that it is significantly different from 1 at 1% level with t-value, ** significant at 5% and * significant at 10%, respectively.

Table 7.12 shows cost efficiency for credit associations by geographical area. It shows that Area 1, 5, 6 and 7 have the higher values (0.745, 0.747, 0.803 and 0.770 respectively) than the average value in Japan, and these are rural area, not major business centres. In contrast Area 4 has lower cost efficiency, with 0.71. Accordingly it is likely that cost efficiency in the urban area is low and that in the rural area is high.

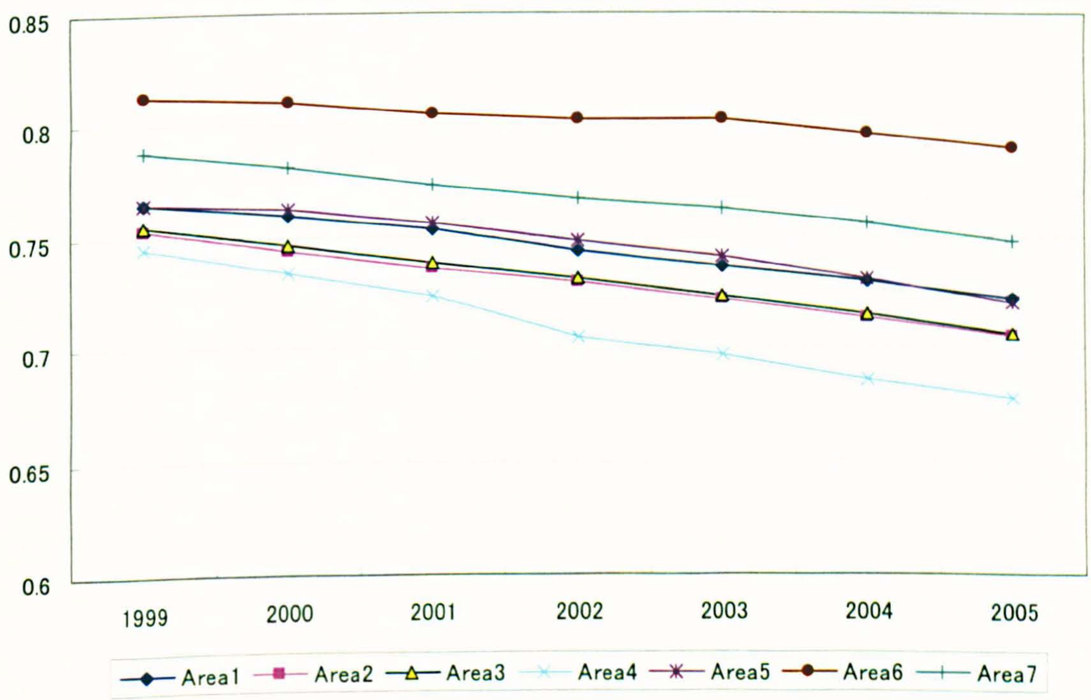
Table 7.12 Cost efficiency of credit associations in geographical area

Area	Cost efficiency (Ave.)	Standard Deviation
1	0.7454***	(0.0596)
2	0.7305***	(0.0543)
3	0.7328***	(0.0393)
4	0.7129***	(0.0755)
5	0.7471***	(0.0723)
6	0.8028***	(0.0608)
7	0.7700***	(0.0506)
All	0.7400***	(0.0602)

Note: *** refers to the fact that it is significantly different from 1 at 1% level with t-value, ** significant at 5% and * significant at 10%, respectively.

In addition, as indicated in Figure 7.5, cost efficiencies in the urban areas, such as Area 2-4, declined more drastically than elsewhere. It appears that there are some factors diminishing cost efficiency, especially in the urban areas. Therefore it could be said that many mergers are carried out in urban areas. There are many credit associations in urban areas, and frequently they can decide to merge. However, it is also expected that cost efficiency decreases temporarily due to the confusion of organizational restructuring. In contrast it is relatively difficult for credit associations in rural areas to find partner associations because there are only a small number of financial institutions. Accordingly, they need to improve their cost efficiency patiently and the degree of cost efficiency becomes larger temporarily.

Figure 7.5 Cost efficiency of credit associations



It was found that mergers have some impact on cost efficiency. Taking into consideration the fact that there are many credit associations in the prefectures in urban area, these credit associations can find partners for merger and thereby become large. It appears, accordingly, that their cost efficiencies decline due to the confusion of organizational restructuring. The estimated results supported this hypothesis. Table 7.13 presents the prefectural average cost efficiencies for credit associations and the logarithms of total assets. The letters 'a' and 'b' indicate the 15 smallest values for total assets and the 15 largest cost efficiencies respectively. There are many prefectures in rural areas with both letters, such as (3)-(5) and (32)-(47), which makes it possible to conclude that small credit associations located in rural areas have higher cost efficiency.

Table 7.13 Prefectural cost efficiency and total assets

Pref.	lnast	Effi	Pref.	lnast	Effi	Pref.	lnast	Effi
1	19.216	0.715	21	19.859	0.740	41	18.054 a	0.818 b
2	18.865	0.756	22	20.175	0.742	42	18.367 a	0.784 b
3	18.086 a	0.799 b	23	20.333	0.709	43	18.843	0.737
4	18.227 a	0.813 b	24	19.147	0.709	44	18.705 a	0.774 b
5	18.464 a	0.777 b	25	19.056	0.717	45	18.174 a	0.727
6	18.69 a	0.730	26	20.941	0.737	46	19.401	0.790 b
7	18.932	0.756	27	19.98	0.747	47	18.645 a	0.803 b
8	19.228	0.740	28	19.418	0.653			
9	18.836	0.692	29	19.542	0.622			
10	20.012	0.734	30	20.294	0.705			
11	20.694	0.708	31	18.848	0.784 b			
12	19.738	0.702	32	18.25 a	0.812 b			
13	20.422	0.717	33	19.03	0.676			
14	20.1	0.728	34	19.889	0.749			
15	20.318	0.731	35	18.425 a	0.772 b			
16	21.174	0.730	36	18.599 a	0.791 b			
17	19.302	0.760	37	19.243	0.745			
18	18.55 a	0.737	38	18.757 a	0.825 b			
19	19.285	0.763	39	19.573	0.834 b			
20	19.071	0.754	40	18.736 a	0.768 b			

Note: (i) 'a' means 15 smallest values of assets, 'b' means 15 largest cost efficiencies. (ii) All values with regard to cost efficiency are significantly different from 1 at 1% level in t-value.

b. Economies of scale of credit associations

Table7.14 shows the output elasticities of credit associations from 1999 to 2005, which ranged between 0.945 and 0.949 and have an average of 0.9470. This means there are significant economies of scale and the effects are much smaller than commercial banks. The reason for small economies of scale of credit associations seems to be that they are based on the local community. Mutual financial institutions such as credit associations have lowered their costs by specifying their business area and creating close relationships with customers. Commercial banks have developed the system for risk-hedge with a large amount of money, while credit associations have independently found the way to judge the credit risks of customers with small amount of costs through making close communications with customers. If credit associations try to merge with some credit associations in order to increase their market share, it might not lead to reduced marginal costs. The reason is that the information in other geographical areas could be useless because of the difference between customers. Therefore it is widely considered that these features of credit associations are responsible for the lesser economies of scale.

The value of output elasticity changed drastically before 2002. It stood at its highest value, 0.9484, in 1999, but the next year fell to its lowest value 0.9455. Since 2002, however, output elasticity has been stable at around 0.947. Also, with respect to standard deviations, there were large fluctuations until 2000 between 0.0251 and 0.0272, but it has declined gently since 2001. One of the reasons for this change seems to be connected with economic fluctuation. The economy in Japan has been recovering since 2003, the lowest point of the recession, and the economies of scale of credit associations follows the broader economic trend. It appears that after the financial crisis the nonperforming loans of credit associations have gradually decreased and the economies of scale have become stable.[152] The impact of mergers might also be another reason. Mergers mean a decrease in small credit associations, and the extent of economies of scale would be small because the effect of economies of scale is absorbed. It seems that the decrease of economies of scale in 2000-2001 was caused by those absorptions and the effects of mergers have become stable.[153] As for the impact of the announcements of relationship lending, there were not significant changes in economies of scale. In general, small financial institutions can use the relationship lending method properly. Therefore the number of small credit associations becomes large and the economies of scale would increase.[154] However the values for economies of scale in credit associations are almost stable, even after 2003, and there were not significant changes.

152 It is the case that economies of scale are easily affected in economic conditions rather than cost efficiency because the cost efficiency of credit associations had continued to decrease even in this period.

153 The fact that the standard deviation has fallen since 2001 is also considered to be evidence of mergers' reduction.

154 In the case of commercial banks, there is some evidence that economies of scale started decreasing before 2003 and 2005, which offered the announcements for relationship lending.

Table 7.14 Time series movement of output elasticity of Japanese credit associations from 1999 to 2005

	Output elasticity (Ave.)	Standard Deviations
1999	0.9484***	(0.0272)
2000	0.9455***	(0.0251)
2001	0.9463***	(0.0264)
2002	0.9471***	(0.0258)
2003	0.9469***	(0.0256)
2004	0.9471***	(0.0256)
2005	0.9471***	(0.0250)
1999-2005	0.9470***	(0.0259)

Note: *** refers to the fact that it is significantly different from 1 at 1% level with t-value, ** significant at 5% and * significant at 10%, respectively.

It was found that credit associations have small economies of scale due to the fact that they are community-based. Following this idea, credit associations with their local communities should have smaller economies of scale. Mutual financial institutions can reduce the costs of information production by creating close relationships. Therefore it is likely that credit associations need to spend extra costs if their size becomes large. Accordingly it is possible that small credit associations have a small extent of economies of scale. In fact, however, it was shown that small credit associations had large economies of scale, as shown in Table 7.15. In other words, basically it is hard for credit associations to make drastic reductions in marginal costs through mergers. However particularly in the case of small credit associations, it seems there is some possibility to reduce their marginal costs. By increasing their size through mergers, credit associations can acquire the ability not only to reduce marginal costs but also to expand their market shares in the local area. In particular, in the case of mutual financial institutions such as credit associations, they need to find partners from neighboring areas due to the limitations of their own geographical region. Therefore, once credit associations undergo mergers, they can effectively improve their cost condition and profitability through increased size and market share. If so, it could be said that the mergers of credit associations in the 1990s were carried out in the large-sized groups and the effect on economies of scale in these groups has been absorbed.

In fact, the output elasticity in the group with the least assets (up to 50 billion yen) stands at 0.91, and then the output elasticity declines gradually depending on the increase in asset size. That is, the larger sized credit associations have smaller economies of scale. As small sized credit associations have large economies of scale, they can still achieve greater reductions in costs through mergers than large credit associations. However, credit associations over 1 trillion yen almost arrive at the unity of output elasticity (actually 0.99), and it appears they are almost at the point of constant returns of scale. It is difficult, therefore, for them to lower their costs significantly, even if they conduct additional mergers. However, it is possible to say that the bottom of cost function curve for the credit associations is at 1 trillion yen, and that it would be advantageous for credit associations with assets below that level to undertake mergers.

Table 7.15 Output elasticity of credit associations with respect to asset size (1999-2005)

Asset size (in 100 million JPY)	Number of observations	Output elasticity (Ave.)	Standard Deviations
0-499.9	146	0.9108***	(0.0265)
500-999.9	433	0.9283***	(0.0158)
1000-1499.9	357	0.9352***	(0.0172)
1500-1999.9	279	0.9449***	(0.0133)
2000-2999.9	323	0.9474***	(0.0145)
3000-3999.9	217	0.9542***	(0.0144)
4000-5999.9	228	0.9636***	(0.0145)
6000-9999.9	192	0.9758***	(0.0172)
10000+	144	0.9947**	(0.0098)
All	2321	0.9470***	(0.0259)

Note: *** refers to the fact that it is significantly different from 1 at 1% level with t-value, ** significant at 5% and * significant at 10%, respectively.

With respect to the geographical area, it was found in Table 7.16 that Area 2, 3 and 4 had significantly low values for economies of scale. If the idea that smaller amount of economies of scale means the fact that mergers were carried out, there seem to be many mergers in these areas. In fact, these areas include the three largest business prefectures in Japan (Tokyo, Osaka and Aichi). Firstly some credit associations execute easily mergers and consolidation because there are many financial institutions in these areas.[155] Secondly it is likely that most credit associations in these areas could find good performing companies more easily than in the other areas. Therefore the scale of their transactions could increase, and most credit institutions in these areas have already reached the adequate asset size for achieving economies of scale. In contrast, Area 5 and 6 show relatively high

155 The high values of standard deviation in these three areas also reflect the fact that there are many financial institutions.

values for economies of scale. These areas are minor business area and the size of credit associations is also relatively small. In these areas the advantages of economies of scale therefore still available through mergers and consolidations.

Table 7.16 Output elasticity of credit associations by geographical area

Area	Output elasticity (Ave.)	Standard Deviation
1	0.9391***	(0.0185)
2	0.9516***	(0.0234)
3	0.9539***	(0.0268)
4	0.9547***	(0.0323)
5	0.9359***	(0.0203)
6	0.9326***	(0.0221)
7	0.9397***	(0.0235)
All	0.9469***	(0.0259)

Note: *** refers to the fact that it is significantly different from 1 at 1% level with t-value, ** significant at 5% and * significant at 10%, respectively.

Figure 7.6 shows the time series movement of economies of scale in each area, and indicates clear difference between Area 2, 3, 4 and the other areas. With respect to the output elasticity, Area 2, 3 and 4 show more than 0.95, and the other areas less than 0.945. However, as for the standard deviations in Figure 7.7, Area 3 and 4 have relatively high values and there are significant differences in each area, while the other areas show almost the same level of variance.

Figure 7.6 Output elasticity of credit associations

Figure 7.7 Standard deviations of output elasticity of credit associations

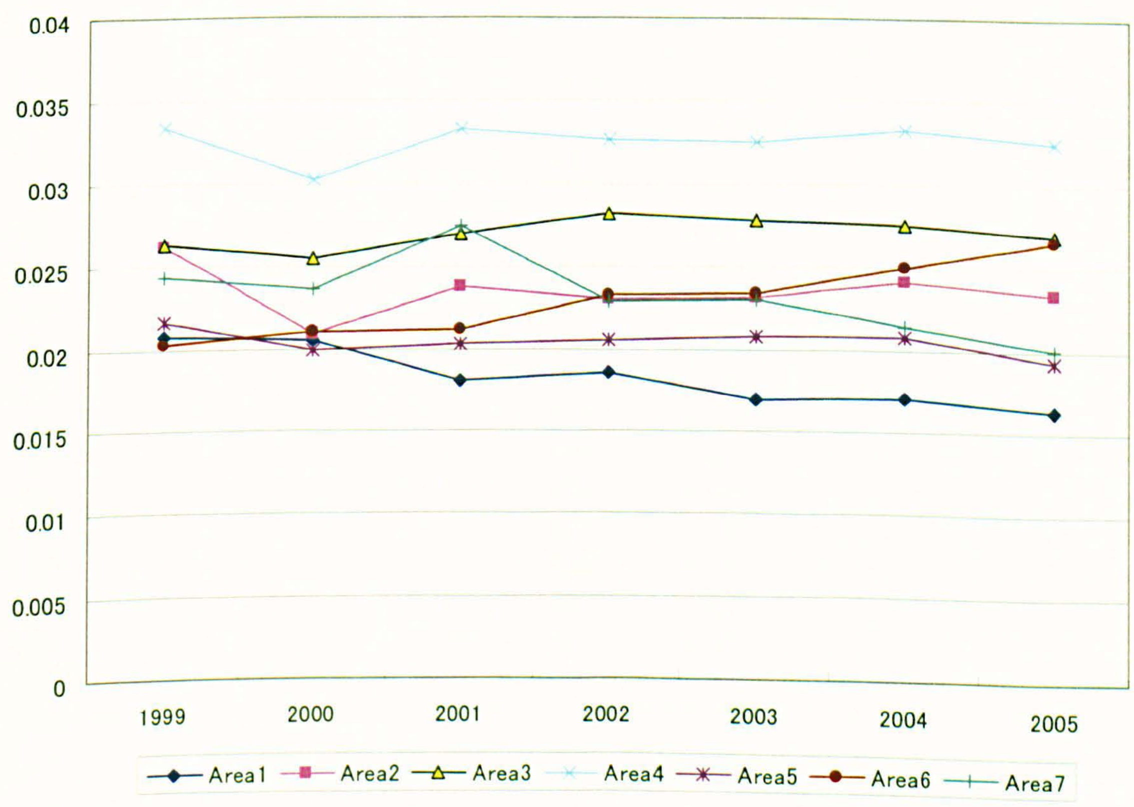


Table 7.17 indicates the economies of scale and the average total assets of credit associations in each prefecture. There are particularly large economies of scale in Toyama (18), Mie (24), Wakayama (29) and Miyazaki (45), while there are small ones in Saitama (11), Nagano (16) and Kyoto (26). From the estimated results it is shown that the prefectures with small economies of scale have large average total assets. Prefectures with small assets show different levels of economies of scale. It is possible, however, that there is a negative relationship between economies of scale and total assets. No evidence has been found to suggest that the level of business industry affects the size of economies of scale, but the results that the change in asset size has a negative impact on economies of scale would be broadly consistent with the hypothesis that there were many mergers in urban areas.

Table 7.17 Output elasticity and standard deviation of credit associations in each prefecture

Code	Output elasticity (Ave.)	lnast	Code	Output elasticity (Ave.)	lnast	Code	Output elasticity (Ave.)	lnast
1	0.9364	19.2158	21	0.9581	19.8589	41	0.9418	18.0544
2	0.9444	18.8646	22	0.9535	20.1751b	42	0.9468	18.3666
3	0.9317	18.0856	23	0.9569	20.3332b	43	0.9595	18.8426
4	0.9479	18.2266	24	0.9219	19.1466	44	0.9352	18.7049
5	0.9356	18.4636	25	0.9458	19.0564	45	0.9206	18.1744
6	0.9490	18.6902	26	0.9761a	20.9408b	46	0.9621a	19.4009
7	0.9389	18.9319	27	0.9694a	19.9797	47	0.9617a	18.6454
8	0.9461	19.2284	28	0.9331	19.4183			
9	0.9357	18.8358	29	0.9210	19.5418			
10	0.9616	20.0123b	30	0.9633a	20.2941b			
11	0.9718a	20.694b	31	0.9508	18.848			
12	0.9547	19.738	32	0.9295	18.2497			
13	0.9683a	20.4221b	33	0.9313	19.0295			
14	0.9654a	20.0999b	34	0.9473	19.8894			
15	0.9698a	20.3179b	35	0.9312	18.4249			
16	0.9947a	21.1739b	36	0.9381	18.5992			
17	0.9460	19.3019	37	0.9297	19.2428			
18	0.9141	18.5502	38	0.9280	18.7567			
19	0.9517	19.2849	39	0.9415	19.5735			
20	0.9355	19.0713	40	0.9330	18.7358			

Note: (i) 'a' means the 10 smallest values for economies of scale, and 'b' means the 10 largest values for total assets.
(ii) All values with regard to output elasticity are significantly different from 1 at 1% level in t-value.

c. Analysis on the cost structure of credit associations

The period from 1999 to 2005 targeted in this research is considered the time of economic recovery after the financial crisis in the 1990s, and/or the period of increased relationship lending. In addition credit associations experienced many mergers in the 1990s. This section has focused on the impacts of these conditions on cost efficiency and economies of scale.

As mutual financial institutions are limited to offering their services outside their business area, the information they collect must be specified in these areas. Even if mutual financial institutions try to merge with other institutions, it might be difficult for both institutions to utilize that information because they are highly specific. In addition, merging with other institutions might make their customers become wary, govern that mutual financial institutions such as credit associations originally have small numbers of branches and close (face-to-face) relationship with customers. The effects of reducing informational production costs from mergers might be outweighed, therefore.

On the other hand, mutual financial institutions offer their services in small geographical areas. Therefore, if they can enhance their power in the local market through mergers, it would easily be possible to decrease their costs.

As shown above, it was found that credit associations have a lot of differences as for the cost structure. Therefore, even if credit associations experienced economic recession and the policy for the intensification of relationship lending, same as for commercial banks, it is expected that they would experience different impacts.

In the discussion of the time series movement, the cost efficiency of credit associations has decreased every year since 1999. The reason is that there are some impacts of economic depression at the city, town and village level. In other words it is the case that most mergers do not perform properly and non-merged credit associations still also suffer from the nonperforming loans. On the other hand the economies of scale in credit associations displayed a downward trend in 2000-2001 and there seems to be the effect of economic depression. However, it has remained more stable since 2002 and the depression might be resolved gradually. In contrast, with respect to economies of scale, the values have not improved significantly and it is impossible to say that there is a definite trend towards economic recovery. The impact of the announcements for relationship lending has not been visible in the economies of scale.

In the analysis between asset size and cost structure, there are negative relationships between asset size and cost efficiency, and between asset size and economies of scale. It is likely that the credit associations with relatively large assets mainly experienced mergers, and there is some disruption caused by the mergers. It appears that cost efficiency decreases and the economies of scale also decline due to this disruption.

As regards geographical area, it was found that the rural areas have relatively high cost efficiency and high economies of scale. It appears there were many mergers of credit associations, particularly in urban areas. In the rural areas there are not many institutions available for merger and it is difficult to gain the full advantages of mergers due to the economic recession. Accordingly, most of the economies of scale are still to be found in rural areas. The relationships with customers can be maintained properly because the size of the institution is adequate, and therefore it is likely that credit associations can offer their services efficiently.

7.4.3. Cost efficiency and economies of scale of credit cooperatives in Japan

a. Cost efficiency

Like credit associations, credit cooperatives have the organizational form of mutual financial institution and attach importance to forge close relationships with customers. However, with regard to the size of total assets and geographical area, credit cooperatives are much smaller than credit associations. How did these points affect their cost structures during the depression and the merger boom in the 1990s?

Table 7.18 shows the cost efficiency results for credit cooperatives from 1999 to 2005. The total cost efficiency in this period is about 0.7546 and it is larger than that of commercial banks and credit associations. This might come from the fact that the main customers of credit cooperatives are small firms and individuals and credit cooperatives have to take large credit risks. In addition the occurrence of even a small amount of non-performing loans, such as individual loans might severely affect the management condition of credit cooperatives because the size of credit cooperatives is small. It is likely that this feature of management instability is connected with high cost efficient management, creating the close information networks.

Although credit cooperatives need to offer relatively higher risk loans than commercial banks and credit cooperatives, it is found that most of credit cooperatives conduct their business near the best practice frontier for credit cooperatives. In fact, as shown in Table 7.18, the cost efficiencies of credit cooperatives are distributed from 0.75 to 0.77. The cost efficiencies are stable or decrease slightly in this period. The number of samples of credit cooperatives drastically decreased from 291 in 1999 to 141 in 2005, while average asset size increased from 72.1 to 98.8 billion yen. It appears, therefore, that the troubles by mergers in this period are carried out. Also, as with credit associations, the systemic change for the announcement of relationship banking could be connected with the trouble.

Table 7.18 Time series movement of cost efficiency on Japanese credit cooperatives from 1999 to 2005

Year	Cost efficiency (Ave.)	Number of observations	Average total asset (billion JPY)
1999	0.7678***	291	72.1
2000	0.7582***	267	74.4
2001	0.7545***	225	81.5
2002	0.7522***	189	87.6
2003	0.7504***	167	88.5
2004	0.7529***	156	92.5
2005	0.7511***	141	98.8
1999-2005	0.7546***	—	—

Note: *** refers to the fact that it is significantly different from 1 at 1% level with t-value, ** significant at 5% and * significant at 10%, respectively.

Table 7.19 shows cost efficiencies of credit cooperatives with respect to asset size. It shows the smallest asset group with less than 10 billion yen has the smallest cost efficiency and that groups with greater assets have higher cost efficiency. As for the averaged value of cost efficiency, credit cooperatives show the similar results to credit associations. However it was found that they have opposite features with regards to the relations with asset size, and larger credit cooperatives have higher cost efficiency. It is likely that this feature is caused by the trouble by mergers and economic recession. In particular small sized credit cooperatives are affected strongly by local economy although they had great care for screening and monitoring of customers. Also it appears in the case of merger that small credit cooperatives with small number of staff are in trouble regarding the process of business transfer.[156]

The opposite results from credit associations are associated with the idea that the mergers of credit cooperatives had a completely different meaning from those of credit associations. In credit associations the mergers were carried out by the financially stable associations in order to increase their market share in the local community. In contrast, in credit cooperatives, the mergers were carried out by the unstable institutions in order to prevent bankruptcy. Therefore it appears, in the case of mergers with both unstable cooperatives, that their management troubles increase and the different features from credit associations are displayed.

Table 7.19 Average cost efficiency of credit cooperatives by asset size (1999-2005)

Asset size (in 100 million JPY)	Number of observations	Cost efficiency (Ave.)	Standard Deviation
0-99.9	164	0.6012***	(0.1584)
100-199.9	184	0.6753***	(0.1021)
200-399.9	235	0.7158***	(0.0792)
400-599.9	194	0.7787***	(0.0608)
600-799.9	116	0.7978***	(0.0609)
800-1199.9	176	0.8438***	(0.0403)
1200-1999.9	140	0.8606***	(0.0268)
2000+	62	0.8932***	(0.0155)
All	1271	0.7546***	(0.1219)

Note: *** refers to the fact that it is significantly different from 1 at 1% level with t-value, ** significant at 5% and * significant at 10%, respectively.

With regard to the impact of geographical factors on cost efficiency, do credit cooperatives

156 In the time-series analysis, the feature of trouble by mergers was found. From the analysis by asset size, it is suggested that this impact is represented mainly in small and medium sized cooperatives.

have the same characteristics as credit associations? The nationwide cost efficiency of credit cooperatives is about 0.24, as shown in Table 7.20. The average cost efficiencies in geographical areas range between 0.73 and 0.78. Compared to commercial banks and credit associations, it seems that credit cooperatives are more cost efficient. Areas 2, 4 and 6 have relatively higher average values: 0.780, 0.764 and 0.769 respectively. In contrast, Areas 3, 5 and 7 show lower values: 0.734, 0.754 and 0.726 respectively. Like the credit associations, credit cooperatives did not show any clear sign of being affected by local economic conditions. That is, it was difficult to say that all areas with high cost efficiency show the high GDP growth. With respect to standard deviations, Areas 2, 3 and 6 show particularly high values. Areas 2 and 3 include large economic prefectures but the economy of Area 6 is particularly small. It is difficult, therefore, to conclude whether there is a significant relationship between the state of the local economy and standard deviations of cost efficiency.

Table 7.20 Cost efficiency of credit cooperatives by geographical area

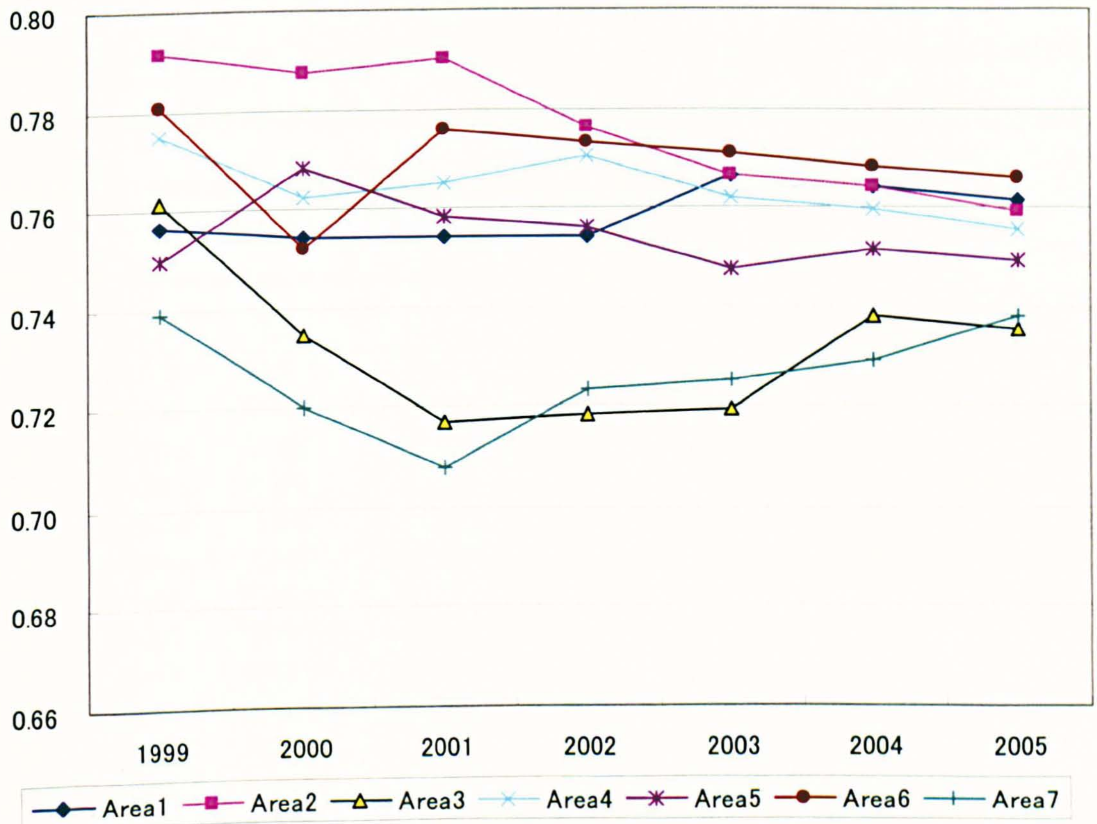
Area	Cost efficiency (Ave.)	Standard Deviation	Area GDP growth
1	0.7580***	(0.1414)	-0.0044
2	0.7792***	(0.0936)	0.0013
3	0.7337***	(0.1191)	-0.0004
4	0.7642***	(0.1214)	0.0029
5	0.7544***	(0.1625)	-0.0004
6	0.7687***	(0.0498)	-0.0054
7	0.7258***	(0.1251)	-0.0005
All	0.7561***	(0.1214)	0.0011

Source: Cabinet Office, Government of Japan, Statistics: Annual Report on Prefectural Accounts (only Japanese). http://www.esri.cao.go.jp/jp/sna/toukei.html#kenmin

Note: *** refers to the fact that it is significantly different from 1 at 1% level with t-value, ** significant at 5% and * significant at 10%, respectively.

Figure 7.8 shows the time series changes of cost efficiency in each area. In the year 2001, the difference between the smallest value (in Area 7, 0.708) and the largest (Area 2, 0.790) was approximately 0.082, while in 2005 the corresponding difference (between Area 3, 0.736, and Area 6, 0.766) declined into approximately 0.03. It is likely that economic impacts in the 1990s – such as those of recession, changes in the policy of relationship lending or mergers – have gradually converged.

Figure 7.8 Cost efficiency of credit cooperatives



At the level of geographical area there was no clear evidence that economic conditions affect cost efficiency. Table 7.21 shows that prefectures with relatively high cost efficiency are quite evenly distributed nationwide. It is difficult to conclude, therefore, that the local economic conditions are connected with cost efficiency, even in the prefectural level. In other words the economic recession in the 1990s might not have had significant impacts on the cost efficiency of credit cooperatives.[157] The second possible point is whether the mergers boom in the 1990s had any effect on cost efficiency. It is expected that mergers increase the average size of assets. They also lead to some disturbances in the organization and could reduce cost efficiency. In contrast, if there are not so many mergers, it appears that the change in average asset size in the prefecture would not happen, and

[157] However, it is difficult to conclude that there is no relationship between economic conditions and cost efficiency. In the case of credit cooperatives, it is possible that economic conditions over small, limited areas – such as cities, towns and villages – have a significant effect upon cost efficiency.

therefore that cost efficiency would be stable at a relatively high level.[158] In order to analyze this issue, Table 7.21 displays the average total assets of credit cooperatives in each prefecture. The mark 'a' indicates the 15 smallest values for total average assets and the mark 'b' represents the 15 largest values for cost efficiency. The results show that all datasets are not matched and credit cooperatives with small assets have relatively low cost efficiency. It can be said that, although there is some impact of mergers to credit cooperatives, that is different from the case of credit associations.

Table 7.21 Prefectural total assets and cost efficiency for credit cooperatives

Pref.	lnast	Effi	Pref.	lnast	Effi	Pref.	lnast	Effi
1	18.078	0.809 b	21	17.514	0.656	41	16.683 a	0.699
2	17.766	0.824 b	22	17.963	0.784 b	42	16.571 a	0.686
3	16.907 a	0.748	23	17.604	0.768	43	17.252	0.768
4	17.001 a	0.728	24	16.508 a	0.626	44	16.803 a	0.705
5	16.542 a	0.608	25	17.958	0.827 b	45	16.087 a	0.711
6	17.084 a	0.688	26	17.519	0.802 b	46	17.853	0.800 b
7	17.956	0.840 b	27	18.065	0.769	47	16.683 a	0.699
8	18.222	0.792 b	28	n.a.	n.a.			
9	17.014	0.798 b	29	16.562 a	0.434			
10	18.82	0.816 b	30	18.417	0.812 b			
11	17.827	0.759	31	n.a.	n.a.			
12	18.456	0.851 b	32	17.666	0.801 b			
13	17.656	0.770	33	18.357	0.789 b			
14	n.a.	n.a.	34	18.044	0.739			
15	n.a.	n.a.	35	16.48 a	0.704			
16	18.429	0.761	36	n.a.	n.a.			
17	17.808	0.769	37	18.523	0.836 b			
18	17.24	0.732	38	n.a.	n.a.			
19	15.691 a	0.637	39	16.64 a	0.737			
20	16.769 a	0.704	40	17.089	0.742			

Note: (i) 'a' means the 15 smallest assets, and 'b' means the 15 largest cost efficiency. (ii) All values with regard to cost efficiency are significantly different from 1 at 1% level in t-value.

b. Economies of scale

Table 7.22 shows the time series movement of economies of scale of credit cooperatives. The average value in the period from 1999 to 2005 is about 0.58, representing much higher economies of scale

158 This feature is shown in the results of credit associations.

than those for credit associations.[159] It may be assumed that the low values in the case of credit associations were because specific information in small geographical areas would not be utilized effectively by the other institutions. Credit cooperatives also produce specific information in small areas and this information would be useless at the different location. However, when credit cooperatives attempt to undertake mergers, the potential partners are necessarily the institutions that are geographically closer. Therefore the information produced by the original institutions could have the effect of decreasing marginal costs, which means economies of scale would be increased significantly.

The economies of scale in credit cooperatives consistently decreased between 1999 and 2004 (Table 7.22). The downward trend reached a bottom in 2004, and then slightly increased in 2005. However, it is possible to conclude that the economies of scale in credit cooperatives decreased. This time series trend is the same as that for credit associations. As in the case of credit associations, the effects of economic recession might be at work. Nonperforming loans in financial institutions increased due to the economic recession. In particular, as small and unstable financial institutions are taken over, the effect of economies of scale becomes small. In contrast, the institutions, which absorbed small institutions, need to dispose nonperforming loans from merged institution. Therefore it appears that these stable institutions also decrease the cost-reducing effects of scale economies until the economic conditions recover.

159 The average values of economies of scale in commercial banks and credit associations were 0.729 and 0.947 respectively.

Table 7.22 Time series movement of output elasticity for Japanese credit cooperatives from 1999 to 2005

Year	Output elasticity (Ave.)	Standard Deviations
1999	0.5788***	(0.0052)
2000	0.5789***	(0.0053)
2001	0.5791***	(0.0055)
2002	0.5800***	(0.0053)
2003	0.5803***	(0.0053)
2004	0.5805***	(0.0052)
2005	0.5803***	(0.0051)
1999-2005	0.5800***	(0.0053)

Note: *** refers to the fact that it is significantly different from 1 at 1% level with t-value, ** significant at 5% and * significant at 10%, respectively.

Why did the mergers by credit associations not have a strong deterrent effect? In order to consider this issue, Table 7.23 displays the economies of scale in each asset group. The results show that the degree of economies of scale has negative (score is positive) relationship with assets. This is consistent with the case of credit associations.

Table 7.23 Output elasticity of credit cooperatives with respect to asset size (1999-2005)

Asset size (in 100 million JPY)	Number of observations	Output elasticity (Ave.)	Standard Deviations
0-99.9	172	0.5750***	(0.0065)
100-199.9	191	0.5768***	(0.0057)
200-399.9	250	0.5788***	(0.0052)
400-599.9	209	0.5810***	(0.0031)
600-799.9	126	0.5811***	(0.0043)
800-1199.9	182	0.5816***	(0.0042)
1200-1999.9	153	0.5829***	(0.0018)
2000+	66	0.5822***	(0.0033)
All	1349	0.5800***	(0.0053)

Note: *** refers to the fact that it is significantly different from 1 at 1% level with t-value, ** significant at 5% and * significant at 10%, respectively.

In the previous section the idea that the mergers of credit cooperatives had significant effects on cost efficiency was considered. If it is correct, it is likely that the economies of scale in areas with many mergers become relatively small. The reason is that credit cooperatives that carried out mergers increase their organizational sizes, and the effects to decrease average costs are depleted. The results, in Table 7.24 show that Areas 2 and 6 have a small extent of economies of scale, whereas Areas 3, 4 and 7 have large extents. Considering the results for both economies of scale and cost efficiency, it could be said that Area 3 did not have many mergers but Area 2 and 6 did. That is to say that there was the set of low cost efficiency and high economies of scale in Area 3, and the opposite set in Areas 2 and 6.

Table 7.24 Output elasticity of credit cooperatives by geographical area

Area	Output elasticity (Ave.)	Standard Deviation
1	0.5802***	(0.0049)
2	0.5810***	(0.0043)
3	0.5784***	(0.0052)
4	0.5774***	(0.0060)
5	0.5798***	(0.0059)
6	0.5806***	(0.0032)
7	0.5789***	(0.0059)
All	0.5796***	(0.0053)

Note: *** refers to the fact that it is significantly different from 1 at 1% level with t-value, ** significant at 5% and * significant at 10%, respectively.

Can the relationship between economies of scale and cost efficiency at the region level also be seen at the prefectural level? Table 7.25 displays the estimated results for each prefecture, with 'a' and 'b' indicating the 10 lowest prefectures on each index. In 7 out of 10 prefectures, both marks are corresponding. Therefore these results supported roughly the hypothesis that the mergers have some impact on cost structure in credit cooperatives.

However, the results in this part do not necessarily mean that there were no mergers in other prefectures.[160] As credit cooperatives carry on their business in small areas such as cities, towns and villages, it might be difficult for these small economic conditions to be reflected to the prefectural

160 In fact, although there were some mergers in Tokyo (17), it was not represented clearly in this analysis.

level estimation. Also it is likely that there is another issue having an effect such as time lag.

Table 7.25 Economies of scale and standard deviation for credit cooperatives in each prefecture

Code	Output elasticity (Ave.)	Effi	Code	Output elasticity (Ave.)	Effi	Code	Output elasticity (Ave.)	Effi
1	0.5827	0.809	21	0.5704 a	0.656 b	41	0.5772	0.699 b
2	0.5831	0.824	22	0.5804	0.784	42	0.5780	0.686 b
3	0.5801	0.748	23	0.5784	0.768	43	0.5788	0.768
4	0.5764 a	0.728	24	0.5666 a	0.626 b	44	0.5799	0.705
5	0.5741 a	0.608 b	25	0.5771 a	0.827	45	0.5806	0.711
6	0.5827	0.688 b	26	0.5830	0.802	46	0.5798	0.800
7	0.5809	0.840	27	0.5777	0.769	47	n.a.	n.a.
8	0.5790	0.792	28	n.a.	n.a.			
9	0.5811	0.798	29	0.5768 a	0.434 b			
10	0.5810	0.816	30	0.5781	0.812			
11	0.5811	0.759	31	n.a.	n.a.			
12	0.5830	0.851	32	0.5814	0.801			
13	0.5814	0.770	33	0.5818	0.789			
14	n.a.	n.a.	34	0.5804	0.739			
15	n.a.	n.a.	35	0.5739 a	0.704 b			
16	0.5832	0.761	36	n.a.	n.a.			
17	0.5809	0.769	37	0.5843	0.836			
18	0.5767 a	0.732	38	n.a.	n.a.			
19	0.5770 a	0.637 b	39	0.5789	0.737			
20	0.5758 a	0.704 b	40	0.5794	0.742			

Note: (i) 'a' means the 10 smallest values for output elasticity (largest economies of scale), and 'b' means the 10 smallest values for cost efficiency. (ii) All values with regard to output elasticity are significantly different from 1 at 1% level in t-value.

Figure 7.9 displays the changes in output elasticity for credit cooperatives in every area. The differences between the largest figure and the smallest one have declined gradually since 2001 and the gaps of economies of scale between geographical areas are convergent. In 2001 the largest difference 0.05, between 0.576 in Area 4 and 0.581 in Area 2, but in 2005 it decreased to 0.002, between 0.580 in Area 4 and 0.582 in Area 1. This feature is shown by the fact that the economies of scale decreased (the scores increased). The disposal processes of non-performing loans were promoted in nation wide.

Figure 7.9 Output elasticity of credit cooperatives

Figure 7.10 Standard deviations of output elasticity of credit cooperatives

c. Analysis on the cost structure of credit cooperatives

Credit cooperatives, like credit associations, experienced many mergers in the 1990s. Mergers, therefore, could be one of the factors affecting cost structure such as cost efficiency and economies of scale. However, the consequences of mergers definitely seem to differ between two industries. It appears the mergers in credit associations were carried out positively in order for financially stable institutions to increase their market share. The mergers in credit cooperatives, in contrast, were carried out negatively in order for small and unstable institutions to escape bankruptcy. Although credit cooperatives that could not resolve non-performing loans by themselves attempted to improve their management through mergers, the mergers led to disruption inside the institutions. Therefore it could be said the cost structure of credit cooperatives has different features from that of commercial banks and credit associations.

However, the results in this paper come from a prefectural dataset. As credit cooperatives conduct their business in smaller geographical areas, it might be possible to obtain different results if more detailed data were collected. In other words, the economic conditions in cities, towns and villages could have a more explicit impact on the cost structure of credit cooperatives.

7.4.4. Conclusion: Cost structure of financial institutions in Japan

It was found that the cost efficiencies of Japanese mutual financial institutions are 0.74 in credit associations and 0.755 in credit cooperatives. The main difference between them is the size of institutions and businesses. However it was concluded firstly that they have almost the same level of cost efficiency. Secondly, as compared with the average cost efficiency in commercial banks 0.530, it was also found that the organizational forms affect the degree of cost efficiency. In other words, the result in this paper indicated that the cost efficiency of commercial banks is lower than that of credit associations and credit cooperatives. Therefore, it was concluded that the mutual financial institutions are more cost efficient than the profit-making company such as commercial banks. It is demonstrated when mutual financial institutions specify their customers or carry out careful monitoring of lenders, more wasteful costs can be reduced in the lending method by commercial banks, transaction lending.

As for economies of scale, it was shown that the results in commercial banks, credit associations and credit cooperatives were 0.729, 0.947 and 0.580 respectively. As there is a cost-reducing effect when the figure is smaller than 1, it appears that commercial banks enjoy a significantly greater cost-reducing effect than mutual financial institutions, in the case of credit associations. The reason seems to come from the transaction-based lending mainly used by commercial banks: the lending method can be applicable for new businesses or new customers due to the mergers, and commercial banks can easily control the increase of marginal costs for loan business.[161]

The above results indicate although there seem to be very good reasons for commercial banks to enlarge their size, it is also necessary for them to make their management system more cost efficient. On the other hand, mutual financial institutions – credit associations in particular – have approximately arrived at their most appropriate size as financial institutions using relationship lending, and have had the significantly cost efficient structures.

It is premature, however, to conclude that all financial institutions should move to relationship lending. The method demands a great deal of time and entails large costs, and it is widely considered there are inefficiencies not to represent on financial statement.

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161 The low value for credit cooperatives seems to derive from their small size. Therefore it is difficult to conclude only for the results from organizational form.

Appendix 7-1. Statistical frontiers of commercial banks and mutual financial institutions

Table 7.26 Panel estimation of stochastic cost efficiency frontier of Japanese commercial banks[162]

	Commercial banks	
Variables	Coef.	P>|z|
Dependent variables		
Ln(total costs)		
Independent variables		
Outputs and input prices		
lnPL	0.13014	0.929
lnPK	0.838182	0.283
lnPF	-0.02009	0.952
Ln(LOAN)	-1.58293*	0.061
Ln(SECURITY)	1.935884***	0.003
lnPLlnPK	-0.058	0.736
lnPLlnPF	0.1781**	0.030
lnPKlnPF	0.032755	0.414
$(\ln PL)^2$	-0.42627**	0.045
$(\ln PK)^2$	0.0942	0.443
$(\ln PF)^2$	0.021406	0.386
ln(LOAN)ln(SECURITY)	-0.02809	0.761
$(\ln(LOAN))^2$	-0.01632	0.895
$(\ln(SECURITY))^2$	0.049141	0.544
ln(LOAN)lnPL	0.592755***	0.001
ln(LOAN)lnPK	-0.15257	0.125
ln(LOAN)lnPF	-0.04298	0.228
ln(SECURITY)lnPL	-0.46121***	0.001
ln(SECURITY)lnPK	0.176615**	0.027
ln(SECURITY)lnPF	0.041798	0.138
lnASSET	0.588309**	0.019
DUMMY (CITY)	0.063457	0.637
Cons	1.227296	0.769
Obs.	930	
Wald X^2 test	5951.39	

Note: *** denotes statistical significance at 1% level, ** denotes statistical significance at 5% level and * denotes statistical significance at 10% level

162 As for the commercial banks in Japan, the following input price indices are employed; PL=(general and administrative expenses / number of employees), PK=(premises and real estate / total assets), PF=(interest expense / total deposits).

Table 7.27 Panel estimation of stochastic cost efficiency frontier of Japanese mutual financial institutions

	Credit association		Credit cooperatives	
Variables	Coef.	P>|z|	Coef.	P>|z|
Dependent variables				
Ln(total costs)				
Independent variables				
Outputs and input prices				
lnPL	0.638105	0.414	0.286476***	0.002
lnPK	0.351444	0.276	-0.27716***	0.000
lnPF	0.074837	0.525	-0.19096***	0.000
Ln(LOAN)	1.179259***	0.000	0.403686***	0.000
Ln(SECURITY)	-0.58317***	0.000	0.029899***	0.003
lnPLlnPK	-0.06869*	0.063	0.000141	0.970
lnPLlnPF	0.110115***	0.000	-6.82E-07	0.999
lnPKlnPF	-0.00441	0.309	0.004537	0.244
$(\ln PL)^2$	-0.05045	0.576	0.000868	0.191
$(\ln PK)^2$	-0.08157***	0.000	0.028432***	0.000
$(\ln PF)^2$	-0.04129***	0.000	0.001151	0.173
ln(LOAN)ln(SECURITY)	-0.06891***	0.000	-8.30E-06	0.948
$(\ln(LOAN))^2$	0.109811***	0.000	-0.00023*	0.060
$(\ln(SECURITY))^2$	0.050944***	0.000	0.000114	0.419
ln(LOAN)lnPL	-0.134***	0.000	0.000045	0.866
ln(LOAN)lnPK	0.031809***	0.001	0.00238	0.174
ln(LOAN)lnPF	-0.00594*	0.069	-0.0003	0.219
ln(SECURITY)lnPL	0.124569***	0.000	-0.00019	0.501
ln(SECURITY)lnPK	-0.02441***	0.000	0.00131	0.470
ln(SECURITY)lnPF	0.002166	0.422	-0.0009***	0.001
Cons	1.765214	0.642	3.465349***	0.000
Obs.	2,320		1,327	
Wald X^2 test	146,017.51		286.32	

Note: *** denotes statistical significance at 1% level, ** denotes statistical significance at 5% level and * denotes statistical significance at 10% level

Appendix 7-2. Time series movement of cost efficiency and output elasticity in each area for Japanese financial institutions

Table 7.28 Time series movement of cost efficiency in each geographical area (standard deviations): commercial banks

Year	1	2	3	4	5	6	7
2000	0.597***	0.597***	0.564***	0.6***	0.582***	0.568***	0.596***
	(0.033)	(0.067)	(0.035)	(0.081)	(0.058)	(0.041)	(0.069)
2001	0.581***	0.582***	0.548***	0.591***	0.566***	0.552***	0.58***
	(0.033)	(0.069)	(0.036)	(0.081)	(0.059)	(0.042)	(0.07)
2002	0.565***	0.565***	0.531***	0.575***	0.549***	0.535***	0.564***
	(0.034)	(0.07)	(0.037)	(0.083)	(0.061)	(0.042)	(0.074)
2003	0.548***	0.549***	0.514***	0.559***	0.533***	0.518***	0.548***
	(0.035)	(0.071)	(0.038)	(0.085)	(0.062)	(0.043)	(0.076)
2004	0.532***	0.532***	0.496***	0.543***	0.515***	0.5***	0.531***
	(0.036)	(0.073)	(0.038)	(0.086)	(0.063)	(0.044)	(0.077)
2005	0.514***	0.515***	0.478***	0.526***	0.498***	0.483***	0.514***
	(0.036)	(0.074)	(0.039)	(0.088)	(0.064)	(0.044)	(0.079)
2006	0.497***	0.498***	0.46***	0.499***	0.48***	0.465***	0.496***
	(0.037)	(0.075)	(0.039)	(0.083)	(0.065)	(0.045)	(0.08)
2007	0.48***	0.48***	0.442***	0.481***	0.462***	0.446***	0.479***
	(0.038)	(0.076)	(0.04)	(0.085)	(0.066)	(0.045)	(0.082)

Note: *** refers to the fact that it is significantly different from 1 at 1% level with t-value, ** significant at 5% and * significant at 10%, respectively.

Table 7.29 Time series movement of output elasticity in each geographical area (standard deviations): commercial banks

Year	1	2	3	4	5	6	7
2000	0.7278***	0.7383***	0.7370***	0.7414***	0.7486***	0.7440***	0.7333***
	(0.013)	(0.0324)	(0.0154)	(0.0167)	(0.0144)	(0.0129)	(0.0135)
2001	0.7250***	0.7318***	0.7362***	0.7340***	0.7404***	0.7373***	0.7296***
	(0.0125)	(0.0318)	(0.0129)	(0.0142)	(0.0138)	(0.0142)	(0.0148)
2002	0.7220***	0.7302***	0.7359***	0.7385***	0.7383***	0.7311***	0.7270***
	(0.0116)	(0.0279)	(0.013)	(0.0234)	(0.0121)	(0.0173)	(0.0135)
2003	0.7184***	0.7256***	0.7311***	0.7317***	0.7319***	0.7287***	0.7252***
	(0.0114)	(0.0244)	(0.0113)	(0.0225)	(0.0133)	(0.0188)	(0.0146)
2004	0.7150***	0.7236***	0.7279***	0.7293***	0.7295***	0.7253***	0.7249***
	(0.0099)	(0.0218)	(0.0115)	(0.016)	(0.0116)	(0.0184)	(0.0163)
2005	0.7120***	0.727***	0.7255***	0.7282***	0.7247***	0.7249***	0.7200***
	(0.0099)	(0.022)	(0.0115)	(0.017)	(0.012)	(0.0181)	(0.0132)
2006	0.7127***	0.7304***	0.7288***	0.7268***	0.7269***	0.7271***	0.7206***
	(0.0105)	(0.0218)	(0.0126)	(0.027)	(0.0139)	(0.0184)	(0.0124)
2007	0.7109***	0.7333***	0.7288***	0.7288***	0.7313***	0.7282***	0.7243***
	(0.0179)	(0.018)	(0.0152)	(0.0261)	(0.0115)	(0.0204)	(0.0135)

Note: *** refers to the fact that it is significantly different from 1 at 1% level with t-value, ** significant at 5% and * significant at 10%, respectively.

Table 7.30 Time series movement of cost efficiency in each geographical area (standard deviations): credit associations

	Area1	Area2	Area3	Area4	Area5	Area6	Area7
1999	0.7656***	0.7533***	0.7557***	0.7451***	0.7650***	0.8124***	0.7881***
	(0.0552)	(0.0505)	(0.0366)	(0.0717)	(0.0684)	(0.0564)	(0.0442)
2000	0.7596***	0.7438***	0.7461***	0.7343***	0.7624***	0.8098***	0.7813***
	(0.0566)	(0.0502)	(0.0362)	(0.0724)	(0.0667)	(0.0591)	(0.0458)
2001	0.7537***	0.7354***	0.7386***	0.7230***	0.7562***	0.8040***	0.7736***
	(0.0581)	(0.0525)	(0.0341)	(0.074)	(0.0693)	(0.0607)	(0.0473)
2002	0.7436***	0.7293***	0.7316***	0.7042***	0.7480***	0.8019***	0.7667***
	(0.0574)	(0.0512)	(0.0348)	(0.0686)	(0.0719)	(0.0635)	(0.0491)
2003	0.7366***	0.7214***	0.7234***	0.6964***	0.7407***	0.8018***	0.7626***
	(0.0592)	(0.0529)	(0.0361)	(0.0708)	(0.0735)	(0.0651)	(0.0523)
2004	0.7307***	0.7135***	0.7151***	0.6859***	0.7309***	0.7958***	0.7563***
	(0.0597)	(0.0546)	(0.0368)	(0.0741)	(0.0754)	(0.0668)	(0.0543)
2005	0.7227***	0.7055***	0.7064***	0.6772***	0.7209***	0.7897***	0.7483***
	(0.0615)	(0.0558)	(0.038)	(0.0756)	(0.0775)	(0.0686)	(0.0564)

Note: *** refers to the fact that it is significantly different from 1 at 1% level with t-value, ** significant at 5% and * significant at 10%, respectively.

Table 7.31 Time series movement of output elasticity in each geographical area (standard deviations): credit associations

	Area1	Area2	Area3	Area4	Area5	Area6	Area7
1999	0.9381***	0.9550***	0.9552***	0.9586***	0.9407***	0.9309***	0.9368***
	(0.0208)	(0.0261)	(0.0263)	(0.0334)	(0.0216)	(0.0202)	(0.0243)
2000	0.9369***	0.9498***	0.9532***	0.9531***	0.9364***	0.9308***	0.9360***
	(0.0206)	(0.0209)	(0.0254)	(0.0302)	(0.02)	(0.0211)	(0.0236)
2001	0.9378***	0.9512***	0.9522***	0.9558***	0.9357***	0.9310***	0.9392***
	(0.0181)	(0.0237)	(0.0269)	(0.0332)	(0.0203)	(0.0212)	(0.0275)
2002	0.9416***	0.9507***	0.9536***	0.9547***	0.9358***	0.9341***	0.9394***
	(0.0186)	(0.0229)	(0.0281)	(0.0326)	(0.0206)	(0.0232)	(0.0229)
2003	0.9392***	0.9512***	0.9546***	0.9540***	0.9344***	0.9353***	0.9414***
	(0.017)	(0.0231)	(0.0278)	(0.0326)	(0.0209)	(0.0233)	(0.023)
2004	0.9405***	0.9516***	0.9540***	0.9529***	0.9338***	0.9343***	0.9439***
	(0.0172)	(0.0241)	(0.0276)	(0.0333)	(0.0208)	(0.025)	(0.0214)
2005	0.9402***	0.9514***	0.9548***	0.9522***	0.9337***	0.9328***	0.9440***
	(0.0164)	(0.0233)	(0.0269)	(0.0326)	(0.0193)	(0.0266)	(0.0201)

Note: *** refers to the fact that it is significantly different from 1 at 1% level with t-value, ** significant at 5% and * significant at 10%, respectively.

Table 7.32 Time series movement of cost efficiency in each geographical area (standard deviations): credit cooperatives

	Area1	Area2	Area3	Area4	Area5	Area6	Area7
1999	0.7565***	0.7914***	0.7612***	0.7747***	0.7499***	0.7807***	0.7390***
	(0.1341)	(0.095)	(0.0883)	(0.1208)	(0.1596)	(0.054)	(0.1107)
2000	0.7541***	0.7876***	0.7347***	0.7623***	0.7680***	0.7519***	0.7201***
	(0.1388)	(0.0962)	(0.1235)	(0.1259)	(0.1711)	(0.0689)	(0.1284)
2001	0.7544***	0.7903***	0.7168***	0.7648***	0.7584***	0.7758***	0.7078***
	(0.1389)	(0.0867)	(0.1295)	(0.1292)	(0.1682)	(0.0545)	(0.1376)
2002	0.7541***	0.7761***	0.7184***	0.7702***	0.7561***	0.7733***	0.7233***
	(0.1556)	(0.0921)	(0.135)	(0.1222)	(0.1682)	(0.0548)	(0.1347)
2003	0.7662***	0.7664***	0.7194***	0.7618***	0.7473***	0.7708***	0.7250***
	(0.1465)	(0.0931)	(0.1383)	(0.1219)	(0.174)	(0.055)	(0.1136)
2004	0.7639***	0.7643***	0.7380***	0.7594***	0.7516***	0.7683***	0.7293***
	(0.1465)	(0.0943)	(0.1128)	(0.1221)	(0.1683)	(0.0552)	(0.1447)
2005	0.7616***	0.7590***	0.7356***	0.7556***	0.7493***	0.7658***	0.7383***
	(0.1521)	(0.0964)	(0.1131)	(0.1251)	(0.1684)	(0.0554)	(0.1096)

Note: *** refers to the fact that it is significantly different from 1 at 1% level with t-value, ** significant at 5% and * significant at 10%, respectively.

Table 7.33 Time series movement of output elasticity in each geographical area (standard deviations): credit cooperatives

	Area1	Area2	Area3	Area4	Area5	Area6	Area7
1999	0.5792***	0.5803***	0.5777***	0.5761***	0.5793***	0.5795***	0.5779***
	(0.0048)	(0.0044)	(0.0052)	(0.0069)	(0.0051)	(0.0041)	(0.0055)
2000	0.5794***	0.5804***	0.5775***	0.5759***	0.5794***	0.5805***	0.5780***
	(0.0048)	(0.0041)	(0.0055)	(0.0068)	(0.0052)	(0.0028)	(0.0059)
2001	0.5798***	0.5809***	0.5780***	0.5758***	0.5796***	0.5807***	0.5778***
	(0.0048)	(0.0043)	(0.0049)	(0.007)	(0.0058)	(0.0033)	(0.0066)
2002	0.5804***	0.5816***	0.5788***	0.5785***	0.5803***	0.5812***	0.5791***
	(0.0055)	(0.0041)	(0.0051)	(0.0055)	(0.0059)	(0.0038)	(0.0066)
2003	0.5811***	0.5817***	0.5789***	0.5783***	0.5801***	0.5810***	0.5801***
	(0.005)	(0.0044)	(0.0054)	(0.0055)	(0.007)	(0.0037)	(0.0057)
2004	0.5811***	0.5816***	0.5796***	0.5784***	0.5804***	0.5809***	0.5806***
	(0.0052)	(0.0045)	(0.0052)	(0.0054)	(0.0064)	(0.0042)	(0.0049)
2005	0.5818***	0.5815***	0.5794***	0.5784***	0.5793***	0.5806***	0.5803***
	(0.0036)	(0.0046)	(0.0053)	(0.0052)	(0.007)	(0.0045)	(0.0053)

Note: *** refers to the fact that it is significantly different from 1 at 1% level with t-value, ** significant at 5% and * significant at 10%, respectively.

Chapter 8 US financial institutions: Analysis on market structure and cost structure

This section considers the differences between Japanese and US mutual financial institutions.

8.1. Analysis on market structure in the US financial institutions

There are some differences between Japan and the USA with respect to the financial system and the historical background. What impacts do these differences have on mutual financial institutions? This chapter discusses the difference between US commercial banks and US thrifts, and between mutual financial institutions in Japan and thrifts in the USA.

8.1.1. Analysis on the US financial institutions using the SCP and efficiency approach

Firstly this section analyzes the empirical results of SCP and efficiency hypotheses for the US commercial banks and US mutual financial institutions.

8.1.1.1. The SCP and efficiency approach in the US commercial banks

In the cases using 'ln (1+ROA)' for dependent variable (Table 8.24-Table 8.26), the coefficients of concentration and market share are not significant values for all markets such as asset, deposit and loan, regardless of whether the pooled, 1-way and 2-way is used. The concentration ratio and market share do not have any impacts on the profitability ROA in the US commercial banks. However the estimated results reported that the ln LOAN/AST has the positive impacts to profitability. It indicates the increase of total loans would affect the profit strongly. This result can not be seen in the case of

Japan. It is consistent with the idea that the US has a market-based financial system, which was assessed by Demirgüç-Kunt and Revine (1999) in World Bank.

In contrast, the cases using 'lnREV' for dependent variable display some significant results (Table 8.1–Table 8.3). Although the 2-way model employing both bank-specific effect and period effect did not show significant results of both CR and MS, the 1-way model is significant. As for MS, there are significantly positive results in almost all markets, the exceptions being the 5-institution model of deposit market and the 3-institution model of loan market. Thus it is partly reported that the US commercial banks support the efficiency hypothesis. In fact, the 5-institutions model in asset market clearly supports the efficiency hypothesis. However, the trend of SCP hypothesis can be found as most of the coefficients of concentration ratio also have positive values. The results did not give a clear indication as to whether the US commercial banks follow the SCP hypothesis or the efficiency hypothesis. Hence, the 2-way models are focused as the most robust model based on Schwartz criteria and showed that all coefficients of CR and MS are insignificant. As a consequence, it is found that the market of the US commercial banks follows neither SCP nor efficiency hypothesis.

Table 8.1 Empirical results of SCP hypothesis for the US commercial banks with Bankscope data, Dependent variable: lnREV

Asset	Normal	1-way	2-way	Normal	1-way	2-way
Constant	-3.955749***	-1.47252***	-2.857524***	-2.57811***	0.237413	-2.910636***
	(-16.28416)	(-5.378619)	(-7.338963)	(-9.023681)	(0.91767)	(-6.310564)
CRA3	4.21857***	2.931969***	0.33403			
	(6.703901)	(8.097865)	(0.376045)			
CRA5				0.312498	-0.464075	0.371102
				(0.514978)	(-1.342863)	(0.427877)
MSA	4.723797***	9.520073***	-1.409496	1.649179	5.980555**	-1.372686
	(4.47377)	(3.483238)	(-0.504375)	(1.184318)	(2.138029)	(-0.496623)
lnAST	0.981417***	0.825306***	0.994498***	0.984144***	0.79558***	0.994488***
	(162.8053)	(56.07274)	(59.08982)	(158.0253)	(55.00575)	(59.13732)
ln LOAN/AST	0.052269	0.418399***	0.323823***	0.05621	0.471942***	0.323552***
	(1.014666)	(5.810117)	(4.964322)	(1.081217)	(6.467127)	(4.959353)
R2	0.937323	0.986726	0.989231	0.936156	0.986308	0.989231
Adj.R2	0.937219	0.984256	0.987189	0.93605	0.983761	0.987189
H0: η=0	—	20.215007***	24.077169***	—	19.89605***	24.061061***
H0: λ=0	—	—	78.299288***	—	—	91.356248***
Schwartz	1.432378	1.088094	0.89842	1.450828	1.119058	0.898405
F	8969.184	399.4733	484.4575	8794.257	387.1295	484.4652
Obs.	2404	2404	2404	2404	2404	2404

Note: (i) each figure below the coefficients is t-value., (ii) *** significant at 1%, ** significant at 5%, * significant at 10%

Table 8.2 Empirical results of SCP hypothesis for the US commercial banks with Bankscope data, Dependent variable: lnREV

Deposit	Normal	1-way	2-way	Normal	1-way	2-way
Constant	-3.116801***	-0.279384	-2.827116***	-1.021868***	0.888116***	-2.890066***
	(-10.9105)	(-1.007191)	(-5.783977)	(-3.978886)	(4.076675)	(-5.015622)
CRD3	1.774002**	0.701932	0.214318			
	(2.455687)	(1.589823)	(0.18398)			
CRD5				-3.075192***	-3.041295***	0.296328
				(-5.914832)	(-10.18922)	(0.26957)
MSD	2.366358**	6.559232**	-1.969302	-4.629931***	-1.014221	-1.839149
	(2.19257)	(2.29138)	(-0.633402)	(-3.684866)	(-0.362368)	(-0.602479)
lnAST	0.983684***	0.797397***	0.995232***	0.994604***	0.841879***	0.995112***
	(162.2702)	(54.88817)	(58.88158)	(161.6321)	(56.69838)	(58.97812)
ln LOAN/AST	0.054403	0.460588***	0.323982***	0.053536	0.476716***	0.323588***
	(1.046048)	(6.302524)	(4.963285)	(1.035584)	(6.697022)	(4.955001)
R2	0.936251	0.986287	0.98922	0.93701	0.986939	0.98922
Adj.R2	0.936144	0.983739	0.987179	0.936905	0.984513	0.98718
H0: η=0	—	19.851922***	24.099002***	—	20.799828***	24.094883***
H0: λ=0	—	—	91.519788***	—	—	71.164251***
Schwartz.	1.449544	1.118923	0.897697	1.437561	1.070149	0.897668
F	8797.208	387.1512	484.7639	8910.473	406.7714	484.7783
Obs.	2401	2401	2401	2401	2401	2401

Note: (i) each figure below the coefficients is t-value., (ii) *** significant at 1%, ** significant at 5%, * significant at 10%

Table 8.3 Empirical results of SCP hypothesis for the US commercial banks with Bankscope data, Dependent variable: lnREV

Loan	Normal	1-way	2-way	Normal	1-way	2-way
Constant	-3.861574***	-3.356883***	-2.528818***	-4.028747***	-1.728953***	-2.60082***
	(-26.1935)	(-12.35027)	(-3.752893)	(-18.01842)	(-5.976924)	(-5.195756)
CRL3	4.375901***	3.769078***	-0.615121			
	(12.31533)	(17.44927)	(-0.3124)			
CRL5				3.884088***	2.47205***	-0.289398
				(7.936433)	(8.407083)	(-0.283493)
MSL	4.678454***	1.050792	-1.118667	8.193927***	4.869464**	-1.164871
	(4.73932)	(0.495507)	(-0.543929)	(6.544104)	(2.190319)	(-0.556226)
lnAST	0.985611***	0.952286***	0.993828***	0.977361***	0.845338***	0.993794***
	(166.0375)	(59.04828)	(59.7909)	(161.0999)	(55.23396)	(59.79251)
ln LOAN/AST	0.041507	0.335977***	0.327045***	0.038716	0.402753***	0.327135***
	(0.826748)	(4.891126)	(4.992497)	(0.757242)	(5.568531)	(4.993497)
R2	0.940012	0.988081	0.989228	0.937851	0.986752	0.989228
Adj.R2	0.939912	0.985863	0.987186	0.937747	0.984286	0.987186
H0: η=0	—	21.905255***	24.080944***	—	20.04865***	24.051628***
H0: λ=0	—	—	35.871836***	—	—	77.395244***
Schwartz.	1.388536	0.980428	0.898611	1.423923	1.086146	0.898654
F	9398.029	445.4945	484.3642	9050.431	400.2625	484.343
Obs.	2404	2404	2404	2404	2404	2404

Note: (i) each figure below the coefficients is t-value., (ii) *** significant at 1%, ** significant at 5%, * significant at 10%

8.1.1.2. The SCP and efficiency approach in the US mutual financial institutions

Table 8.4, Table 8.5 and Table 8.6 report empirical results of SCP hypotheses on US thrifts, using assets, deposits or loans data for concentration and market share from the Bankscope database. These results employ the logarithmic (1+ROA) as dependent variable. In the case of mutual financial institutions in Japan, the estimated results showed that the coefficients of CR and MS are insignificant. In contrast, the US thrifts show some significant results. In spite of mostly insignificant results in the loan market, the cases of the 1-way model of asset market (only 3-institution model) and 1-way model of deposit market indicate significantly positive values for concentration and an insignificant value of MS.[163] The result of US thrifts using ROA suggests the SCP hypothesis, therefore. The estimated results reported that the S&L industry follows collusive behaviour to decide output prices such as loan interest rate. However, there is a common point that the S&Ls are based on membership and most of their customers would request mortgage loans. It is expected that these specific features create imperfect competitive conditions. The skill of judging the credit risks of mortgage loan customers is developed through experience over the long term, and it is therefore understandable that there should be imperfect competition in the market of those special products. As a result it is difficult to conclude from this estimate that the government should intervene in the market.

As for the other control variables, lnAST was significantly positive in all cases, regardless of pooled, 1-way and 2-way model. In the results with ROA, the commercial banks of both Japan and the US showed insignificant results and the Japanese mutual financial institutions had significant but small positive impacts. For the US mutual institutions the increase of total assets connects strongly with ROA and is important. It seems that the US S&Ls' market is not as clearly segmentalized as that in the Japan, and therefore they depend on the impacts of the economies of scale. The loan-to-asset ratio has a significantly positive impact in 1% level.[164] This feature can also be seen in the results for the US commercial banks. The reason appears to be that the security market is developed and the financial institutions need to offer loans actively in order to compete against the securities companies. In addition, the S&Ls specify for the mortgage loans and the increase of these loans should be

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163 The Schwartz criteria indicated that the most favoured model is 1-way model in all markets.

164 It was not possible to collect data of branches in the US thrifts.

reflected directly in profitability.[165] With reference to fixed effect, there were significant cross-sectional results in all estimates. And periodical fixed effects were found in approximately half the cases.

Table 8.4 Empirical results of SCP hypothesis for the US mutual financial institutions with Bankscope data, Dependent variable: ln(1+ROA)

Asset	Normal	1-way	2-way	Normal	1-way	2-way
Constant	-0.339957**	-1.496736***	-1.187587***	-0.285042***	-1.07792**	-1.323516***
	(-2.044436)	(-5.253675)	(-2.91749)	(-1.834487)	(-4.498911)	(-3.981302)
CRA3	0.093737	0.454725**	-0.239562			
	(0.381121)	(2.562534)	(-0.304971)			
CRA5				-0.025823	0.009051	0.081419
				(-0.1191)	(0.063615)	(0.184533)
MSA	-0.344463	-0.050341	-0.196491	-0.338117	-0.042902	-0.177869
	(-0.511611)	(-0.061365)	(-0.230339)	(-0.500791)	(-0.051313)	(-0.208444)
lnAST	0.046026***	0.122982***	0.119654***	0.045706***	0.10658***	0.119471***
	(5.518737)	(7.275051)	(6.878943)	(5.506091)	(6.759971)	(6.870835)
ln LOAN/AST	0.478942***	0.34918***	0.385603***	0.479961***	0.343626***	0.386214***
	(9.98148)	(4.050016)	(4.423821)	(10.01944)	(3.963544)	(4.431867)
R2	0.101673	0.694926	0.697955	0.101577	0.692952	0.697938
Adj.R2	0.098723	0.632347	0.633831	0.098626	0.629968	0.633809
H0: η=0	—	9.665911***	9.715226***	—	9.573359***	9.714624***
H0: λ=0	—	—	1.684818	—	—	2.773014**
Schwartz.	0.802892	0.908724	0.933622	0.802999	0.915175	0.933681
F	34.46358	11.10474	10.88437	34.42711	11.00199	10.88346
Obs.	1223	1223	1223	1223	1223	1223

Note: (i) each figure below the coefficients is t-value., (ii) *** significant at 1%, ** significant at 5%, * significant at 10%

Table 8.5 Empirical results of SCP hypothesis for the US mutual financial institutions with Bankscope data, Dependent variable: ln(1+ROA)

Deposit	Normal	1-way	2-way	Normal	1-way	2-way
Constant	-0.451805	-1.582217***	-1.063687*	-0.414564	-1.77889***	-1.146726
	(-1.512624)	(-4.796035)	(-1.695974)	(-1.509542)	(-5.114903)	(-1.409659)
CRD3	0.41089	1.1169**	-0.651668			
	(0.534778)	(2.175703)	(-0.383889)			
CRD5				0.234331	1.036931***	-0.314382
				(0.441369)	(2.726533)	(-0.177193)
MSD	-0.478173	-0.007902	-0.181839	-0.481733	-0.018306	-0.180165
	(-0.678182)	(-0.008659)	(-0.191173)	(-0.682484)	(-0.020086)	(-0.189321)
lnAST	0.046738***	0.115307***	0.119705***	0.046802***	0.123815***	0.119529***
	(5.656903)	(7.125117)	(6.882031)	(5.640517)	(7.332695)	(6.873125)
ln LOAN/AST	0.478704***	0.345514***	0.386537***	0.478506***	0.350621***	0.386647***
	(9.992717)	(4.00794)	(4.439472)	(9.979306)	(4.070908)	(4.43958)
R2	0.101916	0.694376	0.697967	0.101849	0.695184	0.697933
Adj.R2	0.098967	0.631684	0.633846	0.098899	0.632658	0.633803
H0: η=0	—	9.635618***	9.712781***	—	9.67543***	9.711881***
H0: λ=0	—	—	1.997613*	—	—	1.528697
Schwartz.	0.802621	0.910526	0.933582	0.802696	0.907878	0.933697
F	34.55522	11.07598	10.885	34.52984	11.11826	10.8832
Obs.	1223	1223	1223	1223	1223	1223

Note: (i) each figure below the coefficients is t-value., (ii) *** significant at 1%, ** significant at 5%, * significant at 10%

165 In contrast, in the case of Japanese financial institutions, there was not a significant relationship between the loan-asset ratio and profitability. The reason might be the fact that the ratio of interest revenue to profitability is not as large as for the US financial institutions and the percentage of fee revenue such as transfer fee is important. Therefore it could be said that the Japanese mutual financial institutions strongly take on the role of the financial service network in the local area.

Table 8.6 Empirical results of SCP hypothesis for the US mutual financial institutions with Bankscope data, Dependent variable: ln(1+ROA)

Loan	Normal	1-way	2-way	Normal	1-way	2-way
Constant	-0.327045*	-1.169228***	-1.296823***	-0.376852**	-1.145986***	-1.385325***
	(-1.846594)	(-4.686377)	(-3.586798)	(-1.964115)	(-4.709825)	(-3.363249)
CRL3	0.076708	0.211296	0.012294			
	(0.243378)	(1.011593)	(0.020231)			
CRL5				0.16296	0.191252	0.179755
				(0.546277)	(0.956966)	(0.289845)
MSL	-0.284871	-0.118074	-0.429546	-0.262179	-0.135972	-0.416645
	(-0.451947)	(-0.147691)	(-0.530031)	(-0.415381)	(-0.170466)	(-0.514351)
lnAST	0.04533***	0.106575***	0.120029***	0.044939***	0.104064***	0.119822***
	(5.540337)	(6.790054)	(6.913891)	(5.467472)	(6.505319)	(6.898433)
ln LOAN/AST	0.482062***	0.351071***	0.387654***	0.483262***	0.352508***	0.387759***
	(10.00559)	(4.051418)	(4.452621)	(10.01995)	(4.059528)	(4.453968)
R2	0.101599	0.693298	0.697998	0.101775	0.693265	0.698023
Adj.R2	0.098648	0.630385	0.633883	0.098825	0.630346	0.633913
H0: η=0	—	9.589414***	9.718055***	—	9.585013***	9.717821***
H0: λ=0	—	—	2.614782*	—	—	2.647012*
Schwartz	0.802975	0.914047	0.93348	0.802778	0.914153	0.933397
F	34.43547	11.01991	10.88659	34.50202	11.01822	10.88789
Obs.	1223	1223	1223	1223	1223	1223

Note: (i) each figure below the coefficients is t-value., (ii) *** significant at 1%, ** significant at 5%, * significant at 10%

The following three tables, Table 8.7, Table 8.8 and Table 8.9, present the results for the US thrifts, using the logarithmic total revenue, lnREV, as the dependent variable. Most of the CR coefficients are significantly positive and the MS coefficients are insignificant in the 1-way model. Therefore they support the SCP hypothesis.[166] However, 2-way model with the lower value of Schwartz criteria shows that the coefficients of both CR and MS are insignificant. In addition, as the US thrifts are restricted with regard to their customers and products it is difficult for the de novo institution to compete with the existing institutions immediately. By considering the results of 2-way model and the features as mutual institution it is likely difficult to conclude that the government should intervene in the market of mutual institutions even if the SCP hypothesis is supported in 1-way model.

Significantly positive results are found with respect to the coefficients of total assets and the loan-asset ratio, just as in the case with ROA. The results of total assets indicates the merit of

166 On the other hand the most results on Japanese mutual financial institutions showed the efficiency hypothesis trend.

economies of scale to revenue, and those of loan-asset ratio show that high-risk behaviour in mutual institutions can lead to the high revenue. Even if collusive behaviour is reported, it does not necessarily mean that all market participants can not offer their business actively. In the case of the US, mutual financial institutions can attain higher profitability by offering loans more actively.

Table 8.7 Empirical results of SCP hypothesis for the US mutual financial institutions with Bankscope data, Dependent variable: lnREV

Asset	Normal	1-way	2-way	Normal	1-way	2-way
Constant	-3.119079***	-2.946101***	-2.642275***	-2.460624***	-1.501801***	-2.59489***
	(-21.11154)	(-14.59592)	(-9.065638)	(-17.31036)	(-8.256155)	(-11.27953)
CRA3	1.913409***	1.924409***	0.734821			
	(8.595752)	(13.62944)	(1.243478)			
CRA5				0.499648**	0.471814***	0.519824
				(2.486314)	(3.858798)	(1.566218)
MSA	2.522944***	-0.526653	-0.143397	2.934317***	-0.048429	-0.12802
	(4.148331)	(-0.795291)	(-0.223562)	(4.688795)	(-0.066779)	(-0.199615)
lnAST	0.948197***	0.939092***	0.955725***	0.938736***	0.875332***	0.955912***
	(129.1313)	(77.67669)	(82.79252)	(125.2831)	(71.86548)	(82.86309)
ln LOAN/AST	0.545715***	0.494051***	0.413931***	0.57062***	0.520643***	0.411798***
	(12.69611)	(7.506743)	(6.653803)	(12.94871)	(7.317466)	(6.624885)
R2	0.952578	0.987295	0.989059	0.949999	0.985227	0.989069
Adj.R2	0.952425	0.984742	0.986784	0.949838	0.982258	0.986795
H0: η=0	—	13.863666***	15.840218***	—	12.098565***	15.940969***
H0: λ=0	—	—	27.651694***	—	—	60.267723***
Schwartz.	0.614994	0.46649	0.351376	0.667941	0.617279	0.350497
F	6221.986	386.6755	434.6768	5885.146	331.8556	435.0635
Obs.	1244	1244	1244	1244	1244	1244

Note: (i) each figure below the coefficients is t-value., (ii) *** significant at 1%, ** significant at 5%, * significant at 10%

Table 8.8 Empirical results of SCP hypothesis for the US mutual financial institutions with Bankscope data, Dependent variable: lnREV

Deposit	Normal	1-way	2-way	Normal	1-way	2-way
Constant	-3.167886***	-2.201825***	-2.002791***	-3.953957***	-3.619032***	-2.581776***
	(-11.51756)	(-8.446365)	(-4.319238)	(-15.86511)	(-13.96193)	(-4.256616)
CRD3	2.536623***	2.025103***	-0.984893			
	(3.561394)	(4.596923)	(-0.770888)			
CRD5				3.628291***	3.58805***	0.560418
				(7.479613)	(11.5853)	(0.419581)
MSD	2.519701***	-0.639646	0.078435	2.314983***	-0.674286	0.100038
	(3.853236)	(-0.808555)	(0.10963)	(3.596818)	(-0.896807)	(0.139738)
lnAST	0.944758***	0.892975***	0.955788***	0.949714***	0.930756***	0.955303***
	(126.5652)	(71.58103)	(82.77232)	(128.7873)	(75.43114)	(82.73117)
ln LOAN/AST	0.565338***	0.501726***	0.411694***	0.552981***	0.500684***	0.413512***
	(12.83562)	(7.096924)	(6.623375)	(12.75903)	(7.451721)	(6.649665)
R2	0.950089	0.985316	0.989048	0.951757	0.986736	0.989044
Adj.R2	0.949928	0.982364	0.986771	0.951601	0.98407	0.986765
H0: η=0	—	12.170699***	15.989569***	—	13.379383***	15.913962***
H0: λ=0	—	—	58.452966***	—	—	36.127446***
Schwartz.	0.666134	0.61128	0.352359	0.632156	0.509557	0.352765
F	5896.353	333.8824	434.2454	6110.85	370.1664	434.067
Obs.	1244	1244	1244	1244	1244	1244

Note: (i) each figure below the coefficients is t-value., (ii) *** significant at 1%, ** significant at 5%, * significant at 10%

Table 8.9 Empirical results of SCP hypothesis for the US mutual financial institutions with Bankscope data, Dependent variable: lnREV

	Normal	1-way	2-way	Normal	1-way	2-way
Constant	-2.651873***	-1.696092***	-2.590099***	-2.032289***	-1.19188***	-2.454077***
	(-16.30523)	(-8.902255)	(-10.17107)	(-11.47991)	(-6.340956)	(-8.300784)
CRL3	0.977419***	0.884645***	0.579124			
	(3.351062)	(4.95282)	(1.266554)			
CRL5				-0.422911	-0.315677*	0.209253
				(-1.527261)	(-1.833801)	(0.448115)
MSL	2.654449***	-0.003303	-0.157179	2.398539***	-0.930153	-0.191433
	(4.552809)	(-0.004784)	(-0.257926)	(4.093535)	(-1.336819)	(-0.314054)
lnAST	0.940462***	0.877779***	0.955738***	0.942912***	0.883441***	0.955867***
	(127.5931)	(72.71952)	(82.99686)	(126.931)	(71.22963)	(82.91444)
ln LOAN/AST	0.554132***	0.531375***	0.413036***	0.548865***	0.488569***	0.413041***
	(12.53634)	(7.506175)	(6.649969)	(12.3561)	(6.806498)	(6.645348)
R2	0.950125	0.985368	0.98906	0.949767	0.98507	0.989045
Adj.R2	0.949964	0.982427	0.986785	0.949605	0.982069	0.986767
H0: η=0	—	12.220427***	15.941233***	—	11.996399***	15.934728***
H0: λ=0	—	—	57.877726***	—	—	62.235011***
Schwartz.	0.665431	0.607697	0.351281	0.672573	0.627878	0.352643
F	5900.718	335.0986	434.7189	5856.522	328.3045	434.1204
Obs.	1244	1244	1244	1244	1244	1244

Note: (i) each figure below the coefficients is t-value., (ii) *** significant at 1%, ** significant at 5%, * significant at 10%

8.1.1.3. Analysis on the SCP and efficiency approach in the US financial institutions

To sum up, although the market structure of the US commercial banks shows mixed results, there is a certain amount of support for the efficiency hypothesis. In contrast, it was found with the US thrifts that estimated results both using ROA and REV strongly supported the SCP hypothesis. As both the Japanese commercial banks and mutual financial institutions follow the efficiency hypothesis, it is possible to say that the US financial institutions have a totally different market structure. It is difficult to conclude, however, that the SCP hypothesis for the US thrifts comes only from collusive behaviour, because the US S&Ls are restricted with regards to their customers and financial products. In other words it appears that these specialities of mutual institutions could make it difficult for there to be competitive conditions.

8.1.2. Analysis on the US financial institutions using Panzar-Rosse H-statistics

This section discusses the market competitiveness in the US commercial banks and thrifts such as the S&Ls and credit unions.

8.1.2.1. Panzar-Rosse H statistics for the US commercial banks

Table 8.10 shows the estimated results of H statistics on the US commercial banks. The coefficients of input prices, PL, PK and PF, are significant in almost all estimates. The H statistics, being defined as sum of the coefficients of these three inputs, are indicated in the fourth block from the bottom. The H statistics in the pooled, 1-way and 2-way models are 0.67, 0.71 and 0.70 respectively. The most preferred specification is 2-way model, and therefore the H statistics is 0.70. If the H statistics is equal to 1, it is defined that the market is in perfect competition. Therefore it can be said that the market competitiveness of the US commercial banks is in the monopolistic competition and the competitive level is relatively high.

As for the other control variables, it is shown that the coefficients of DEP/AST are significantly negative in the 2-way model. This is employed in order to consider the cost size and the cost ratio (deposit ratio) and they have negative impacts on profitability.

Table 8.10 Empirical results of H statistics of the US commercial banks with Bankscope data

	Normal	1-way Fixed Effects	2-way Fixed Effects
Constant	0.303805***	-0.07256	-1.14183***
	(3.735448)	(-0.405353)	(-5.247047)
lnPL	0.01748	0.138738***	0.222089***
	(1.30463)	(7.585362)	(11.4858)
lnPK	0.487786***	0.335462***	0.329255***
	(54.44829)	(20.65991)	(20.85632)
lnPF	0.163986***	0.232559***	0.146685***
	(19.59698)	(29.38807)	(13.58956)
lnAST	0.993648***	0.944273***	0.984679***
	(322.1082)	(76.7371)	(73.32015)
DEP/AST	-0.27086***	-0.00912	-0.26677***
	(-5.083224)	(-0.122436)	(-3.535698)
LOAN/DEP	-0.00495***	-0.00136	-0.00118
	(-3.312623)	(-0.911874)	(-0.820698)
R^2	0.985006	0.995756	0.996126
R^2 adj.	0.984954	0.994749	0.995186
H0: η=0	—	F(325,1395) =10.87135***	F(325,1389) =11.51633***
H0: λ=0	—	—	F(6,1389) =22.11608***
H-stat	**0.669252**	**0.706758**	**0.69803**
H_0:H=0	F(1, 1720) =1058.57***	F(1, 1395) =850.6454***	F(1, 1389) =893.5971***
H_0:H=1	F(1, 1720) =258.5441***	F(1, 1395) =146.4397***	F(1, 1389) =167.2334***
Schwartz.	-0.036618	0.104082	0.038738
F	18832.68	988.7989	1059.794
Obs.	1727	1727	1727

Note: (i) each figure below the coefficients is t-value., (ii) *** significant at 1%, ** significant at 5%, * significant at 10%

Table 8.11 presents the results of E statistics. Similar to the H statistics, E statistics are defined as the sum of the inputs such as PL, PK and PF in the case using the return on assets as a dependent variable. If the value of E statistics is statistically zero, 0, it assumes that the market is in long-term equilibrium. However, if the null hypotheses of E=0 is statistically rejected, it means that the market has not attained market equilibrium. With respect to the US commercial banks, the F-tests for all three specifications rejected the null hypothesis H=0 and it suggested that the idea of long-term market equilibrium should be reflected.

During the sample period the US economy was experiencing favourable conditions and it can be expected that the financial market was also active. This is likely to be the main reason that the degree of market competition in Table 8.10 is a temporary result. However, if it is the case that both the drastic movement of the market and the high level of market competition occur due to the favourable economy, it is possible to explain all features consistently. That is, in the favourable economic circumstances the US commercial banks can develop a high profit structure by actively offering their services. In the meantime, however, the de novo banks would gradually increase in number and the level of competition could become high. Accordingly it could be said that the market would be in a state of disequilibrium.

Table 8.11 Empirical results of E statistics of the US commercial banks with Bankscope data

	Normal	1-way Fixed Effects	2-way Fixed Effects
Constant	2.455928***	1.347205***	1.076631***
	(22.96864)	(5.293625)	(3.384062)
lnPL	-0.07805***	0.122916***	0.154138***
	(-4.433615)	(4.874745)	(5.543328)
lnPK	0.136833***	-0.02107	-0.01958
	(11.58013)	(-0.854801)	(-0.785511)
lnPF	-0.00917	-0.01684	-0.05485***
	(-0.828896)	(-1.486487)	(-3.34489)
lnAST	0.003686	-0.04137**	-0.03435*
	(0.908182)	(-2.320408)	(-1.71204)
DEP/AST	-0.98628***	-0.6775***	-0.79692***
	(-14.04392)	(-6.496871)	(-7.235314)
LOAN/DEP	-0.00602***	-0.01202***	-0.01166***
	(-3.082902)	(-5.884357)	(-5.675949)
R^2	0.250582	0.766389	0.768667
R^2 adj.	0.24795	0.710478	0.712052
H0: η=0	—	F(325,1383) =9.395776**	F(325,1377) =9.451744***
H0: λ=0	—	—	F(6,1377) =2.26002**
E-stat	**0.049609**	**0.085011**	**0.079709**
H_0:E=0	F(1,1708) =3.306152*	F(1,1383) =5.874042***	F(1, 1377) =5.132933**
Schwartz.	0.497704	0.743335	0.75959
F	95.18376	13.70725	13.57703
Obs.	1715	1715	1715

Note: (i) each figure below the coefficients is t-value., (ii) *** significant at 1%, ** significant at 5%, * significant at 10%

8.1.2.2. Panzar-Rosse H statistics for the US mutual financial institutions

Table 8.12 shows the empirical result of H statistics for the thrift institutions in the USA. As the figures of adjusted R^2 are between 0.983 and 0.994, this model is shown to fit extremely well for the

US thrifts. In terms of the variables, many coefficients, in both cases with and without the fixed effects, are significant in 1% level.[167] The H statistics, which are the sum of the lnPL, lnPK, and lnPF, are represented in the fourth section from the bottom on the table. The values of the H statistics range from 0.563 to 0.633. The most favoured specification with regards to Schwartz criteria is 1-way model and its H statistics is 0.577. It is therefore the case that the market condition of the US thrift institutions is in monopolistic competition.[168] It can be reported that the market competition in the US mutual financial institutions is slightly lower than that in the US commercial banks. However, the US thrifts are experiencing much greater competition than Japanese mutual financial institutions. As in the case of commercial banks, it appears that the favourable economic conditions induce the de novo entrants and increase the level of competition. In addition some of the S&Ls have demutualised since the S&L crisis in the 1980s. It is possible that these stock-formed S&Ls might raise the level of market competition through active management.

As for the other control variables, lnAST is significantly positive, as in the case of Japan. Most of the DEP/AST are significantly positive although they are nearly zero, which is different from the situation in Japan.

167 However, as for the case of US savings banks, the enough data for the number of branches could not be collected from Bankscope.

168 Both tests on the null hypothesis that H=0 and H=1 are significantly rejected. These results are indicated below the columns of the H statistics.

Table 8.12 Empirical results of H statistics of the US mutual financial institutions with Bankscope data

	Normal	1-way Fixed Effects	2-way Fixed Effects
Constant	-0.587952***	0.121341	-0.24519
	(-5.974561)	(0.811784)	(-1.213948)
lnPL	0.055289***	0.000502	0.023294
	(2.983465)	(0.022824)	(0.96145)
lnPK	0.27593***	0.236784***	0.234991***
	(33.02368)	(17.18555)	(17.15641)
lnPF	0.302272***	0.339429***	0.304234***
	(24.84373)	(30.20479)	(18.49751)
lnAST	0.997166***	0.957459***	0.968196***
	(223.2188)	(95.01948)	(88.41509)
DEP/AST	6.43E-10**	2.21E-09**	1.87E-09**
	(2.211527)	(2.383468)	(2.015629)
LOAN/DEP	-0.045877***	-0.03987***	-0.03677***
	(-9.064947)	(-6.735976)	(-6.193676)
R^2	0.982723	0.993998	0.994123
R^2 adj.	0.982632	0.992845	0.99295
H0: η=0	—	F(178,958) =10.10958***	F(178,952) =9.942906***
H0: λ=0	—	—	F(6,952) =3.3689***
H-stat	**0.63349**	**0.576715**	**0.56252**
H_0:H=0	F(1, 1136) =601.694***	F(1, 958) =384.5979***	F(1, 952) =340.3011***
H_0:H=1	F(1, 1136) =201.403***	F(1, 958) =207.1815***	F(1, 952) =205.8279***
Schwartz.	-0.508996	-0.469667	-0.453714
F	10769.65	862.2376	847.5041
Obs.	1143	1143	1143

Note: (i) each figure below the coefficients is t-value., (ii) *** significant at 1%, ** significant at 5%, * significant at 10%

From the results of the H statistics estimates, it can be seen that the monopolistic level of competition is slightly higher than in the case of Japanese cooperative institutions. However, as noted before, it is hard to conclude that the value of H statistics is accurate, unless the E statistics estimate for each model is accepted. The results of the E statistics for the US thrifts are shown in Table 8.13. The F-tests (η=0 and λ=0) reject the pooled OLS and favoured the fixed effect models. In both 1-way and 2-way fixed effect model, the E statistics were -0.24 and -0.23, and the null hypothesis, E=0, were both rejected in 1% significant level.[169] This means that the market of the US thrifts is in a state of inequilibrium. Therefore, as a result, as with the Japanese cooperative financial institutions, it is not possible to conclude clearly from this static model that the result in Table 8.12 is accurate.

The fact that the market of the US thrifts does not attain equilibrium might derive from the

[169] The 1-way model has the lower value of Schwartz criteria and favoured as the robust result.

favourable economic conditions in the US in the sample period. In particular it is certainly to be expected that there were many new entrants to the S&L industry since the market in mortgage loans was popular.

Table 8.13 Empirical results of E statistics of the US mutual financial institutions with Bankscope data

	Normal	1-way Fixed Effects	2-way Fixed Effects
Constant	-0.969039***	-0.44419	-1.09531***
	(-5.47358)	(-1.556619)	(-2.895713)
lnPL	0.102207***	-0.05284	0.005389
	(3.030948)	(-1.260598)	(0.115697)
lnPK	-0.020398	-0.14982***	-0.15421***
	(-1.305622)	(-5.412492)	(-5.587946)
lnPF	-0.034006	-0.0396*	-0.07732**
	(-1.543667)	(-1.86602)	(-2.493874)
lnAST	0.071597***	0.036592*	0.056104***
	(8.867859)	(1.868552)	(2.681464)
DEP/AST	-1.81E-09***	2.80E-09	2.25E-09
	(-3.468022)	(1.636264)	(1.313106)
LOAN/DEP	0.02899***	-0.0096	-0.00596
	(3.201271)	(-0.871851)	(-0.538611)
R^2	0.104727	0.670143	0.67604
R^2 adj.	0.099922	0.605575	0.610138
H0: η=0	—	F(178,940) =9.052101***	F(178,934) =9.06819***
H0: λ=0	—	—	F(6,934) =2.833592***
E-stat	**0.047803**	**-0.24225**	**-0.22614**
H_0:E=0	F(1, 1118) =0.99649	F(1, 940) =17.57566***	F(1, 934) =14.34986***
Schwartz.	0.651139	0.764267	0.783697
F	21.79684	10.37889	10.25826
Obs.	1125	1125	1125

Note: (i) each figure below the coefficients is t-value., (ii) *** significant at 1%, ** significant at 5%, * significant at 10%

As the market of the US thrifts did not attain equilibrium, the estimated H statistics can be seen as provisional results, which is same as the case of commercial banks. Although the results are only provisional, it is nevertheless indicated that there is greater competition in the market of the US thrifts than in that of the Japanese mutual financial institutions.

To sum up, due to the inconclusive results in the equilibrium test, from this model it was difficult to come to a firm conclusion regarding which of the two countries, the US or Japan, has the more competitive market. However, as provisional conclusion, the Panzar-Rosse H statistics showed that both Japanese and the US mutual financial institutions have monopolistic competitive market – 0.40 for Japan, and 0.577 for the US.

8.1.2.3. Analysis on the H statistics in the US financial institutions

The market competitiveness of the US financial institutions ranged 0.67-0.71 for commercial banks and 0.56-0.63 for mutual financial institutions. In contrast those of the Japanese institutions were 0.77-0.96[170] for commercial banks and 0.40-0.44 for mutual institutions.

With respect to market competition, the difference in the US between commercial banks and mutual institutions is smaller than in Japan. Both US financial institutions have high level of monopolistic competitive condition. In contrast the gap in Japan between commercial banks and mutual institutions is very different: commercial banks are in a state of highly monopolistic competition (one of the results showed the perfect competition), while mutual institutions are in the relatively low-level monopolistic competition. These results suggest that the Japanese financial system classifies the business category more clearly than the US financial system. The US financial institutions have to compete not only with the same kind of institutions but also with the other financial institutions such as security companies, and therefore they offer their lending services actively. In addition, it is also possible that the economic boom in the US caused the high number of new entrants into the market and the high level of competition.

8.2. Cost structure in the US financial institutions

Having already analysed market structure, the following section of this thesis will discuss cost

[170] The 1-way model with H statistics 0.96 does not reject the null hypothesis H=0.

structure, in particular the cost efficiency of the US commercial banks and mutual financial institutions (savings and loan institutions and credit unions).

8.2.1. Cost structure in the US commercial banks

8.2.1.1. Cost efficiency in the US commercial banks

a. Time series movement of cost efficiency in the US commercial banks

Table 8.14 shows the movement of average values and standard deviations of cost efficiency from 2001 to 2005, the average value being 0.91. It is found that the cost efficiency of US commercial banks is significantly higher than that of Japanese commercial banks (0.530). As the best practice frontiers are different between them, it is impossible to compare these results directly. However it could be argued that commercial banks in the US are more cost efficient than in Japan. One of the reasons seems to be that the number of the US commercial banks is much larger than Japan and that the market for the US commercial banks is more competitive.[171, 172] In addition, although the total land area of the US is extremely large, the average amount of land per commercial bank is smaller, which tends to lead to more competitive market systems and affects the cost structure of commercial banks. In fact the number of population per commercial bank is 74,144 in Japan, but 42,510 in the US. Although the savings banks are not included, it is clear that the number of commercial banks in the US is much larger than in Japan. The average amount of land per commercial bank also shows the same feature as follows: 3,258 km^2 in Japan and 1,300 km^2 in the USA.

As regards the time-series results of cost efficiency, the average cost efficiencies had increased since 2001. The main difference between the US and Japan in this period is that Japan suffered from the depression, while the US economy grew.[173] In fact the GDP values in the US were

171 The total number of commercial banks in the US is 7,402. The National chartered banks and State chartered banks number 1,715 and 5,687 respectively (as of 31.12.2006).

172 The number of total population in Japan is 127,156,200 in 2009 and the total area of the national territory is 377,923km^2. As for the US, its population is 314,658,800 in 2009 and its total area is 9,629,091km^2. (Source: United Nation web-site: http://unstats.un.org/unsd/demographic/products/socind/population.htm)

173 However the US economy has drastically contracted since the subprime loan crisis in 2007.

positive. As the cost efficiencies in Japanese financial institutions have declined, it could be said that there is a positive effect between the cost efficiency of financial institutions and the economic conditions.

Table 8.14 Time series movement of cost efficiency of the US commercial banks from 2001 to 2005

Year	Cost efficiency (Ave.)	Standard Deviations	Real GDP (%)
2001	0.9054***	(0.0166)	1.1
2002	0.9060***	(0.0173)	1.8
2003	0.9067***	(0.0172)	2.5
2004	0.9075***	(0.0170)	3.6
2005	0.9080***	(0.0169)	3.1
2001-2005	0.9067***	(0.0170)	3.0

Source: National Economic Analysis in the department of Commerce.

Note: *** refers to the fact that it is significantly different from 1 at 1% level with t-value, ** significant at 5% and * significant at 10%, respectively.

b. Cost efficiency of the US commercial banks with respect to asset size

With respect to the asset size group, the cost efficiencies of the US commercial banks range between 0.88 and 0.94 in Table 8.15. The trend indicates the average cost efficiency increases following an increase in asset size. This feature was not presented in the results of Japan.[174] This means that small banks conduct their business further away from the minimum cost on the best cost frontier. A possible reason from this is that the main customers are different between small and large banks. If large sized banks focus mainly on large firms, the banks can recover loans easily.

174 Hunter and Timme (1995), however, found the same feature – cost efficiency in commercial banks increases with asset size.

Table 8.15 Cost efficiency of the US commercial banks with respect to asset size (2001-2005)

Asset size (100 million,USD)	Cost efficiency (Ave.)	Standard Deviations	Maximum cost efficiency	Minimum cost efficiency	No. of observations
0-0.249	0.8792***	(0.0207)	0.9080	0.7865	156
0.25-0.49	0.8921***	(0.0069)	0.9193	0.8287	217
0.5-0.99	0.8989***	(0.0067)	0.9231	0.8711	210
1.0-1.99	0.9063***	(0.0043)	0.9228	0.8925	183
2.0-3.99	0.9112***	(0.0042)	0.9275	0.8843	225
4.0-6.99	0.9154***	(0.0050)	0.9284	0.8910	175
7.0-99.99	0.9245***	(0.0061)	0.9371	0.9060	309
100+	0.9387***	(0.0027)	0.9425	0.9333	35

Note: *** refers to the fact that it is significantly different from 1 at 1% level with t-value, ** significant at 5% and * significant at 10%, respectively.

8.2.1.2. Analysis of the cost structure of US commercial banks

As for the cost efficiency of the US commercial banks, it was found that the US commercial banks have more efficient cost structure than Japan.[175] It appears that there are many banks in the US, compared to Japan, contributing to perform the market power properly. Also, as reported in Kunt and Revine (1999), the US commercial banks belong to the market-based financial system. Therefore they are required to compete with security companies so that there is a strong effect to the high cost efficiency.

The time-series results exhibited that the high cost efficiency of commercial banks is caused by the steady economy. This result is consistent of the case of Japan.

Also, there were the features that cost efficiency is positively connected with the asset size. It might be true that there are larger wasting works in the company, increasing its size. However large sized commercial banks would focus only on the large and prime customers, and they can recover their loan funds easily. Therefore they could bring about the high cost efficiency.

175 It was not possible to measure the economies of scale for the US commercial banks significantly.

8.2.2. Cost structure in the US mutual financial institutions

8.2.2.1. Cost efficiency in the US thrifts

a. Time series movement of cost efficiency in the US thrifts

Table 8.16 shows the cost efficiency of US mutual financial institutions. The average value in 1999-2005 is 0.866 and it is much larger than that of commercial banks.[176] Although commercial banks are profit-making firms, they have quite low cost efficiency. The mutual financial institutions analysed in this paper are saving and loan institutions (S&Ls) and their main business with their customers is mortgage loans. In other words, by targeting customers with specific financial products, financial institutions can receive more detailed information about customers, which contributes to greater cost efficiency.

Cost efficiencies declined from 0.891 in 2000 to 0.845 in 2004, which shows a gradual slide towards cost inefficiency on the part of the US mutual financial institutions. Also, the amount of total assets gradually increased.[177] Therefore it can be seen that the economic boom leads to increased assets and induces a decrease in cost efficiency. That is, the institutions with a surplus tend to have high risk and waste behaviour, which induces a decline in cost efficiency. Another reason is likely to be the impacts of mergers and the de-mutualizations since the 1990s. In terms of regulations, many restructuring policies have been carried out in S&Ls in order to recover from the financial crisis. These changes have caused mergers and the de-mutualizations in the S&Ls. It appears that the disturbance caused by these changes is connected with the decrease in cost efficiency.

176 This relationship between commercial banks and mutual financial institutions can be seen in the case of Japan.
177 The number of samples in this period did not change in 158 institutions.

Table 8.16 Time series movement of cost efficiency of the US thrifts from 1999 to 2005

Year	Cost efficiency (Ave.)	Standard Deviations	Asset (Ave.)
1999	0.8773***	(0.0432)	3,299,941
2000	0.891***	(0.0431)	3,869,683
2001	0.8819***	(0.0504)	4,549,495
2002	0.8577***	(0.0597)	5,171,229
2003	0.8548***	(0.0613)	5,557,021
2004	0.8456***	(0.0802)	6,605,949
2005	0.8507***	(0.0821)	7,575,538
1999-2005	0.8655***	(0.0638)	5,232,694

Note: (i) Asset: 100 thousand, USD. (ii) *** refers to the fact that it is significantly different from 1 at 1% level with t-value, ** significant at 5% and * significant at 10%, respectively.

b. Cost efficiency in the US thrifts with respect to asset size

The cost efficiencies of the US S&Ls for the different categories of asset size are distributed between 0.85 and 0.88, as shown in Table 8.17. However, there appears not to be a clear relationship between cost efficiency and asset size. Every group has the same level of cost efficiency and there are not significant impacts from mergers or the economic boom. Essentially it is expected that cost efficiency increases after a certain period of mergers, the reason being that the disturbance of the merger process is contained within a certain period, after which the organization in question will be restructured. Nevertheless, no such trend is visible in the case of US mutual financial institutions. It appears that the economic boom after the S&L crisis led to a surplus and it did not precipitate the proper restructuring in the S&Ls.

Table 8.17 Cost efficiency of the US thrifts with respect to asset size (1999-2005)

Asset size (million,USD)	Cost efficiency (Ave.)	Standard Deviations	No. of observations
0-39.9	0.8516***	(0.0584)	134
40.0-49.9	0.8751***	(0.0427)	104
50.0-69.9	0.8624***	(0.05)	168
70.0-89.9	0.8611***	(0.049)	119
90.0-119.9	0.8688***	(0.0581)	102
120.0-199.9	0.8794***	(0.0504)	157
200.0-399.9	0.8743***	(0.0506)	107
400.0-999.9	0.8614***	(0.0715)	102
1000.0+	0.8532***	(0.1172)	113

Note: *** refers to the fact that it is significantly different from 1 at 1% level with t-value, ** significant at 5% and * significant at 10%, respectively.

8.2.2.2. Economies of scale in the US thrifts

a. Time series movement of economies of scale in the US thrifts

The time series change in the US thrifts is represented in Table 8.18. The average economies of scale are almost stable for 7 years at around 0.94, and there are significant cost reducing effects. The difference between the maximum and minimum values decreases gradually. However, as the standard deviation does not become small, it was not found that there were large systemic changes in this period. To sum up, although the size of total assets increases due to the mergers and the economic boom, this does not necessarily affect cost reduction by economies of scale. It is likely that the disturbances in the S&Ls caused by the mergers have already finished.

Table 8.18 Time series movement of output elasticity of the US thrifts from 1999 to 2005

Year	Output elasticity (Ave.)	Standard Deviations	Maximum output elasticity	Minimum output elasticity	Asset (Ave.)
1999	0.9391***	(0.0154)	0.9825	0.8571	3,299,941
2000	0.9407***	(0.0125)	0.9844	0.8741	3,869,683
2001	0.9408***	(0.0136)	0.9879	0.8717	4,549,495
2002	0.9403***	(0.0149)	0.9872	0.855	5,171,229
2003	0.9403***	(0.0135)	0.9866	0.8666	5,557,021
2004	0.9396***	(0.0137)	0.9882	0.8641	6,605,949
2005	0.9398***	(0.0129)	0.9877	0.8972	7,575,538
1999-2005	0.9401***	(0.0138)	0.9882	0.855	5,232,694

Note: *** refers to the fact that it is significantly different from 1 at 1% level with t-value, ** significant at 5% and * significant at 10%, respectively.

b. Economies of scale on the US thrifts with respect to asset size

The estimated economies of scale for the US thrifts, savings and loan institutions, are shown in Table 8.19. The results of cost efficiency by asset size showed there were not significant differences. However, it was found the large S&Ls have small cost-reducing effects (large value of output elasticity) of economies of scale. The largest economy of scale was in the group with 0-39.9 million dollars (0.928), and the smallest in the group with more than 1 billion dollars (0.955). This result is different from that obtained from credit cooperatives in Japan, but similar to that of the credit associations. Also, the output elasticity of credit associations was 0.947 – almost the same level as the S&Ls.

The fact that the increase in asset size leads to smaller effects of economies of scale might show that there were many mergers and consolidations after the S&L crisis in the large institutions. It seems that the cost-reducing effects from mergers have already been depleted and are currently decreasing.

Table 8.19 Output elasticity of the US thrifts with respect to asset size (1999-2005)

Asset size (million,USD)	Output elasticity (Ave.)	Standard Deviations	Maximum output elasticity	Minimum output elasticity
0-39.9	0.928***	(0.0183)	0.9668	0.855
40.0-49.9	0.9367***	(0.0087)	0.9578	0.9125
50.0-69.9	0.9366***	(0.0058)	0.9524	0.9196
70.0-89.9	0.9371***	(0.0083)	0.9605	0.9083
90.0-119.9	0.9385***	(0.012)	0.9583	0.8571
120.0-199.9	0.9415***	(0.009)	0.9659	0.9028
200.0-399.9	0.9444***	(0.0067)	0.9577	0.9167
400.0-999.9	0.9468***	(0.0139)	0.9724	0.8603
1000.0+	0.9554***	(0.0179)	0.9882	0.8972
All	0.9401***	(0.0138)	—	—

Note: *** refers to the fact that it is significantly different from 1 at 1% level with t-value, ** significant at 5% and * significant at 10%, respectively.

8.2.2.3. Analysis of cost structure of the US mutual financial institutions

There seem to be two economic factors that had some impact on the cost structure of S&Ls in the US. The first is the effect of mergers after the S&L crisis. In the S&L industry many restructuring processes have been operated since the second half of 1990s, and the mergers and the de-mutualization of S&Ls are adopted as one of these processes. It is important to discuss the relations of these processes with cost structures. The second factor is the influences of the economic boom since 2000. An economic boom brings about surplus revenue and financial institutions do not have to pursue economies of scale. Therefore the performance of such institutions tends to be negligent and tends to reduce cost efficiency.

The result for cost efficiency in the time series showed that the effect of cost efficiency decreased gradually. One of the reasons seems to be the excess costs by the rough performance caused in the economic boom. Another reason for the decrease in cost efficiency is likely the disturbance caused by mergers.

However, with respect to economies of scale, there were no clear time series changes. A possible explanation for this is that the period of upheaval caused by mergers had already finished and the merging procedures have become stable. To sum up, it was found that the cost structure of S&Ls represents features of economic boom in the S&L industry.

Also, the results of cost efficiency for each category of asset size indicated that the impact of an economic boom outweighs that of the disturbance of mergers. All asset classes stood at almost the same level of cost efficiency and there were no clear relationship with asset size. In general it is expected that the cost efficiency would increase after a certain period of the mergers due to the restructuring effect. However, the estimated results on this paper did not show such features. It appears that the economic boom after the S&L crisis induced some extra profits and financial institutions did not have to carry out the organizational restructuring. To survive in the depression since 2007, many S&Ls have needed to properly complete the restructuring process which should have been concluded in the 1990s.

In contrast, as for the results of economies of scale for every category of asset size, there still exist the effects of mergers. In fact it was found that larger asset groups have smaller effects of economies of scale. It is therefore the case that mergers can be carried out in the large asset class. The effects to reduce the cost by mergers have been depleted and the larger asset classes have currently lower effect (larger score).

8.2.3. Conclusion: Cost efficiency and Economies of scale in the US financial industry

As for the cost efficiency, commercial banks indicate about 0.91, which means that they highly attain the optimal cost efficiency. The US thrifts, in contrast, report a cost efficiency value of around 0.87, and can also complete highly the optimal level. It is difficult to compare these values directly since the best efficient frontiers for them are different. It appears, however, that both the US commercial banks and thrifts can manage at positions near the frontier.

It could be responsible for these results that the market pressure exerts properly due to the strong market competition, and that the US economy in the sample period was stable.

Table 8.20 Time series movement of cost efficiency and standard deviations for the US commercial banks and thrifts from 1999 to 2005

Year	Commercial banks	Commercial banks (S.D.)	Thrifts	Thrifts (S.D.)
1999	n.a.	n.a.	0.8773***	(0.0432)
2000	n.a.	n.a.	0.891***	(0.0431)
2001	0.9054***	(0.0166)	0.8819***	(0.0504)
2002	0.9060***	(0.0173)	0.8577***	(0.0597)
2003	0.9067***	(0.0172)	0.8548***	(0.0613)
2004	0.9075***	(0.0170)	0.8456***	(0.0802)
2005	0.9080***	(0.0169)	0.8507***	(0.0821)
1999-2005 or 2001-2005	0.9067***	(0.0170)	0.8655***	(0.0638)

Note: *** refers to the fact that it is significantly different from 1 at 1% level with t-value, ** significant at 5% and * significant at 10%, respectively.

In terms of economies of scale, the results are extremely different from those for cost efficiency. In general, increasing returns to scale should exist if the value is less than 1. Therefore it is shown from the estimated results that there are significant effects of economies of scale in both commercial banks and thrifts. The average value for thrifts is 0.94. They can obtain, on average, a cost reducing effect of about 6% for every 1% increase in production.

The fact that the economies of scale of mutual financial institutions are relatively small can be explained by focusing on their features that they are restricted with regard to their customers, as well as the case of cost efficiency. Thrifts limit their customers to a certain amount of area, so that they need to collect accurate information on customers in order to hedge credit risks. However, there are large extents of informational asymmetry in their customers, and it is difficult to decrease marginal and average costs even if the organizational size is increased. Although small cost reducing effects can be shown in the part of fixed costs, it is expected that most of the other costs, such as the costs for information producing, would not decrease. If they try to increase their business area, there is a possibility that the quality of services provided to the original customers will deteriorate. As a result, the value of economies of scale becomes relatively small.

Table 8.21 Time series movement of output elasticity for the US thrifts from 1999 to 2005

Year	Thrifts	Standard Deviation
1999	0.9391***	(0.0154)
2000	0.9407***	(0.0125)
2001	0.9408***	(0.0136)
2002	0.9403***	(0.0149)
2003	0.9403***	(0.0135)
2004	0.9396***	(0.0137)
2005	0.9398***	(0.0129)
1999-2005	0.9401***	(0.0138)

Note: *** refers to the fact that it is significantly different from 1 at 1% level with t-value, ** significant at 5% and * significant at 10%, respectively.

8.3. Conclusion: US mutual financial institutions

As for the market structure of the US financial industry, commercial banks show a weak efficiency hypothesis. In contrast, thrifts such as S&Ls show results consistent with the SCP hypothesis in some estimates. In comparison with the case in Japan, where both commercial banks and mutual financial institutions support the efficiency hypothesis, the US market structure is clearly different. It could be suggested, however, that these results represent the feature as the self-helping institution or as the membership-based organization properly.

In terms of the estimated results of H statistics for the US financial institutions, commercial banks have values ranging from 0.67 to 0.71, while thrifts display 0.56 to 0.63. These results suggest that commercial banks are in a more competitive market than mutual financial institutions. The results for Japanese financial institutions range from 0.77 to 0.96 for commercial banks, and from 0.40 to 0.43 for mutual financial institutions. In the comparisons between commercial banks, Japan has a more competitive market than the US. Nevertheless, the comparison for mutual financial institutions shows greater competition in the US than in Japan. The difference in the levels of competition experienced by US commercial banks and mutual institutions therefore appears smaller than in Japan.

The fact that the US thrifts need to compete fiercely with other financial institutions might induce a shift in their main lending methodology from relationship lending to transaction lending, existence of self-helping financial institutions. In contrast, as the Japanese differences between commercial banks and mutual institutions are relatively large (0.37-0.53), it is possible that the market is clearly segmentalized and that the mutual financial institutions can properly offer relationship-based lending services.

These findings are broadly consistent with the results regarding market structure in the previous section, except for the case of mutual financial institutions in Japan. In accordance with the clear result of the efficiency hypothesis, commercial banks in Japan are expected to experience more intense competition while those in the US are expected to face less competition. As the US thrifts support the SCP hypothesis, their degree of market competition is expected to be lower. As for the mutual financial institutions in Japan, as the efficiency hypothesis is partially supported, it is expected that the market competition could be relatively higher. Nevertheless, the mutual institutions in Japan provided only unexpected results, with lower values than those for the US thrifts.

The unexpected results for the Japanese mutual institutions might be caused by the fact that the main financial products by the mutual institutions in the two countries are different. In fact, both the US S&Ls, and the Japanese credit associations and cooperatives take the same organizational form as mutual financial institutions. However, the S&Ls offer stable services such as mortgage loans, while credit associations and cooperatives mainly supply low-profit services such as consumer loans. It could be said that these differences are revealed in the market structure.

In order to confirm the feature of the market structure, the next section considered the cost structure.

The cost efficiency of the US commercial banks provided to be approximately 0.91, while that of the US thrifts was approximately 0.87. The cost efficiencies of the commercial banks, credit associations and cooperatives in Japan were 0.53, 0.74 and 0.75 respectively. With respect to commercial banks, it appears that there is a large difference between Japan and the US. It could be possible to explain by considering the feature of financial system, bank- or market base. In contrast, credit associations and cooperatives in Japan and the US S&Ls are approximately 70-80% cost efficient and these are the same level.[178] To sum up, the cost efficiencies of mutual financial institutions could be in the same level, reflecting the point that they are similarly restricted with regards to their customers, geographical area and financial products.

As for the economies of scale in the US financial institutions, the average value for the S&Ls is about 0.94 meaning they have the possibility of reducing costs by 6% when increasing their production by 1%. In contrast, the Japanese commercial banks, credit associations and cooperatives have values of 0.73, 0.95 and 0.58 respectively. As well as cost efficiency, the credit associations in Japan and the US S&Ls have similar and high impacts of economies of scale. In addition, if the commercial banks in Japan are considered as the benchmark, it appears that commercial banks have relatively greater effects of economies of scale than mutual financial institutions.

The fact that mutual financial institutions such as the S&Ls and credit associations have greater economies of scale could be caused by differences in targeting customers. The business conducted by mutual financial institutions is limited to a certain geographical area or type of clients and it is necessary for them to collect accurate and detailed information. Nevertheless, if they extend their business size and the targeting area, the quality of this information might decrease. Accordingly the economies of scale do not attain high values although there are small cost-reducing effects.

From the estimated results regarding market structure it was expected that the commercial banks in Japan encounter greater market competition than those in the US, and that mutual financial institutions in Japan should experience more intense competition than those in the US. In fact, however, the mutual financial institutions in Japan faced greater competition than those in the US.

178 With respect to the empirical parts of the US mutual financial institutions, it was impossible to collect a sufficient number of datasets on credit unions from the Bankscope database. The object in this research, therefore, is the savings and loan institutions.

Next, the cost structures of the different financial institutions were examined in order to analyse the difference between them. The results showed that S&Ls have the same level of cost efficiency and economies of scale as credit associations. However, credit cooperatives which are also mutual institutions in Japan showed greater economies of scale than credit associations, with regards to the same level of cost efficiency. It appears that the lower level of market competition in the Japanese mutual institutions is connected with the fact that the credit cooperatives are included in the estimate. In other words, it is probably the case that a lower degree of market competition is caused by small assets and greater economies of scale. It could be said that these results are caused particularly in the case that the market is segmentalized with regards to the geographical conditions, customers and financial products. Therefore, the facts that Japanese financial markets are strongly segmentalized and the market competition level is small might be responsible for these results.

Appendix 8-1. Statistical frontiers of US financial institutions

Table 8.22 Panel estimation of stochastic cost efficiency frontier for the US commercial banks

	Commercial banks	
Variables	Coef.	P>|z|
Dependent variables		
Ln(total costs)		
Independent variables		
Outputs and input prices		
lnPL	1.124049***	0.000
lnPK	0.554414***	0.000
lnPF	-0.19685	0.118
Ln(LOAN)	1.064267***	0.000
Ln(SECURITY)	-0.16094***	0.006
lnPLlnPK	0.102322***	0.000
lnPLlnPF	0.01652	0.468
lnPKlnPF	-0.04913***	0.001
$(\ln PL)^2$	0.047164***	0.003
$(\ln PK)^2$	0.022596***	0.003
$(\ln PF)^2$	0.010147**	0.037
ln(LOAN)ln(SECURITY)	-0.07876***	0.000
$(\ln(LOAN))^2$	0.049344***	0.000
$(\ln(SECURITY))^2$	0.038464***	0.000
ln(LOAN)lnPL	-0.16156***	0.000
ln(LOAN)lnPK	-0.00564	0.356
ln(LOAN)lnPF	0.006177	0.209
ln(SECURITY)lnPL	0.105838***	0.000
ln(SECURITY)lnPK	0.000322	0.961
ln(SECURITY)lnPF	-0.01193**	0.034
cons	-2.13558**	0.018
Obs.	1,511	
Wald X^2 test	74,837.67	

Note: *** denotes statistical significance at the 1% level, ** denotes statistical significance at 5% and * denotes statistical significance at 10%

Table 8.23 Panel estimation of stochastic cost efficiency frontier for the US thrifts

	Mutual financial institutions (S&Ls)	
Variables	Coef.	P>|z|
Dependent variables		
Ln(total costs)		
Independent variables		
Outputs and input prices		
lnPL	0.377094	0.244
lnPK	1.17229***	0.000
lnPF	-1.27402***	0.000
Ln(LOAN)	0.777079***	0.000
Ln(SECURITY)	0.152**	0.020
lnPLlnPK	-0.07804***	0.002
lnPLlnPF	0.079146**	0.016
lnPKlnPF	-0.1373***	0.000
$(\ln PL)^2$	-0.09031	0.112
$(\ln PK)^2$	0.244358***	0.000
$(\ln PF)^2$	-0.21399***	0.000
ln(LOAN)ln(SECURITY)	-0.07906***	0.000
$(\ln(LOAN))^2$	0.078591***	0.000
$(\ln(SECURITY))^2$	0.085898***	0.000
ln(LOAN)lnPL	-0.04274***	0.006
ln(LOAN)lnPK	0.026719***	0.000
ln(LOAN)lnPF	-0.03689***	0.000
ln(SECURITY)lnPL	0.04246***	0.001
ln(SECURITY)lnPK	-0.01459**	0.027
ln(SECURITY)lnPF	0.03992***	0.000
cons	-0.11953	0.921
Obs.	1,082	
Wald X^2 test	66,776.26	

Note: *** denotes statistical significance at the 1% level, ** denotes statistical significance at 5%, and * denotes statistical significance at 10%

Appendix 8-2. Empirical results of SCP hypothesis for US commercial banks

Table 8.24 Empirical results of SCP hypothesis for the US commercial banks with Bankscope data, Dependent variable: ln(1+ROA)

Asset	Normal	1-way	2-way	Normal	1-way	2-way
Constant	0.534705***	0.427772*	0.448347	0.466563**	0.365747	0.448049
	(2.90468)	(1.678642)	(1.120978)	(2.177194)	(1.550031)	(0.949425)
CRA3	0.336192	0.043635	0.81712			
	(0.705737)	(0.130995)	(0.906611)			
CRA5				0.423289	0.187881	0.62321
				(0.929374)	(0.59983)	(0.708275)
MSA	-0.358654	-3.245012	-1.290065	0.085842	-3.008797	-1.598509
	(-0.449549)	(-1.293064)	(-0.452798)	(0.082162)	(-1.189202)	(-0.567283)
lnAST	0.005307	0.015656	-0.006318	0.004568	0.014874	-0.005874
	(1.150728)	(1.135462)	(-0.356025)	(0.967079)	(1.113106)	(-0.331245)
ln LOAN/DEP	0.146612***	0.266827***	0.274463***	0.146814***	0.265598***	0.274362***
	(3.705394)	(4.034461)	(4.131499)	(3.711114)	(4.024562)	(4.128939)
R2	0.007171	0.690292	0.690996	0.007324	0.690345	0.690946
Adj.R2	0.005496	0.632377	0.632109	0.005649	0.63244	0.63205
H0: η=0	—	11.922674***	11.918307***	—	11.922969***	11.907203***
H0: λ=0	—	—	0.757018	—	—	0.646555
Schwarz	0.864382	0.910366	0.927728	0.864228	0.910195	0.927888
F	4.279638	11.91898	11.73419	4.371696	11.92194	11.73146
Obs.	2375	2375	2375	2375	2375	2375

Note: (i) each figure below the coefficients is t-value., (ii) *** significant at 1%, ** significant at 5%, * significant at 10%

Table 8.25 Empirical results of SCP hypothesis for the US commercial banks with Bankscope data, Dependent variable: ln(1+ROA)

Deposit	Normal	1-way	2-way	Normal	1-way	2-way
Constant	0.468255**	0.383242	0.412735	0.519718***	0.381862*	0.529829
	(2.184396)	(1.515055)	(0.826782)	(2.679296)	(1.87074)	(0.902343)
CRD3	0.490962	0.168315	0.921317			
	(0.905721)	(0.42091)	(0.779007)			
CRD5				0.28696	0.26574	0.461209
				(0.730338)	(0.95438)	(0.413412)
MSD	-0.293566	-2.334321	-0.313805	-0.22608	-1.995107	-1.03907
	(-0.362794)	(-0.90228)	(-0.099011)	(-0.238174)	(-0.769523)	(-0.333975)
lnAST	0.005258	0.015179	-0.008048	0.004995	0.010504	-0.007083
	(1.142581)	(1.132312)	(-0.451401)	(1.062185)	(0.743532)	(-0.397952)
ln LOAN/DEP	0.145516***	0.265243***	0.274017***	0.14602***	0.266212***	0.274339***
	(3.672636)	(4.014212)	(4.121578)	(3.685327)	(4.036698)	(4.124048)
R2	0.00744	0.690205	0.690901	0.00732	0.690319	0.690834
Adj.R2	0.005763	0.632371	0.632092	0.005642	0.632506	0.632012
H0: η=0	—	11.933458***	11.928568***	—	11.941931***	11.920214***
H0: λ=0	—	—	0.747637	—	—	0.553019
Schwarz	0.865173	0.909767	0.927176	0.865295	0.9094	0.927394
F	4.435629	11.93413	11.74813	4.363382	11.94048	11.74443
Obs.	2372	2372	2372	2372	2372	2372

Note: (i) each figure below the coefficients is t-value., (ii) *** significant at 1%, ** significant at 5%, * significant at 10%

Table 8.26 Empirical results of SCP hypothesis for the US commercial banks with Bankscope data, Dependent variable: ln(1+ROA)

Loan	Normal	1-way	2-way	Normal	1-way	2-way
Constant	0.675567***	0.681065**	0.653635	0.568844***	0.524349*	0.42685
	(5.873806)	(2.518533)	(0.949729)	(3.339147)	(1.941061)	(0.833625)
CRL3	0.025863	-0.23594	0.349579			
	(0.093925)	(-1.115429)	(0.174537)			
CRL5				0.275964	-0.082651	0.78317
				(0.740969)	(-0.304605)	(0.756712)
MSL	0.062788	-1.144648	-0.711099	0.487208	-1.388439	-0.38189
	(0.082411)	(-0.558915)	(-0.340343)	(0.512115)	(-0.681732)	(-0.179538)
lnAST	0.003329	0.003607	-0.007669	0.00295	0.011974	-0.00778
	(0.716545)	(0.224875)	(-0.437637)	(0.63229)	(0.83399)	(-0.44406)
ln LOAN/DEP	0.150391***	0.277409***	0.277332***	0.149273***	0.27196***	0.276777***
	(3.813121)	(4.167298)	(4.156014)	(3.782908)	(4.089405)	(4.148028)
R2	0.006593	0.690284	0.690747	0.00682	0.690105	0.690831
Adj.R2	0.004917	0.632367	0.631812	0.005143	0.632155	0.631912
H0: η=0	—	11.932277***	11.920128***	—	11.918353***	11.91228***
H0: λ=0	—	—	0.497874	—	—	0.780133
Schwarz.	0.864964	0.910394	0.928534	0.864736	0.91097	0.928262
F	3.932466	11.9185	11.7205	4.068415	11.90857	11.72512
Obs.	2375	2375	2375	2375	2375	2375

Note: (i) each figure below the coefficients is t-value., (ii) *** significant at 1%, ** significant at 5%, * significant at 10%

Chapter 9 Conclusion

The submitted research study shows the complexity of the niche segment within the Japanese Banking sector, i.e., the role and position of credit associations (Shinkin) and regional banks in Japan are also compared with mutual financial institutions (S&Ls and credit unions) in USA. We thoroughly examined the features of mutual financial institutions over the last 20 years. The period was the time when the Japanese economy has undergone a protracted recession and an extensive consolidation process. We provided a detailed examination of roots that caused the almost collapse of the Japanese financial market. The particular attention was given the solution of nonperforming loans (NPLs) in Japan that have remained the main obstacles for a rapid recovery of the financial institutions.

The study significantly contributed to current research on banking sector in Japan. We outlined the problem of the bank based system as performed in Japan. This study is the first attempt to analyse the behaviour of mutual financial institutions by investigating the competitive environment and bank efficiency. These results are of particular importance for policy makers to outline a further strategy of how to consolidate the system, to improve competitiveness and efficiency of credit associations and regional banks.

It was found in this study that the policy for functional reinforcement of relationship banking by Japanese government can be assessed as the appropriate direction. It is possible that the relationship banking method encourage financial institutions to preserve sound management, regardless of the segmented-market conditions, and maintain the same level of cost efficiency as the US mutual institutions in the economic boom. It can be said that the results from Japanese mutual financial institutions showed the importance to enhance the quality of services such as screening and monitoring, rather than to increase their size.

However, from the results for the US estimation, it appears that there is still some possibility that the problems due to the market segmentation are revealed in the case of economic boom. Needless to say, as they have different financial system, it is difficult to apply the case of the US to that of Japan completely. It could be said, however, that financial authorities in Japan should know the negative aspects on relationship banking from the case of the US mutual financial institutions and consider carefully the time and direction for the policy change.

We show in our detailed analysis that the financial institutions operates within the relationship banking system, that is further reinforced by imposed geographical restriction, and that does not allow credit associations and regional banks operate across the country. This undoubtedly contributes to a close relationship between these institutions and customers. By applying SCP and the Panzar-Rosse H statistics we were in position to scrutinise in detail the market structure in which these institutions operate. Our results did not show that these institutions behave as monopolistic firm. We found for the relationship between market structure and bank performance for credit associations and credit cooperatives mixed results were found. The cases using ROA as the dependent variable did not show significant results, while those employing lnREV showed results that mainly supported the efficiency hypothesis. Chapter 5 shows that the market structure of credit associations and cooperatives is efficient and that we could not confirm the presence of collusive behaviours that would lead to decreasing the quality of their services.

On the other hand, we argue in Chapter 6 that the sound and efficient market structure is not necessarily caused by the competitive market conditions. Using the combined data of credit associations and credit cooperatives in Japan, the values on H statistics stand at 0.4-0.44, which supports the presence of monopolistic competition. Further, our results are almost identical if the Bankscope database is applied, to the presence of monopolistic competition. We also compared our results with the market structure of commercial banks. We identified that the statistics shows even higher values but still remain the bracket of monopolistic competition.

These results showed that the market of mutual financial institutions is to a certain extent segmented. In other words, the geographical restriction does not show the lack of market structure.

This might be due to good corporate governance.

Chapter 7 provided interesting results as for efficiency scores and economies of scale. It was found that the cost efficiencies of Japanese mutual financial institutions are 0.74 in credit associations and 0.755 in credit cooperatives. The main difference between them is the size of institutions and businesses. However it was concluded firstly that they have almost the same level of cost efficiency. Secondly, as compared with the average cost efficiency in commercial banks 0.530, it was also found that the organizational forms affect the degree of cost efficiency. In other words, the result in this study indicated that the cost efficiency of commercial banks is lower than that of credit associations and credit cooperatives. Therefore, it was concluded that the mutual financial institutions are more cost efficient than the profit-making company such as commercial banks. It is demonstrated when mutual financial institutions specify their customers or carry out careful monitoring of lenders, more wasteful costs can be reduced in the lending method by commercial banks, transaction lending.

As for economies of scale, obtained results indicate that the results in commercial banks, credit associations and credit cooperatives were 0.729, 0.947 and 0.580 respectively. As there is a cost-reducing effect when the figure is smaller than 1, it appears that commercial banks enjoy a significantly greater cost-reducing effect than mutual financial institutions, in the case of credit associations. The reason seems to come from the transaction-based lending mainly used by commercial banks: the lending method can be applicable for new businesses or new customers due to the mergers, and commercial banks can easily control the increase of marginal costs for loan business.

The above results indicate although there seem to be very good reasons for commercial banks to enlarge their size, it is also necessary for them to make their management system more cost efficient. On the other hand, mutual financial institutions – credit associations in particular – have approximately arrived at their most appropriate size as financial institutions using relationship lending, and have had the significantly cost efficient structures.

It would be rather premature to conclude that all financial institutions should move to relationship lending. The method demands a great deal of time and entails large costs, and it is widely considered there are inefficiencies not to represent on financial statement.

As for the market structure of the US financial industry, commercial banks show a weak efficiency hypothesis. In contrast, thrifts such as S&Ls show results consistent with the SCP hypothesis in some estimates. In comparison with the case in Japan, where both commercial banks and mutual financial institutions support the efficiency hypothesis, the US market structure is clearly different. It could be suggested, however, that these results represent the feature as the self-helping institution or as the membership-based organization properly.

In terms of the estimated results of H statistics for the US financial institutions, commercial banks have values ranging from 0.67 to 0.71, while thrifts display 0.56 to 0.63. These results suggest that commercial banks are in a more competitive market than mutual financial institutions. The results for Japanese financial institutions range from 0.77 to 0.96 for commercial banks, and from 0.40 to 0.43 for mutual financial institutions. In the comparisons between commercial banks, Japan has a more competitive market than the US. Nevertheless, the comparison for mutual financial institutions shows greater competition in the US than in Japan. The difference in the levels of competition experienced by US commercial banks and mutual institutions therefore appears smaller than in Japan. The fact that the US thrifts need to compete fiercely with other financial institutions might induce a shift in their main lending methodology from relationship lending to transaction lending, existence of self-helping financial institutions. In contrast, as the Japanese differences between commercial banks and mutual institutions are relatively large (0.37-0.53), it is possible that the market is clearly segmentalized and that the mutual financial institutions can properly offer relationship-based lending services.

These findings are broadly consistent with the results regarding market structure in the previous section, except for the case of mutual financial institutions in Japan. In accordance with the clear result of the efficiency hypothesis, commercial banks in Japan are expected to experience more intense competition while those in the US are expected to face less competition. As the US thrifts support the SCP hypothesis, their degree of market competition is expected to be lower. As for the mutual financial institutions in Japan, as the efficiency hypothesis is partially supported, it is expected that the market competition could be relatively higher. Nevertheless, the mutual institutions in Japan provided only unexpected results, with lower values than those for the US thrifts.

The unexpected results for the Japanese mutual institutions might be caused by the fact that the main financial products by the mutual institutions in the two countries are different. In fact, both the US S&Ls, and the Japanese credit associations and cooperatives take the same organizational form as mutual financial institutions. However, the S&Ls offer stable services such as mortgage loans, while credit associations and cooperatives mainly supply low-profit services such as consumer loans. It could be said that these differences are revealed in the market structure.

The cost efficiency of the US commercial banks provided to be approximately 0.91, while that of the US thrifts was approximately 0.87. The cost efficiencies of the commercial banks, credit associations and cooperatives in Japan were 0.53, 0.74 and 0.75 respectively. With respect to commercial banks, it appears that there is a large difference between Japan and the US. It could be possible to explain by considering the feature of financial system, bank- or market base. In contrast, credit associations and cooperatives in Japan and the US S&Ls are approximately 70-80% cost efficient and these are the same level.

As for the economies of scale in the US financial institutions, the average value for the S&Ls is about 0.94 meaning they have the possibility of reducing costs by 6% when increasing their production by 1%. In contrast, the Japanese commercial banks, credit associations and cooperatives have values of 0.73, 0.95 and 0.58 respectively. As well as cost efficiency, the credit associations in Japan and the US S&Ls have similar and high values of economies of scale. In addition, if the commercial banks in Japan are considered as the benchmark, it appears that commercial banks have relatively greater effects of economies of scale than mutual financial institutions.

The fact that mutual financial institutions such as the S&Ls and credit associations have greater economies of scale could be caused by differences in targeting customers. The business conducted by mutual financial institutions is limited to a certain geographical area or type of clients and it is necessary for them to collect accurate and detailed information. Nevertheless, if they extend their business size and the targeting area, the quality of this information might decrease. Accordingly the economies of scale do not attain high values although there are small cost-reducing effects.

From the estimated results regarding market structure it was expected that the commercial banks in Japan encounter greater market competition than those in the US, and that mutual financial institutions in Japan should experience more intense competition than those in the US. In fact, however, the mutual financial institutions in Japan faced greater competition than those in the US.

Directions for further research

Finally, it is important to point out possible shortcomings. One problem is that the period of time during the analysis was carried out might be too short. The sample period in this study is mainly from 1999 to 2005. It would be necessary to prolong the sample period in order to find more robust results. There is also the fact that samples from only two countries, Japan and the USA, were studied. It might be difficult to conclude the clear feature of mutual financial institutions at this moment. There are many kinds of mutual financial institutions in the world – such as the building society of the UK, for example – and research focusing on some other variables should be worthwhile. In addition, with respect to the area analysis in Japan, the index for regional characteristics should be changed into the smaller area. Although my study employed the prefectural economic index, the mutual financial institutions generally operate at city, town and village level. It would be worthwhile to use the different forms of index targeting on a smaller geographical area in order to discuss the relationship between local economy and market / cost structure. Last but not least important contribution would be to compare our stochastic methodology with Data Envelopment Analysis in order to verify our results.

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Appendix I Geographical results on SCP and efficiency hypothesis

[Area 1]

Table A. I.1 Empirical results of SCP hypothesis for Japanese credit associations and credit cooperatives in Area1 with financial statement data, Dependent variable: ln(1+ROA)

Asset	Normal	1-way	2-way	Normal	1-way	2-way
Constant	-0.03753***	-0.06562**	-0.04087	-0.03771***	-0.06563*	-0.03604
	(-5.614669)	(-1.979449)	(-1.200343)	(-5.597003)	(-1.951086)	(-1.061833)
CRA3	-0.01002***	-0.01167***	-0.02706			
	(-3.259382)	(-4.298723)	(-1.38737)			
CRA5				-0.00602	-0.015*	-0.00399
				(-0.750171)	(-1.818776)	(-0.170045)
MSA	-0.00327	-0.21626	-0.31247*	-0.0078	-0.24679	-0.19206
	(-0.120317)	(-1.444298)	(-1.728758)	(-0.226928)	(-1.627476)	(-1.085195)
lnAST	0.002769***	0.003917**	0.002548	0.002775***	0.004048**	0.002149
	(6.718293)	(2.042684)	(1.277428)	(6.544949)	(2.082103)	(1.071734)
ln LOAN/DEP	0.001437	0.008597***	0.009671***	0.001861	0.010711***	0.009561***
	(1.086878)	(3.358011)	(3.794161)	(1.374139)	(4.197123)	(3.744637)
lnBR	-0.00309***	-0.00086	0.000123	-0.00314***	-0.00157	-0.00028
	(-6.776573)	(-0.419962)	(0.059267)	(-6.804428)	(-0.761104)	(-0.138051)
R2	0.101827	0.524147	0.539899	0.087808	0.510711	0.538247
Adj.R2	0.094853	0.42167	0.43446	0.080725	0.40534	0.432429
H_0: η=0	—	4.308421***	4.357601***	—	4.195901***	4.324254***
H_0: λ=0	—	—	3.012756***	—	—	5.247728***
Schwartz.	-8.384649	-7.9238	-7.897675	-8.36916	-7.895956	-7.894091
F	14.6022	5.114749	5.120453	12.39827	4.846788	5.086522
Obs.	650	650	650	650	650	650

Note: (i) each figure below the coefficients is t-value., (ii) *** significant at 1%, ** significant at 5%, * significant at 10%.
Source: *Financial statement of national credit associations, Financial statement of national credit cooperatives.*

Table A. I.2 Empirical results of SCP hypothesis for Japanese credit associations and credit cooperatives in Area1 with financial statement data, Dependent variable: ln(1+ROA)

Deposit	Normal	1-way	2-way	Normal	1-way	2-way
Constant	-0.037051***	-0.056875*	-0.031546	-0.037814***	-0.05993	-0.032044
	(-5.506932)	(-1.755471)	(-0.965883)	(-5.639705)	(-1.848142)	(-0.981427)
CRD3	-0.016784	-0.030522***	-0.025669			
	(-1.420921)	(-2.64892)	(-0.624642)			
CRD5				-0.007151	-0.01743**	-0.011849
				(-0.885101)	(-2.100223)	(-0.46558)
MSD	-0.012556	-0.207882	-0.217083	-0.011931	-0.231222	-0.211467
	(-0.415624)	(-1.43226)	(-1.322878)	(-0.348458)	(-1.593346)	(-1.237363)
lnAST	0.0028***	0.003546*	0.002019	0.002795***	0.003716**	0.001994
	(6.730857)	(1.895135)	(1.055404)	(6.636166)	(1.982783)	(1.039827)
ln LOAN/DEP	0.001696	0.010398***	0.009728***	0.001794	0.010703***	0.009701***
	(1.264996)	(4.089875)	(3.801469)	(1.324598)	(4.199842)	(3.791602)
lnBR	-0.003113***	-0.001033	-3.62E-05	-0.003134***	-0.001308	-0.000117
	(-6.751697)	(-0.491355)	(-0.017291)	(-6.777969)	(-0.622569)	(-0.056146)
R2	0.089829	0.514024	0.538573	0.088084	0.511672	0.538422
Adj.R2	0.082762	0.409366	0.43283	0.081004	0.406508	0.432644
H_0: η=0	—	4.237405***	4.332334***	—	4.210952***	4.328062***
H_0: λ=0	—	—	4.681849***	—	—	5.099853***
Schwartz.	-8.371378	-7.902749	-7.894798	-8.369464	-7.897921	-7.89447
F	12.7118	4.911478	5.093199	12.44114	4.865456	5.090096
Obs.	650	650	650	650	650	650

Note: (i) each figure below the coefficients is t-value., (ii) *** significant at 1%, ** significant at 5%, * significant at 10%.
Source: *Financial statement of national credit associations, Financial statement of national credit cooperatives.*

Table A. I.3 Empirical results of SCP hypothesis for Japanese credit associations and credit cooperatives in Area1 with financial statement data, Dependent variable: ln(1+ROA)

Loan	Normal	1-way	2-way	Normal	1-way	2-way
Constant	-0.038071***	-0.070333**	-0.035823	-0.038124***	-0.068182	-0.036033
	(-5.643859)	(-2.065023)	(-1.051382)	(-5.686021)	(-2.001365)	(-1.057063)
CRL3	-0.00388	-0.010643	-0.019536			
	(-0.323123)	(-0.851241)	(-0.453471)			
CRL5				-0.004198	-0.009508	-0.001363
				(-0.651896)	(-1.435818)	(-0.042218)
MSL	-6.13E-05	-0.201638	-0.167886	-0.00688	-0.196479	-0.1462
	(-0.002014)	(-1.62979)	(-1.231076)	(-0.212448)	(-1.597094)	(-0.990621)
lnAST	0.002756***	0.004141**	0.002147	0.002777***	0.004023**	0.002042
	(6.721946)	(2.132965)	(1.089148)	(6.753773)	(2.073004)	(1.025344)
ln LOAN/DEP	0.001968	0.013192***	0.01132***	0.001931	0.012929***	0.011086***
	(1.533279)	(4.606914)	(3.802262)	(1.506099)	(4.570007)	(3.654984)
lnBR	-0.003168***	-0.001711	-0.000189	-0.003147***	-0.001504	-0.000236
	(-6.855976)	(-0.824909)	(-0.091094)	(-6.803327)	(-0.723256)	(-0.113967)
R2	0.087066	0.508793	0.538371	0.08752	0.510019	0.538193
Adj.R2	0.079978	0.403009	0.432581	0.080435	0.404498	0.432362
H_0: η=0	—	4.167894***	4.329499***	—	4.185954***	4.321712***
H_0: λ=0	—	—	5.638311***	—	—	5.368724***
Schwartz.	-8.368845	-7.894541	-7.893973	-0.919611	-0.703034	-0.71817
F	12.28352	4.809731	5.089051	12.35374	4.833367	5.085403
Obs.	650	650	650	650	650	650

Note: (i) each figure below the coefficients is t-value., (ii) *** significant at 1%, ** significant at 5%, * significant at 10%.
Source: *Financial statement of national credit associations, Financial statement of national credit cooperatives.*

Table A. I.4 Empirical results of SCP hypothesis for Japanese credit associations and credit cooperatives in Area1 with financial statement data, Dependent variable: lnREV

Asset	Normal	1-way	2-way	Normal	1-way	2-way
Constant	-2.142097***	4.362611***	4.502123***	-2.109515***	4.780214***	4.533946***
	(-7.762165)	(3.470244)	(3.679148)	(-7.548482)	(3.897027)	(3.72575)
CRA3	-1.244857***	-1.128661***	0.021617			
	(-9.689846)	(-10.99529)	(0.030654)			
CRA5				-2.943369***	-3.768539***	0.598752
				(-8.713479)	(-12.4584)	(0.70557)
MSA	-5.01965***	-13.10439**	0.148722	-11.26682***	-15.77036***	2.341886
	(-4.434158)	(-2.286318)	(0.022717)	(-7.847549)	(-2.825584)	(0.365921)
lnAST	0.89687***	0.519537***	0.497316***	0.921008***	0.528626***	0.488199***
	(52.6018)	(7.142861)	(6.933313)	(52.31442)	(7.455384)	(6.78665)
ln LOAN/DEP	0.432443***	0.502008***	0.437979***	0.393195***	0.539812***	0.43974***
	(7.86403)	(5.156427)	(4.765868)	(6.932968)	(5.770903)	(4.788573)
lnBR	0.121673***	0.295884***	0.309821***	0.129465***	0.292958***	0.310897***
	(6.371454)	(3.79361)	(4.131951)	(6.664731)	(3.859524)	(4.187911)
R2	0.976868	0.989808	0.991156	0.976295	0.990312	0.991165
Adj.R2	0.97669	0.987614	0.989132	0.976113	0.988227	0.989142
H_0: η=0	—	6.16523***	6.851128***	—	7.025323***	6.861721***
H_0: λ=0	—	—	13.544544***	—	—	8.574667***
Schwartz.	-0.909745	-0.631864	-0.714448	-0.885294	-0.682559	-0.71538
F	5489.804	451.251	489.6392	5354.06	474.9581	490.0997
Obs.	656	656	656	656	656	656

Note: (i) each figure below the coefficients is t-value., (ii) *** significant at 1%, ** significant at 5%, * significant at 10%.
Source: *Financial statement of national credit associations, Financial statement of national credit cooperatives.*

Table A. I.5 Empirical results of SCP hypothesis for Japanese credit associations and credit cooperatives in Area1 with financial statement data, Dependent variable: lnREV

Deposit	Normal	1-way	2-way	Normal	1-way	2-way
Constant	-1.887878***	5.81942***	4.768604***	-2.075359***	5.406531***	4.778283***
	(-6.806046)	(4.912704)	(4.063585)	(-7.437477)	(4.549422)	(4.079121)
CRD3	-4.635703***	-5.386205***	0.871681			
	(-9.400518)	(-12.77475)	(0.586741)			
CRD5				-2.899468***	-3.814308***	1.236163
				(-8.50488)	(-12.50611)	(1.346373)
MSD	-8.77637***	-7.514698	5.221713	-10.99941***	-11.36099**	7.933591
	(-7.001368)	(-1.410345)	(0.883999)	(-7.662345)	(-2.126744)	(1.292368)
lnAST	0.909752***	0.46228***	0.476589***	0.918229***	0.491299***	0.468015***
	(53.01301)	(6.757064)	(6.928698)	(52.32942)	(7.152886)	(6.79664)
ln LOAN/DEP	0.405396***	0.548017***	0.431147***	0.394577***	0.551109***	0.430432***
	(7.272218)	(5.88238)	(4.684797)	(6.934365)	(5.885712)	(4.684826)
lnBR	0.130369***	0.324136***	0.290814***	0.131057***	0.297007***	0.292025***
	(6.770289)	(4.20394)	(3.851978)	(6.720016)	(3.846595)	(3.884357)
R2	0.976678	0.990377	0.99117	0.97616	0.990283	0.991194
Adj.R2	0.976498	0.988306	0.989149	0.975977	0.988191	0.989179
H_0: η=0	—	6.912341***	6.880811***	—	7.057264***	6.913437***
H_0: λ=0	—	—	7.980567***	—	—	9.195233***
Schwartz	-0.901576	-0.689286	-0.71599	-0.879618	-0.679567	-0.718739
F	5444.083	478.1954	490.4011	5323.019	473.5255	491.7634
Obs.	656	656	656	656	656	656

Note: (i) each figure below the coefficients is t-value., (ii) *** significant at 1%, ** significant at 5%, * significant at 10%.
Source: *Financial statement of national credit associations, Financial statement of national credit cooperatives.*

Table A. I.6 Empirical results of SCP hypothesis for Japanese credit associations and credit cooperatives in Area1 with financial statement data, Dependent variable: lnREV

Loan	Normal	1-way	2-way	Normal	1-way	2-way
Constant	-1.948981***	4.689827***	5.146555***	-2.1613***	5.001387***	5.202657***
	(-7.090264)	(3.822665)	(4.219804)	(-7.758749)	(3.936034)	(4.272843)
CRL3	-4.854806***	-5.896527***	1.09949			
	(-9.768228)	(-13.00365)	(0.706307)			
CRL5				-2.223433***	-2.763717***	1.829169
				(-8.178884)	(-11.10013)	(1.572417)
MSL	-9.608844***	-4.722517	6.888004	-10.327***	-7.365446	9.932946*
	(-7.686283)	(-1.051029)	(1.401678)	(-7.611289)	(-1.591925)	(1.872634)
lnAST	0.910521***	0.531661***	0.456995***	0.91184***	0.49752***	0.44208***
	(54.39579)	(7.600606)	(6.474072)	(53.26184)	(6.871204)	(6.212993)
ln LOAN/DEP	0.500596***	0.572288***	0.361619***	0.510102***	0.66441***	0.330479***
	(9.514214)	(5.525965)	(3.390253)	(9.511539)	(6.268943)	(3.048758)
lnBR	0.132317***	0.263943***	0.281999***	0.131194***	0.290682***	0.284233***
	(6.931201)	(3.507168)	(3.776998)	(6.72979)	(3.721105)	(3.818822)
R2	0.977095	0.990508	0.991189	0.976183	0.98985	0.991222
Adj.R2	0.976918	0.988465	0.989172	0.976	0.987666	0.989212
H_0: η=0	—	6.862009***	6.858407***	—	6.538756***	6.903447***
H_0: λ=0	—	—	6.867091***	—	—	13.87637***
Schwartz	-0.919611	-0.703034	-0.71817	-0.880593	-0.636043	-0.721863
F	5545.52	484.8795	491.4811	5328.341	453.1598	493.3155
Obs.	656	656	656	656	656	656

Note: (i) each figure below the coefficients is t-value., (ii) *** significant at 1%, ** significant at 5%, * significant at 10%.
Source: *Financial statement of national credit associations, Financial statement of national credit cooperatives.*

[Area 2]

Table A. I.7 Empirical results of SCP hypothesis for Japanese credit associations and credit cooperatives in Area2 with financial statement data, Dependent variable: ln(1+ROA)

Asset	Normal	1-way	2-way	Normal	1-way	2-way
Constant	-0.009983	-0.280704	-0.261093	-0.019747	-0.31777	-0.330891
	(-0.137352)	(-0.965248)	(-0.412489)	(-0.273426)	(-1.093779)	(-1.047412)
CRA3	-0.245267**	-0.328808**	-0.310325			
	(-2.005171)	(-2.469387)	(-0.087873)			
CRA5				-0.149105*	-0.182904**	0.133492
				(-1.834241)	(-2.019742)	(0.204145)
MSA	-0.429847	-0.038653	-0.282417	-0.519088*	-0.292313	-0.068654
	(-1.538603)	(-0.033356)	(-0.216142)	(-1.687917)	(-0.25473)	(-0.048249)
lnAST	0.003034	0.01968	0.018398	0.003248	0.021037	0.017473
	(0.707391)	(1.213599)	(1.082937)	(0.751094)	(1.293319)	(1.022729)
ln LOAN/DEP	0.005586	-0.027347	-0.0256	0.005637	-0.02352	-0.026005
	(0.415777)	(-1.059198)	(-0.97248)	(0.418419)	(-0.91026)	(-0.985198)
lnBR	0.001062	-0.002867	-0.002005	0.001185	-0.003097	-0.002044
	(0.263502)	(-0.245476)	(-0.169615)	(0.293995)	(-0.264623)	(-0.173315)
R2	0.007291	0.492193	0.494496	0.006518	0.490695	0.494522
Adj.R2	0.001382	0.368975	0.366245	0.000605	0.367113	0.366277
H_0: η=0	—	4.058305***	4.037834***	—	4.040308***	4.037401***
H_0: λ=0	—	—	0.511744	—	—	0.850418
Schwartz.	-3.030753	-2.426287	-2.383027	-3.029975	-2.423341	-2.383078
F	1.233863	3.994496	3.855689	1.102275	3.97062	3.856082
Obs.	846	846	846	846	846	846

Note: (i) each figure below the coefficients is t-value., (ii) *** significant at 1%, ** significant at 5%, * significant at 10%.
Source: *Financial statement of national credit associations, Financial statement of national credit cooperatives.*

Table A. I.8 Empirical results of SCP hypothesis for Japanese credit associations and credit cooperatives in Area2 with financial statement data, Dependent variable: ln(1+ROA)

Deposit	Normal	1-way	2-way	Normal	1-way	2-way
Constant	-0.009162	-0.301336	-0.22506	-0.019003	-0.335186	-0.338531
	(-0.126331)	(-1.044415)	(-0.335888)	(-0.263764)	(-1.162471)	(-1.074806)
CRD3	-0.250323**	-0.330842**	-0.64149			
	(-2.021932)	(-2.459632)	(-0.169365)			
CRD5				-0.149675*	-0.178206**	0.071389
				(-1.843068)	(-1.975988)	(0.110643)
MSD	-0.434063	-0.209782	-0.488305	-0.517299*	-0.451508	-0.308883
	(-1.552801)	(-0.185591)	(-0.381133)	(-1.690089)	(-0.403048)	(-0.225637)
lnAST	0.003024	0.020857	0.019544	0.003196	0.021931	0.018768
	(0.707418)	(1.297401)	(1.161844)	(0.74221)	(1.36012)	(1.113323)
ln LOAN/DEP	0.005531	-0.027351	-0.025167	0.005612	-0.022954	-0.025463
	(0.411631)	(-1.058149)	(-0.954987)	(0.416553)	(-0.888602)	(-0.963003)
lnBR	0.001116	-0.002748	-0.001757	0.001251	-0.002917	-0.001902
	(0.277096)	(-0.235079)	(-0.148419)	(0.310699)	(-0.249042)	(-0.161131)
R2	0.007383	0.492315	0.49457	0.006569	0.490723	0.494558
Adj.R2	0.001475	0.369127	0.366338	0.000656	0.367148	0.366322
H_0: η=0	—	4.059528***	4.038888***	—	4.040334***	4.03786***
H_0: λ=0	—	—	0.501144	—	—	0.852321
Schwartz.	-3.030846	-2.426527	-2.383173	-3.030027	-2.423395	-2.383149
F	1.249574	3.996445	3.856829	1.110958	3.971061	3.856639
Obs.	846	846	846	846	846	846

Note: (i) each figure below the coefficients is t-value., (ii) *** significant at 1%, ** significant at 5%, * significant at 10%.
Source: *Financial statement of national credit associations, Financial statement of national credit cooperatives.*

Table A. I.9 Empirical results of SCP hypothesis for Japanese credit associations and credit cooperatives in Area2 with financial statement data, Dependent variable: ln(1+ROA)

Loan	Normal	1-way	2-way	Normal	1-way	2-way
Constant	-0.016112	-0.325915	-0.286724	-0.020382	-0.316794	-0.283013
	(-0.219722)	(-1.126504)	(-0.932894)	(-0.280145)	(-1.095005)	(-0.899885)
CRL3	-0.153196	-0.225982	0.05188			
	(-1.279287)	(-1.562968)	(0.087196)			
CRL5				-0.112382	-0.178383*	0.019311
				(-1.428744)	(-1.78915)	(0.034308)
MSL	-0.32325	-0.130126	0.063906	-0.424668	-0.058466	0.052869
	(-1.233442)	(-0.14589)	(0.066444)	(-1.462506)	(-0.065417)	(0.052938)
lnAST	0.002438	0.021157	0.016321	0.002759	0.020986	0.016358
	(0.569404)	(1.316388)	(0.993008)	(0.640568)	(1.307863)	(0.991259)
ln LOAN/DEP	0.008716	-0.020054	-0.026806	0.008785	-0.023058	-0.0267
	(0.637439)	(-0.696498)	(-0.905236)	(0.644405)	(-0.799477)	(-0.893871)
lnBR	0.001048	-0.003448	-0.002254	0.001167	-0.003413	-0.00225
	(0.2591)	(-0.294457)	(-0.191374)	(0.28856)	(-0.291806)	(-0.190956)
R2	0.004477	0.489522	0.494468	0.004956	0.490088	0.494463
Adj.R2	-0.001448	0.365656	0.36621	-0.000967	0.36636	0.366204
H_0: η=0	—	4.038252***	4.038177***	—	4.043472***	4.037745***
H_0: λ=0	—	—	1.099081	—	—	0.972118
Schwartz	-3.027923	-2.42104	-2.382972	-3.028404	-2.422151	-2.382962
F	0.755574	3.952027	3.855258	0.836726	3.960997	3.855183
Obs.	846	846	846	846	846	846

Note: (i) each figure below the coefficients is t-value., (ii) *** significant at 1%, ** significant at 5%, * significant at 10%.
Source: *Financial statement of national credit associations, Financial statement of national credit cooperatives.*

Table A. I.10 Empirical results of SCP hypothesis for Japanese credit associations and credit cooperatives in Area2 with financial statement data, Dependent variable: lnREV

Asset	Normal	1-way	2-way	Normal	1-way	2-way
Constant	-1.774766***	5.660163***	3.378491*	-1.938826***	5.048427***	3.442484***
	(-6.116922)	(6.562591)	(1.736659)	(-6.738136)	(5.971994)	(3.79181)
CRA3	-4.564423***	-7.024524***	2.790855			
	(-9.242071)	(-17.36033)	(0.256125)			
CRA5				-3.037376***	-4.899194***	2.34236
				(-9.254183)	(-18.1076)	(1.160221)
MSA	-0.518076	4.876065	8.782382**	-2.721229**	1.546245	11.17463**
	(-0.460659)	(1.338279)	(2.217005)	(-2.202324)	(0.435967)	(2.583439)
lnAST	0.920086***	0.538559***	0.571841***	0.927027***	0.572565***	0.562788***
	(54.11663)	(11.35635)	(12.01362)	(54.13964)	(12.27229)	(11.73158)
ln LOAN/DEP	0.44132***	0.160047**	0.101902	0.433789***	0.16032**	0.09547
	(8.718315)	(2.188742)	(1.421172)	(8.549761)	(2.22478)	(1.328555)
lnBR	0.032886**	0.106613***	0.097207***	0.035035**	0.09904***	0.098426***
	(2.018872)	(2.937153)	(2.738149)	(2.150862)	(2.765672)	(2.783661)
R2	0.969017	0.990267	0.990931	0.969024	0.99052	0.990948
Adj.R2	0.968836	0.987925	0.98865	0.968843	0.988239	0.988671
H_0: η=0	—	9.353949***	7.800552***	—	9.713754***	7.767767***
H_0: λ=0	—	—	8.386153***	—	—	5.417676***
Schwartz	-0.215628	-0.103304	-0.126841	-0.215866	-0.129583	-0.1287
F	5354.332	422.833	434.5236	5355.647	434.2024	435.3397
Obs.	862	862	862	862	862	862

Note: (i) each figure below the coefficients is t-value., (ii) *** significant at 1%, ** significant at 5%, * significant at 10%.
Source: *Financial statement of national credit associations, Financial statement of national credit cooperatives.*

Table A. I.11 Empirical results of SCP hypothesis for Japanese credit associations and credit cooperatives in Area2 with financial statement data, Dependent variable: lnREV

Deposit	Normal	1-way	2-way	Normal	1-way	2-way
Constant	-1.765558***	5.683005***	3.004942	-1.926754***	5.121703***	3.454864***
	(-6.097771)	(6.615248)	(1.458606)	(-6.713274)	(6.076957)	(3.815092)
CRD3	-4.614457***	-7.071024***	5.350013			
	(-9.232629)	(-17.3124)	(0.457947)			
CRD5				-3.038843***	-4.864231***	2.421714
				(-9.272328)	(-18.03865)	(1.216282)
MSD	-0.499046	5.222975	9.634239**	-2.602774**	2.249425	11.621***
	(-0.443481)	(1.464033)	(2.475781)	(-2.116986)	(0.64683)	(2.7878)
lnAST	0.919864***	0.537522***	0.56846***	0.926071***	0.567511**	0.561387***
	(54.2786)	(11.38574)	(12.02682)	(54.326)	(12.20908)	(11.82358)
ln LOAN/DEP	0.441163***	0.159352**	0.098899	0.433522***	0.163693**	0.092562
	(8.715864)	(2.175371)	(1.379428)	(8.547635)	(2.268188)	(1.28827)
lnBR	0.033018**	0.105444***	0.095016***	0.035459**	0.098126***	0.096677***
	(2.029008)	(2.898381)	(2.674996)	(2.179487)	(2.732783)	(2.733929)
R2	0.969016	0.990241	0.990945	0.96904	0.990487	0.990962
Adj.R2	0.968835	0.987893	0.988668	0.96886	0.988197	0.988689
H_0: η=0	—	9.316948***	7.798206***	—	9.65746***	7.788339***
H_0: λ=0	—	—	8.92004***	—	—	6.029719***
Schwartz	-0.21562	-0.100579	-0.128445	-0.2164	-0.126087	-0.130288
F	5354.287	421.671	435.2277	5358.6	432.6727	436.0379
Obs.	862	862	862	862	862	862

Note: (i) each figure below the coefficients is t-value., (ii) *** significant at 1%, ** significant at 5%, * significant at 10%.
Source: *Financial statement of national credit associations, Financial statement of national credit cooperatives.*

Table A. I.12 Empirical results of SCP hypothesis for Japanese credit associations and credit cooperatives in Area2 with financial statement data, Dependent variable: lnREV

Loan	Normal	1-way	2-way	Normal	1-way	2-way
Constant	-1.817385***	4.155169***	3.612096***	-1.997246***	4.436759***	3.539882***
	(-6.231621)	(4.804872)	(4.031307)	(-6.854528)	(5.189338)	(3.849388)
CRL3	-4.676666***	-7.390362***	1.731835			
	(-9.638499)	(-17.27123)	(0.941589)			
CRL5				-2.858366***	-5.23962***	1.658634
				(-8.907233)	(-18.02615)	(0.954717)
MSL	-1.131546	0.818507	7.070712**	-3.05419***	1.615816	7.387429**
	(-1.071061)	(0.292702)	(2.421555)	(-2.591822)	(0.584224)	(2.440352)
lnAST	0.926119***	0.631312***	0.570071***	0.929855***	0.615976***	0.567943***
	(54.55924)	(13.30148)	(11.9894)	(54.08588)	(13.14466)	(11.88898)
ln LOAN/DEP	0.43161***	0.126522	0.03677	0.445814***	0.108857	0.032164
	(8.384043)	(1.581354)	(0.462745)	(8.62037)	(1.377292)	(0.401773)
lnBR	0.03105*	0.087588**	0.104663***	0.034617**	0.094791***	0.104283***
	(1.905605)	(2.433889)	(2.967955)	(2.109228)	(2.668402)	(2.956841)
R2	0.969138	0.990341	0.990936	0.96869	0.990594	0.990937
Adj.R2	0.968957	0.988017	0.988657	0.968507	0.98833	0.988657
H_0: η=0	—	9.403952***	7.968902***	—	9.97532***	7.818228***
H_0: λ=0	—	—	7.53105***	—	—	4.339701***
Schwartz	-0.219546	-0.110882	-0.127445	-0.20515	-0.137381	-0.127481
F	5376.021	426.0807	434.7886	5296.739	437.6342	434.8044
Obs.	862	862	862	862	862	862

Note: (i) each figure below the coefficients is t-value., (ii) *** significant at 1%, ** significant at 5%, * significant at 10%.
Source: *Financial statement of national credit associations, Financial statement of national credit cooperatives.*

[Area 3]

Table A. I.13 Empirical results of SCP hypothesis for Japanese credit associations and credit cooperatives in Area3 with financial statement data, Dependent variable: ln(1+ROA)

Asset	Normal	1-way	2-way	Normal	1-way	2-way
Constant	-0.095946***	-0.501664***	-0.465133***	-0.097103***	-0.500503***	-0.464911***
	(-8.359939)	(-9.261004)	(-8.525536)	(-8.48984)	(-9.239823)	(-8.566393)
CRA3	2.18E-05	-0.003216	-0.012383			
	(0.001377)	(-0.233498)	(-0.19282)			
CRA5				0.009093	0.008546	-0.019647
				(0.764316)	(0.792948)	(-0.553515)
MSA	-0.138086***	-0.175962	-0.197211	-0.118505**	-0.125015	-0.24831
	(-2.598179)	(-0.855001)	(-0.87906)	(-2.075475)	(-0.597545)	(-1.043523)
lnAST	0.006041***	0.028363***	0.026336***	0.005985***	0.028193***	0.026474***
	(8.834163)	(9.569299)	(8.843399)	(8.721349)	(9.495171)	(8.863536)
ln LOAN/DEP	0.003017	0.041326***	0.036717***	0.003106	0.041493***	0.036824***
	(1.117699)	(8.851359)	(7.713715)	(1.153278)	(8.924808)	(7.730803)
lnBR	-0.005605***	-0.019287***	-0.017082***	-0.005626***	-0.019626***	-0.017044***
	(-6.524253)	(-6.604781)	(-5.831957)	(-6.552894)	(-6.746217)	(-5.821507)
R2	0.093159	0.521054	0.538059	0.093782	0.521449	0.538239
Adj.R2	0.087831	0.411797	0.427755	0.088457	0.412281	0.427978
H_0: η=0	—	4.043552***	4.102481***	—	4.044729***	4.101819***
H_0: λ=0	—	—	4.239519***	—	—	4.187709***
Schwartz.	-6.356312	-5.781121	-5.76999	-6.356998	-5.781945	-5.770379
F	17.48459	4.769057	4.877959	17.61343	4.776597	4.881491
Obs.	857	857	857	857	857	857

Note: (i) each figure below the coefficients is t-value., (ii) *** significant at 1%, ** significant at 5%, * significant at 10%.
Source: *Financial statement of national credit associations, Financial statement of national credit cooperatives.*

Table A. I.14 Empirical results of SCP hypothesis for Japanese credit associations and credit cooperatives in Area3 with financial statement data, Dependent variable: ln(1+ROA)

Deposit	Normal	1-way	2-way	Normal	1-way	2-way
Constant	-0.096889***	-0.496103***	-0.459295***	-0.098337***	-0.489537***	-0.4596***
	(-8.269538)	(-9.187598)	(-8.449252)	(-8.568866)	(-9.050852)	(-8.497174)
CRD3	0.009675	-0.016856	-0.019216			
	(0.29731)	(-0.511107)	(-0.246059)			
CRD5				0.022842	0.027489	-0.023557
				(1.261646)	(1.505892)	(-0.57829)
MSD	-0.130696**	-0.116651	-0.144106	-0.094924	-0.014121	-0.201132
	(-2.333269)	(-0.576262)	(-0.578206)	(-1.558177)	(-0.068922)	(-0.785473)
lnAST	0.006013***	0.028203***	0.026097***	0.005889***	0.027369***	0.026252***
	(8.710807)	(9.507569)	(8.765949)	(8.501764)	(9.164162)	(8.788395)
ln LOAN/DEP	0.003154	0.041195***	0.036737***	0.003144	0.040961***	0.036873***
	(1.161938)	(8.808936)	(7.713539)	(1.169413)	(8.797912)	(7.732256)
lnBR	-0.005615***	-0.019682***	-0.017437***	-0.005604***	-0.019576***	-0.017416***
	(-6.541145)	(-6.75214)	(-5.903056)	(-6.535357)	(-6.733399)	(-5.914156)
R2	0.093364	0.520886	0.537748	0.094962	0.522261	0.537931
Adj.R2	0.088037	0.41159	0.427369	0.089645	0.413278	0.427596
H_0: η=0	—	4.038607***	4.093638***	—	4.048107***	4.092592***
H_0: λ=0	—	—	4.201002***	—	—	3.905658***
Schwartz.	-6.356537	-5.780769	-5.769315	-6.358302	-5.783643	-5.769712
F	17.52689	4.765837	4.871845	17.85849	4.792166	4.875436
Obs.	857	857	857	857	857	857

Note: (i) each figure below the coefficients is t-value., (ii) *** significant at 1%, ** significant at 5%, * significant at 10%.
Source: *Financial statement of national credit associations, Financial statement of national credit cooperatives.*

Table A. I.15 Empirical results of SCP hypothesis for Japanese credit associations and credit cooperatives in Area3 with financial statement data, Dependent variable: ln(1+ROA)

Loan	Normal	1-way	2-way	Normal	1-way	2-way
Constant	-0.09629***	-0.508662***	-0.468592***	-0.096795***	-0.509438***	-0.47125***
	(-8.286715)	(-9.350437)	(-8.566405)	(-8.427404)	(-9.35367)	(-8.621921)
CRL3	-0.000579	-0.031194	-0.046682			
	(-0.022097)	(-1.239608)	(-0.687509)			
CRL5				0.004218	-0.009624	-0.006205
				(0.265886)	(-0.607664)	(-0.151917)
MSL	-0.131308**	-0.251781	-0.308461	-0.123233**	-0.238994	-0.237091
	(-2.576363)	(-1.355622)	(-1.344853)	(-2.222556)	(-1.272094)	(-0.979514)
lnAST	0.006057***	0.02893***	0.026782***	0.006025***	0.028834***	0.026606***
	(8.797275)	(9.705681)	(8.931735)	(8.716643)	(9.652707)	(8.882619)
ln LOAN/DEP	0.003533	0.041024***	0.037376***	0.003648	0.041395***	0.037123***
	(1.303942)	(8.749384)	(7.816176)	(1.34514)	(8.815533)	(7.78265)
lnBR	-0.005675***	-0.018856***	-0.016868***	-0.005683***	-0.018944***	-0.016877***
	(-6.613547)	(-6.624212)	(-5.874142)	(-6.620392)	(-6.635772)	(-5.839321)
R2	0.093486	0.522536	0.538736	0.093561	0.521737	0.538436
Adj.R2	0.08816	0.413617	0.428593	0.088235	0.412636	0.428221
H_0: η=0	—	4.067057***	4.10952***	—	4.051989***	4.103334***
H_0: λ=0	—	—	4.044616***	—	—	4.166532***
Schwartz.	-6.356672	-5.784221	-5.771456	-6.356754	-5.782548	-5.770805
F	17.55219	4.797468	4.891256	17.56768	4.782124	4.885353
Obs.	857	857	857	857	857	857

Note: (i) each figure below the coefficients is t-value., (ii) *** significant at 1%, ** significant at 5%, * significant at 10%.
Source: *Financial statement of national credit associations, Financial statement of national credit cooperatives.*

Table A. I.16 Empirical results of SCP hypothesis for Japanese credit associations and credit cooperatives in Area3 with financial statement data, Dependent variable: lnREV

Asset	Normal	1-way	2-way	Normal	1-way	2-way
Constant	-0.306308	0.80485	-0.083769	-0.384419*	0.62045	0.039487
	(-1.391107)	(0.852497)	(-0.106776)	(-1.74393)	(0.650869)	(0.050589)
CRA3	-0.893494***	-1.174626***	2.217296**			
	(-2.935669)	(-4.891908)	(2.386545)			
CRA5				-0.184509	-0.611222***	1.200384**
				(-0.800829)	(-3.213488)	(2.336986)
MSA	6.733191***	-7.290394**	3.463425	7.154225***	-7.208386*	4.340458
	(6.625425)	(-2.030362)	(1.071455)	(6.514966)	(-1.954143)	(1.265133)
lnAST	0.785648***	0.73931***	0.751059***	0.784452***	0.748185***	0.747839***
	(60.00165)	(14.29985)	(17.52861)	(59.39328)	(14.30507)	(17.39673)
ln LOAN/DEP	0.73973***	1.031737***	0.793436***	0.748103***	1.060105***	0.789779***
	(14.77922)	(12.74157)	(11.71161)	(14.90017)	(13.012)	(11.64476)
lnBR	0.117073***	0.029896	0.097257**	0.115776***	0.014271	0.097914**
	(7.094315)	(0.584804)	(2.304292)	(6.984982)	(0.277423)	(2.32005)
R2	0.981996	0.992188	0.994877	0.981829	0.992039	0.994875
Adj.R2	0.981892	0.990402	0.993651	0.981724	0.990219	0.993649
H_0: η=0	—	5.887853***	6.829116***	—	5.788072***	6.814338***
H_0: λ=0	—	—	61.060828***	—	—	64.379141***
Schwartz.	-0.430492	-0.047004	-0.422055	-0.421266	-0.028138	-0.421723
F	9381.615	555.3842	811.7013	9293.881	544.923	811.4299
Obs.	866	866	866	866	866	866

Note: (i) each figure below the coefficients is t-value., (ii) *** significant at 1%, ** significant at 5%, * significant at 10%.
Source: *Financial statement of national credit associations, Financial statement of national credit cooperatives.*

Table A. I.17 Empirical results of SCP hypothesis for Japanese credit associations and credit cooperatives in Area3 with financial statement data, Dependent variable: lnREV

Deposit	Normal	1-way	2-way	Normal	1-way	2-way
Constant	-0.043153	0.719563	0.001668	-0.409425*	0.476998	0.091976
	(-0.195295)	(0.822203)	(0.002131)	(-1.848387)	(0.500726)	(0.118154)
CRD3	-3.971845***	-6.280596***	2.018035*			
	(-6.433404)	(-11.72933)	(1.783797)			
CRD5				-0.00863	-1.081506***	1.196199**
				(-0.024535)	(-3.35295)	(2.0282)
MSD	4.556641***	-11.65038***	4.310778	7.446995***	-7.058794*	5.171967
	(4.325439)	(-3.548209)	(1.198362)	(6.330846)	(-1.951661)	(1.399586)
lnAST	0.795911***	0.784435***	0.749844***	0.783524***	0.763606***	0.746164***
	(61.34688)	(16.30259)	(17.48061)	(58.69932)	(14.49704)	(17.34533)
ln LOAN/DEP	0.70823***	0.982508***	0.793731***	0.747975***	1.082901***	0.78899***
	(14.33459)	(13.0336)	(11.69261)	(14.89828)	(13.26924)	(11.61293)
lnBR	0.117639***	0.030305	0.092855**	0.115729***	-0.012643	0.095334**
	(7.263926)	(0.63874)	(2.178613)	(6.981095)	(-0.245852)	(2.24473)
R2	0.982645	0.993242	0.994859	0.981809	0.992048	0.994866
Adj.R2	0.982544	0.991696	0.993629	0.981704	0.990229	0.993637
H_0: η=0	—	7.075813***	6.794832***	—	5.810153***	6.794891***
H_0: λ=0	—	—	36.597966***	—	—	63.849669***
Schwartz.	-0.46717	-0.191835	-0.418502	-0.420166	-0.029179	-0.41983
F	9738.522	642.6195	808.807	9283.472	545.4951	809.8872
Obs.	866	866	866	866	866	866

Note: (i) each figure below the coefficients is t-value., (ii) *** significant at 1%, ** significant at 5%, * significant at 10%.
Source: *Financial statement of national credit associations, Financial statement of national credit cooperatives.*

Table A. I.18 Empirical results of SCP hypothesis for Japanese credit associations and credit cooperatives in Area3 with financial statement data, Dependent variable: lnREV

Loan	Normal	1-way	2-way	Normal	1-way	2-way
Constant	0.000945	0.699162	0.116936	-0.141195	0.410698	0.054477
	(0.004396)	(0.818043)	(0.14806)	(-0.661018)	(0.478186)	(0.06925)
CRL3	-4.376988***	-5.513025***	0.992903			
	(-8.988568)	(-13.94579)	(1.006704)			
CRL5				-2.480451***	-3.409812***	1.324865**
				(-8.360222)	(-13.6447)	(2.240385)
MSL	3.720389***	-10.36357***	2.759455	2.368211**	-12.50386***	5.874594*
	(3.948343)	(-3.544965)	(0.830207)	(2.297724)	(-4.213818)	(1.680762)
lnAST	0.799077***	0.78104***	0.751317***	0.800963***	0.791153***	0.74723***
	(62.9262)	(16.6655)	(17.34227)	(62.46812)	(16.78254)	(17.32302)
ln LOAN/DEP	0.665515***	0.950809***	0.790529***	0.667243***	0.948201***	0.789591***
	(13.7368)	(12.97309)	(11.5578)	(13.6833)	(12.87035)	(11.60908)
lnBR	0.121564***	0.036725	0.096688**	0.123741***	0.051159	0.08725**
	(7.657317)	(0.817573)	(2.32638)	(7.745605)	(1.131425)	(2.092353)
R2	0.983316	0.993672	0.994843	0.983121	0.993613	0.994873
Adj.R2	0.983219	0.992225	0.99361	0.983023	0.992153	0.993646
H_0: η=0	—	7.385536***	6.800377***	—	7.413717***	6.816277***
H_0: λ=0	—	—	26.42179***	—	—	28.579751***
Schwartz.	-0.506638	-0.25768	-0.415488	-0.494984	-0.248391	-0.421202
F	10137.5	686.6541	806.3605	10018.04	680.2648	811.0055
Obs.	866	866	866	866	866	866

Note: (i) each figure below the coefficients is t-value., (ii) *** significant at 1%, ** significant at 5%, * significant at 10%.
Source: *Financial statement of national credit associations, Financial statement of national credit cooperatives.*

[Area 4]

Table A. I.19 Empirical results of SCP hypothesis for Japanese credit associations and credit cooperatives in Area4 with financial statement data, Dependent variable: ln(1+ROA)

Asset	Normal	1-way	2-way	Normal	1-way	2-way
Constant	-0.032078***	-0.123023***	0.04517	-0.032898***	-0.129135***	-0.082501*
	(-2.746353)	(-3.302719)	(0.419491)	(-2.822288)	(-3.465581)	(-1.882721)
CRA3	-0.001415	-0.026001**	-0.538224			
	(-0.113671)	(-2.291405)	(-1.264895)			
CRA5				0.007152	-0.017337	0.003807
				(0.615607)	(-1.563394)	(0.05575)
MSA	-0.008784	-0.157902	-0.210534*	0.008016	-0.182281*	-0.120376
	(-0.3291)	(-1.645012)	(-1.78563)	(0.239241)	(-1.914446)	(-1.187925)
lnAST	0.002028***	0.006792***	0.005333**	0.001902***	0.007058***	0.004124*
	(2.897521)	(3.37748)	(2.272532)	(2.674783)	(3.481485)	(1.894362)
ln LOAN/DEP	0.009141***	0.016729***	0.015812***	0.009161***	0.016946***	0.01515***
	(6.74749)	(10.28847)	(9.006356)	(6.766651)	(10.38526)	(8.971606)
lnBR	-0.002271***	-0.000353	0.000519	-0.00225***	-0.000273	0.000444
	(-3.24011)	(-0.251783)	(0.36732)	(-3.213019)	(-0.193593)	(0.314151)
R2	0.093099	0.625959	0.644824	0.093799	0.62327	0.643339
Adj.R2	0.083533	0.538233	0.554635	0.08424	0.534914	0.552773
H_0: η=0	—	6.427271***	6.438151***	—	6.340828***	6.403392***
H_0: λ=0	—	—	3.381624***	—	—	3.582422***
Schwartz	-7.134128	-6.913658	-6.888238	-7.1349	-6.906496	-6.884066
F	9.731821	7.135371	7.149716	9.812545	7.054024	7.103559
Obs.	480	480	480	480	480	480

Note: (i) each figure below the coefficients is t-value., (ii) *** significant at 1%, ** significant at 5%, * significant at 10%.
Source: *Financial statement of national credit associations, Financial statement of national credit cooperatives.*

Table A. I.20 Empirical results of SCP hypothesis for Japanese credit associations and credit cooperatives in Area4 with financial statement data, Dependent variable: ln(1+ROA)

Deposit	Normal	1-way	2-way	Normal	1-way	2-way
Constant	-0.033002***	-0.130472***	-0.086855**	-0.033763***	-0.135798***	-0.08787**
	(-2.826264)	(-3.464443)	(-1.989294)	(-2.899438)	(-3.606649)	(-2.062814)
CRD3	0.000687	-0.022717*	0.002214			
	(0.052225)	(-1.839691)	(0.033723)			
CRD5				0.008636	-0.013596	0.00566
				(0.714688)	(-1.163536)	(0.109922)
MSD	-0.009286	-0.186096*	-0.139927	0.008069	-0.208619**	-0.137036
	(-0.346713)	(-1.908927)	(-1.436647)	(0.238283)	(-2.163113)	(-1.353772)
lnAST	0.002045***	0.007137***	0.004392**	0.001918***	0.007336***	0.004371**
	(2.922056)	(3.511551)	(2.025371)	(2.695186)	(3.575731)	(2.006375)
ln LOAN/DEP	0.009174***	0.016987***	0.01534***	0.009184***	0.017169***	0.01533***
	(6.767912)	(10.31172)	(9.023026)	(6.780719)	(10.39073)	(9.006746)
lnBR	-0.002271***	-0.000239	0.0005	-0.002253***	-0.000142	0.000497
	(-3.241427)	(-0.170218)	(0.353307)	(-3.218203)	(-0.10061)	(0.35113)
R2	0.09327	0.624942	0.643756	0.094241	0.622986	0.643766
Adj.R2	0.083706	0.536977	0.553296	0.084687	0.534562	0.553309
H_0: η=0	—	6.395552***	6.396812***	—	6.327344***	6.406133***
H_0: λ=0	—	—	3.362418***	—	—	3.713934***
Schwartz	-7.134316	-6.910943	-6.885236	-7.135387	-6.905741	-6.885265
F	9.75154	7.104462	7.116483	9.863602	7.045479	7.116799
Obs.	480	480	480	480	480	480

Note: (i) each figure below the coefficients is t-value., (ii) *** significant at 1%, ** significant at 5%, * significant at 10%.
Source: *Financial statement of national credit associations, Financial statement of national credit cooperatives.*

Table A. I.21 Empirical results of SCP hypothesis for Japanese credit associations and credit cooperatives in Area4 with financial statement data, Dependent variable: ln(1+ROA)

Loan	Normal	1-way	2-way	Normal	1-way	2-way
Constant	-0.0337***	-0.112352***	-0.081959**	-0.034282***	-0.120686***	-0.083647**
	(-2.914687)	(-3.219189)	(-2.162526)	(-2.95886)	(-3.45288)	(-2.207305)
CRL3	-0.014399*	-0.024015***	-0.009548			
	(-1.837248)	(-3.782905)	(-0.373963)			
CRL5				-0.010672	-0.020713***	-0.000335
				(-1.321291)	(-3.022716)	(-0.016421)
MSL	-0.035041	-0.128467*	-0.124827	-0.041827	-0.149505**	-0.119659
	(-1.635771)	(-1.750187)	(-1.648456)	(-1.627511)	(-2.039987)	(-1.559078)
lnAST	0.002353***	0.00623***	0.004322**	0.002374***	0.006723***	0.004261**
	(3.44003)	(3.313413)	(2.110351)	(3.434706)	(3.560813)	(2.078375)
ln LOAN/DEP	0.00931***	0.016478***	0.015409***	0.009386***	0.016831***	0.015372***
	(6.831045)	(10.23353)	(9.174838)	(6.875799)	(10.42153)	(9.148109)
lnBR	-0.002355***	-0.000362	0.000405	-0.002342***	-0.000409	0.000396
	(-3.374857)	(-0.265652)	(0.288858)	(-3.350571)	(-0.297439)	(0.282258)
R2	0.101271	0.635697	0.64433	0.098192	0.630951	0.6442
Adj.R2	0.09179	0.550254	0.554016	0.088679	0.544396	0.553853
H_0: η=0	—	6.618474***	6.374583***	—	6.512981***	6.36337***
H_0: λ=0	—	—	1.545398	—	—	2.370796**
Schwartz.	-7.143179	-6.940037	-6.886848	-7.139759	-6.927094	-6.886483
F	10.68226	7.440074	7.134323	10.32216	7.289568	7.130279
Obs.	480	480	480	480	480	480

Note: (i) each figure below the coefficients is t-value., (ii) *** significant at 1%, ** significant at 5%, * significant at 10%.
Source: *Financial statement of national credit associations, Financial statement of national credit cooperatives.*

Table A. I.22 Empirical results of SCP hypothesis for Japanese credit associations and credit cooperatives in Area4 with financial statement data, Dependent variable: lnREV

Asset	Normal	1-way	2-way	Normal	1-way	2-way
Constant	-2.194988***	3.251835***	2.288697	-2.227465***	2.699881***	0.776748
	(-5.996155)	(3.146461)	(0.823776)	(-6.15366)	(2.597374)	(0.688279)
CRA3	-3.098393***	-2.480636***	-7.287326			
	(-7.976509)	(-7.916285)	(-0.663356)			
CRA5				-3.096346***	-2.278392***	-0.744396
				(-8.599645)	(-7.39319)	(-0.423008)
MSA	-4.404422***	-4.303462	-4.903451	-7.473929***	-5.824309**	-4.085558
	(-5.263265)	(-1.616067)	(-1.611115)	(-7.182753)	(-2.192965)	(-1.564785)
lnAST	0.937864***	0.644074***	0.770484***	0.954119***	0.680477***	0.757785***
	(42.7781)	(11.54293)	(12.72455)	(43.21974)	(12.03118)	(13.51747)
ln LOAN/DEP	0.588078***	0.344933***	0.397803***	0.591899***	0.368733***	0.390653***
	(13.8267)	(7.644819)	(8.779848)	(14.05338)	(8.099935)	(8.980338)
lnBR	0.082966***	0.12464***	0.071981**	0.084264***	0.119903***	0.071036*
	(3.775768)	(3.207738)	(1.975076)	(3.872935)	(3.047749)	(1.950155)
R2	0.973616	0.991536	0.993042	0.97411	0.991384	0.993038
Adj.R2	0.97334	0.989518	0.991249	0.973839	0.989329	0.991243
H_0: η=0	—	9.383202***	9.475623***	—	8.884837***	9.385011***
H_0: λ=0	—	—	13.855926***	—	—	15.20428***
Schwartz.	-0.240129	-0.25306	-0.3724	-0.25902	-0.23521	-0.37172
F	3527.791	491.2664	553.6081	3596.892	482.5011	553.2294
Obs.	484	484	484	484	484	484

Note: (i) each figure below the coefficients is t-value., (ii) *** significant at 1%, ** significant at 5%, * significant at 10%.
Source: *Financial statement of national credit associations, Financial statement of national credit cooperatives.*

Table A. I.23 Empirical results of SCP hypothesis for Japanese credit associations and credit cooperatives in Area4 with financial statement data, Dependent variable: lnREV

Deposit	Normal	1-way	2-way	Normal	1-way	2-way
Constant	-2.152807***	3.232567***	0.86174	-2.190802***	2.562349**	0.89842
	(-5.901583)	(3.12116)	(0.765221)	(-6.09626)	(2.459764)	(0.817823)
CRD3	-3.349307***	-2.829105***	-0.530827			
	(-8.181176)	(-8.367119)	(-0.31327)			
CRD5				-3.344406***	-2.54192***	-0.627775
				(-8.989443)	(-7.889098)	(-0.472361)
MSD	-4.586249***	-3.93645	-3.215109	-7.892192***	-5.759629**	-3.489417
	(-5.484474)	(-1.468581)	(-1.279249)	(-7.559058)	(-2.158814)	(-1.33608)
lnAST	0.939911***	0.650886***	0.746824***	0.957621***	0.693487***	0.749025***
	(43.01392)	(11.64439)	(13.35188)	(43.62242)	(12.21641)	(13.33322)
ln LOAN/DEP	0.589639***	0.347922***	0.385782***	0.593857***	0.375693***	0.386859***
	(13.89803)	(7.678891)	(8.794904)	(14.17876)	(8.217992)	(8.810249)
lnBR	0.082445***	0.119379***	0.070625*	0.083718***	0.114258***	0.070752*
	(3.763751)	(3.086068)	(1.932137)	(3.872077)	(2.917724)	(1.936247)
R2	0.973776	0.991662	0.993023	0.974427	0.991519	0.993026
Adj.R2	0.973501	0.989674	0.991225	0.97416	0.989496	0.991227
H_0: η=0	—	9.506786***	9.455563***	—	8.930997***	9.379478***
H_0: λ=0	—	—	12.488056***	—	—	13.82767***
Schwartz	-0.246209	-0.268046	-0.36966	-0.271358	-0.251009	-0.369985
F	3549.888	498.7471	552.0828	3642.732	490.251	552.2637
Obs.	484	484	484	484	484	484

Note: (i) each figure below the coefficients is t-value., (ii) *** significant at 1%, ** significant at 5%, * significant at 10%.
Source: *Financial statement of national credit associations, Financial statement of national credit cooperatives.*

Table A. I.24 Empirical results of SCP hypothesis for Japanese credit associations and credit cooperatives in Area4 with financial statement data, Dependent variable: lnREV

Loan	Normal	1-way	2-way	Normal	1-way	2-way
Constant	-2.239157***	3.414061***	0.591516	-2.207896***	3.124515***	0.602044
	(-5.994902)	(3.392974)	(0.605717)	(-5.958864)	(3.118968)	(0.616675)
CRL3	-1.527071***	-1.112613***	-0.02342			
	(-6.062559)	(-6.107132)	(-0.035571)			
CRL5				-1.734736***	-1.187832***	-0.065439
				(-6.735853)	(-6.071638)	(-0.124583)
MSL	-2.241983***	-5.278229**	-3.348385*	-4.174778***	-5.902059***	-3.396661*
	(-3.235484)	(-2.494013)	(-1.715067)	(-5.076771)	(-2.809658)	(-1.716883)
lnAST	0.917567***	0.615719***	0.753745***	0.928607***	0.638573***	0.754206***
	(41.54348)	(11.35604)	(14.28152)	(42.02491)	(11.79893)	(14.27779)
ln LOAN/DEP	0.595034***	0.338727***	0.392834***	0.604667***	0.352553***	0.3931***
	(13.49187)	(7.295777)	(9.073798)	(13.82773)	(7.615784)	(9.077105)
lnBR	0.087732***	0.145335***	0.06904*	0.087459***	0.139383***	0.069057*
	(3.889505)	(3.693837)	(1.907529)	(3.909797)	(3.534488)	(1.908262)
R2	0.972218	0.991098	0.993048	0.972676	0.991089	0.993048
Adj.R2	0.971928	0.988975	0.991256	0.97239	0.988964	0.991256
H_0: η=0	—	9.398772***	9.547527***	—	9.157296***	9.523605***
H_0: λ=0	—	—	17.952808***	—	—	18.038845***
Schwartz	-0.188514	-0.202572	-0.373195	-0.205116	-0.20156	-0.373232
F	3345.516	466.8725	554.0516	3403.121	466.396	554.0724
Obs.	484	484	484	484	484	484

Note: (i) each figure below the coefficients is t-value., (ii) *** significant at 1%, ** significant at 5%, * significant at 10%.
Source: *Financial statement of national credit associations, Financial statement of national credit cooperatives.*

[Area 5]

Table A. I.25 Empirical results of SCP hypothesis for Japanese credit associations and credit cooperatives in Area5 with financial statement data, Dependent variable: ln(1+ROA)

Asset	Normal	1-way	2-way	Normal	1-way	2-way
Constant	0.019763	0.137669***	0.145003***	0.019062	0.136308***	0.141009***
	(1.420076)	(3.809902)	(3.84086)	(1.38975)	(3.851927)	(3.951354)
CRA3	-0.006094	-0.019184	-0.014133			
	(-0.365103)	(-1.050881)	(-0.333831)			
CRA5				-0.001793	-0.009127	-0.002697
				(-0.245656)	(-1.625223)	(-0.138635)
MSA	0.017467	0.286297***	0.321861***	0.02071	0.292808***	0.317499***
	(0.754067)	(2.861814)	(3.049047)	(1.033982)	(2.950503)	(2.719598)
lnAST	-0.000643	-0.005397***	-0.005942***	-0.000678	-0.005445***	-0.00592***
	(-0.727338)	(-2.687766)	(-2.91685)	(-0.774043)	(-2.720179)	(-2.850779)
ln LOAN/DEP	-0.006251***	-0.000164	0.000336	-0.006215***	4.82E-05	0.000348
	(-4.022942)	(-0.080413)	(0.161258)	(-4.013977)	(0.023801)	(0.166319)
lnBR	0.000656	-0.013379***	-0.013416***	0.000646	-0.013589***	-0.013365***
	(0.647879)	(-4.685385)	(-4.546291)	(0.638502)	(-4.765526)	(-4.506479)
R2	0.065622	0.634201	0.642858	0.065391	0.636462	0.64272
Adj.R2	0.049785	0.553903	0.553572	0.04955	0.556661	0.5534
H_0: η=0	—	7.803455***	7.849241***	—	7.886411***	7.850676***
H_0: λ=0	—	—	0.969578	—	—	0.700683
Schwartz	-7.878877	-7.887609	-7.797797	-7.87863	-7.89381	-7.797413
F	4.143585	7.898145	7.200014	4.127977	7.975608	7.195713
Obs.	301	301	301	301	301	301

Note: (i) each figure below the coefficients is t-value., (ii) *** significant at 1%, ** significant at 5%, * significant at 10%.
Source: *Financial statement of national credit associations, Financial statement of national credit cooperatives.*

Table A. I.26 Empirical results of SCP hypothesis for Japanese credit associations and credit cooperatives in Area5 with financial statement data, Dependent variable: ln(1+ROA)

Deposit	Normal	1-way	2-way	Normal	1-way	2-way
Constant	0.019853	0.125786***	0.135346***	0.01891	0.130292***	0.127243***
	(1.424003)	(3.478079)	(2.767871)	(1.371993)	(3.622264)	(3.423189)
CRD3	-0.007875	-0.01807	-0.021502			
	(-0.460692)	(-0.934546)	(-0.19512)			
CRD5				-0.002565	-0.023352	0.004867
				(-0.175629)	(-1.513506)	(0.141829)
MSD	0.014795	0.23176**	0.263413**	0.018621	0.244299**	0.269108**
	(0.626339)	(2.3499)	(2.518562)	(0.576699)	(2.482734)	(2.522027)
lnAST	-0.000612	-0.004785**	-0.005293***	-0.000648	-0.004739**	-0.005353***
	(-0.692462)	(-2.395388)	(-2.611978)	(-0.709084)	(-2.383875)	(-2.626448)
ln LOAN/DEP	-0.006274***	-0.00036	0.000121	-0.006223***	-7.12E-05	8.60E-05
	(-4.040098)	(-0.175529)	(0.05784)	(-4.01149)	(-0.035044)	(0.040867)
lnBR	0.000655	-0.012748***	-0.01278***	0.000636	-0.013538***	-0.012798***
	(0.647004)	(-4.408809)	(-4.235263)	(0.626308)	(-4.60305)	(-4.243477)
R2	0.065419	0.630229	0.638453	0.064844	0.63234	0.638426
Adj.R2	0.049579	0.54906	0.548066	0.048994	0.551634	0.548032
H_0: η=0	—	7.66846***	7.696211***	—	7.749154***	7.705132***
H_0: λ=0	—	—	0.909844	—	—	0.673274
Schwartz	-7.87866	-7.87681	-7.785538	-7.878046	-7.882534	-7.785463
F	4.129898	7.764375	7.063556	4.091108	7.835105	7.062729
Obs.	301	301	301	301	301	301

Note: (i) each figure below the coefficients is t-value., (ii) *** significant at 1%, ** significant at 5%, * significant at 10%.
Source: *Financial statement of national credit associations, Financial statement of national credit cooperatives.*

Table A. I.27 Empirical results of SCP hypothesis for Japanese credit associations and credit cooperatives in Area5 with financial statement data, Dependent variable: ln(1+ROA)

Loan	Normal	1-way	2-way	Normal	1-way	2-way
Constant	0.015973	0.113633***	0.147622**	0.017259	0.116743***	0.123412***
	(1.110446)	(3.309463)	(2.331977)	(1.264612)	(3.679072)	(3.69537)
CRL3	0.008735	-0.006632	-0.086252			
	(0.40529)	(-0.190693)	(-0.566142)			
CRL5				0.003183	-0.013762	-0.01787
				(0.301518)	(-1.365376)	(-0.651281)
MSL	0.034061	0.233503***	0.288053***	0.031001	0.257267***	0.258035***
	(1.378512)	(2.775484)	(3.158937)	(1.383585)	(3.043005)	(2.687913)
lnAST	-0.000702	-0.004213**	-0.004562**	-0.000685	-0.004127**	-0.004485**
	(-0.832247)	(-2.318991)	(-2.487962)	(-0.814158)	(-2.280642)	(-2.449202)
ln LOAN/DEP	-0.006561***	-0.001118	-0.001127	-0.006528***	-0.001418	-0.001023
	(-4.225088)	(-0.54186)	(-0.532662)	(-4.213536)	(-0.692124)	(-0.482656)
lnBR	0.000497	-0.013394***	-0.013833***	0.000529	-0.013897***	-0.013304***
	(0.490518)	(-4.670571)	(-4.607289)	(0.52539)	(-4.824722)	(-4.328408)
R2	0.069898	0.633308	0.643385	0.069667	0.636012	0.643539
Adj.R2	0.054134	0.552814	0.554231	0.053899	0.556112	0.554423
H_0: η=0	—	7.713674***	7.813151***	—	7.811468***	7.816391***
H_0: λ=0	—	—	1.130327	—	—	0.844617
Schwartz.	-7.883465	-7.885171	-7.799274	-7.883216	-7.892573	-7.799705
F	4.433911	7.867815	7.216575	4.418148	7.960112	7.221412
Obs.	301	301	301	301	301	301

Note: (i) each figure below the coefficients is t-value., (ii) *** significant at 1%, ** significant at 5%, * significant at 10%.
Source: *Financial statement of national credit associations, Financial statement of national credit cooperatives.*

Table A. I.28 Empirical results of SCP hypothesis for Japanese credit associations and credit cooperatives in Area5 with financial statement data, Dependent variable: lnREV

Asset	Normal	1-way	2-way	Normal	1-way	2-way
Constant	-1.96677***	12.72107***	11.57731***	-2.354819***	11.74377***	11.67765***
	(-3.546382)	(8.880164)	(8.796901)	(-4.294459)	(8.556068)	(9.411247)
CRA3	-3.85067***	-5.190989***	0.40874			
	(-5.772057)	(-7.207381)	(0.275505)			
CRA5				-1.626838***	-1.772818***	0.645941
				(-5.557086)	(-8.108377)	(0.955078)
MSA	-5.029412***	8.868587**	18.13347***	-3.990358***	8.769223**	19.66807***
	(-5.432023)	(2.250027)	(4.971277)	(-4.966835)	(2.282972)	(4.913086)
lnAST	0.949188***	0.158821**	0.130521*	0.937787***	0.162259**	0.116811
	(26.97133)	(2.006238)	(1.844314)	(26.80968)	(2.098028)	(1.617493)
ln LOAN/DEP	0.404855***	0.072461	0.052731	0.418223***	0.127077	0.050025
	(6.561137)	(0.899012)	(0.728235)	(6.775128)	(1.618904)	(0.691489)
lnBR	0.12522***	0.184684	0.028659	0.116507***	0.151279	0.020669
	(3.111808)	(1.649531)	(0.281896)	(2.882688)	(1.379245)	(0.203049)
R2	0.974122	0.98995	0.992391	0.973929	0.990394	0.992418
Adj.R2	0.973684	0.987753	0.990497	0.973488	0.988293	0.99053
H_0: η=0	—	7.939273***	9.648979***	—	8.63961***	9.893892***
H_0: λ=0	—	—	12.88667***	—	—	10.721688***
Schwartz.	-0.502718	-0.522041	-0.686849	-0.495296	-0.567167	-0.690312
F	2228.418	450.5625	523.8828	2211.5	471.5717	525.7141
Obs.	302	302	302	302	302	302

Note: (i) each figure below the coefficients is t-value., (ii) *** significant at 1%, ** significant at 5%, * significant at 10%.
Source: *Financial statement of national credit associations, Financial statement of national credit cooperatives.*

Table A. I.29 Empirical results of SCP hypothesis for Japanese credit associations and credit cooperatives in Area5 with financial statement data, Dependent variable: lnREV

Deposit	Normal	1-way	2-way	Normal	1-way	2-way
Constant	-1.928382***	13.15942***	10.83341***	-2.309508***	13.02965***	11.19515***
	(-3.480317)	(9.274164)	(6.429437)	(-4.087108)	(9.230167)	(8.807725)
CRD3	-4.031077***	-5.616523***	3.374592			
	(-5.916199)	(-7.469737)	(0.886764)			
CRD5				-2.297218***	-4.555476***	2.133681*
				(-3.823943)	(-7.536426)	(1.814651)
MSD	-5.265502***	10.04121***	19.04195***	-5.289076***	10.43813***	20.09279***
	(-5.591761)	(2.638876)	(5.40048)	(-3.981985)	(2.740934)	(5.627821)
lnAST	0.95013***	0.139278*	0.121203*	0.95241***	0.166996**	0.10853
	(27.07148)	(1.785548)	(1.742061)	(25.42127)	(2.150939)	(1.557562)
ln LOAN/DEP	0.406618***	0.068574	0.04364	0.422069***	0.14533*	0.035612
	(6.611221)	(0.858391)	(0.608499)	(6.655097)	(1.828604)	(0.497916)
lnBR	0.126564***	0.196406*	-0.002925	0.110774***	0.046379	0.026201
	(3.153256)	(1.760523)	(-0.028706)	(2.663523)	(0.409105)	(0.258137)
R2	0.974255	0.990095	0.992519	0.972566	0.990127	0.992595
Adj.R2	0.97382	0.987929	0.990656	0.972102	0.987969	0.990752
H_0: η=0	—	8.060819***	9.844723***	—	8.966513***	10.231559***
H_0: λ=0	—	—	13.015085***	—	—	13.38942***
Schwartz.	-0.507872	-0.536515	-0.703741	-0.444328	-0.539815	-0.714055
F	2240.239	457.1983	532.8759	2098.668	458.7244	538.4418
Obs.	302	302	302	302	302	302

Note: (i) each figure below the coefficients is t-value., (ii) *** significant at 1%, ** significant at 5%, * significant at 10%.
Source: *Financial statement of national credit associations, Financial statement of national credit cooperatives.*

Table A. I.30 Empirical results of SCP hypothesis for Japanese credit associations and credit cooperatives in Area5 with financial statement data, Dependent variable: lnREV

Loan	Normal	1-way	2-way	Normal	1-way	2-way
Constant	-1.582688***	12.20068***	10.96125***	-1.761292***	11.00676***	9.940154***
	(-2.667463)	(8.662694)	(4.899625)	(-3.194215)	(9.510961)	(8.581503)
CRL3	-3.269841***	-7.267908***	-3.027814			
	(-3.665922)	(-5.017014)	(-0.559496)			
CRL5				-2.187716***	-3.670913***	-0.185761
				(-5.109336)	(-9.787863)	(-0.190583)
MSL	-3.689234***	2.681739	13.73208***	-4.348599***	6.454388**	13.21738***
	(-3.607841)	(0.763977)	(4.241709)	(-4.785728)	(2.045877)	(3.876608)
lnAST	0.914299***	0.229118***	0.23571***	0.917085***	0.256288***	0.237988***
	(26.31593)	(3.111032)	(3.723022)	(26.99744)	(3.910743)	(3.760546)
ln LOAN/DEP	0.467749***	0.056637	-0.026742	0.45988***	0.029193	-0.025713
	(7.325666)	(0.663073)	(-0.360008)	(7.366605)	(0.384815)	(-0.345187)
lnBR	0.145633***	0.258196**	0.035532	0.137692***	0.148921	0.04301
	(3.492509)	(2.169659)	(0.33552)	(3.387614)	(1.394163)	(0.396658)
R2	0.972388	0.988927	0.992194	0.973474	0.991209	0.992185
Adj.R2	0.971921	0.986507	0.990251	0.973025	0.989287	0.990239
H_0: η=0	—	7.52954***	9.471265***	—	10.169122***	9.360872***
H_0: λ=0	—	—	16.808806***	—	—	5.017565***
Schwartz.	-0.43787	-0.425117	-0.661248	-0.477988	-0.655842	-0.660101
F	2084.777	408.5193	510.5398	2172.537	515.7225	509.9497
Obs.	302	302	302	302	302	302

Note: (i) each figure below the coefficients is t-value., (ii) *** significant at 1%, ** significant at 5%, * significant at 10%.
Source: *Financial statement of national credit associations, Financial statement of national credit cooperatives.*

[Area 6]

Table A. I.31 Empirical results of SCP hypothesis for Japanese credit associations and credit cooperatives in Area6 with financial statement data, Dependent variable: ln(1+ROA)

Asset	Normal	1-way	2-way	Normal	1-way	2-way
Constant	-0.072008***	-0.022524	0.047574	-0.062686**	0.007497	0.053555
	(-2.770521)	(-0.149019)	(0.256887)	(-2.405706)	(0.056745)	(0.289954)
CRA3	-0.017329***	-0.004813	-0.002806			
	(-2.663405)	(-0.426809)	(-0.218883)			
CRA5				-0.012466*	-0.001847	-0.000557
				(-1.763449)	(-0.203554)	(-0.052862)
MSA	-0.06579***	-0.006103	0.013987	-0.065819**	0.01388	0.022243
	(-2.839067)	(-0.075766)	(0.170372)	(-2.183286)	(0.220883)	(0.285493)
lnAST	0.0054***	0.001546	-0.00251	0.004784***	-0.000257	-0.002895
	(3.220924)	(0.17652)	(-0.235367)	(2.811725)	(-0.033991)	(-0.272072)
ln LOAN/DEP	-0.011367**	0.007855	0.003219	-0.009656**	0.00868	0.003116
	(-2.604803)	(0.646527)	(0.24639)	(-2.215527)	(0.719265)	(0.238615)
lnBR	-0.000649	-9.22E-05	0.001727	-0.000521	-5.60E-05	0.001531
	(-0.36095)	(-0.017631)	(0.308606)	(-0.284112)	(-0.010703)	(0.276406)
R2	0.278926	0.649633	0.696495	0.251595	0.649046	0.696319
Adj.R2	0.243579	0.553699	0.583653	0.214909	0.552952	0.583412
H_0: η=0	—	4.937589***	5.421902***	—	5.284954***	5.642421***
H_0: λ=0	—	—	2.007209*	—	—	2.02365*
Schwartz.	-8.23729	-8.178696	-8.062159	-8.200087	-8.177023	-8.06158
F	7.891128	6.771684	6.172313	6.85797	6.754258	6.167191
Obs.	108	108	108	108	108	108

Note: (i) each figure below the coefficients is t-value., (ii) *** significant at 1%, ** significant at 5%, * significant at 10%.
Source: *Financial statement of national credit associations, Financial statement of national credit cooperatives.*

Table A. I.32 Empirical results of SCP hypothesis for Japanese credit associations and credit cooperatives in Area6 with financial statement data, Dependent variable: ln(1+ROA)

Deposit	Normal	1-way	2-way	Normal	1-way	2-way
Constant	-0.078686***	-0.094106	-0.106015	-0.079606***	-0.074823	-0.140219
	(-3.253745)	(-0.80848)	(-0.788635)	(-3.287167)	(-0.632034)	(-1.069374)
CRD3	-0.009416	-0.004071	-0.016197			
	(-1.224307)	(-0.488667)	(-0.698412)			
CRD5				-0.009158	0.005111	0.028217**
				(-1.318191)	(0.621541)	(2.355857)
MSD	-0.083768***	-0.109486	-0.116389	-0.092266***	-0.094435	-0.072631
	(-3.474616)	(-1.219882)	(-1.289351)	(-3.242809)	(-1.029018)	(-0.815871)
lnAST	0.005476***	0.005225	0.006186	0.005603***	0.003842	0.006449
	(3.473928)	(0.840407)	(0.855833)	(3.510418)	(0.601029)	(0.923473)
ln LOAN/DEP	-0.012249***	0.008189	0.004456	-0.011228***	0.010239	0.005027
	(-3.415874)	(0.677326)	(0.359647)	(-3.402266)	(0.850336)	(0.41912)
lnBR	0.000477	0.004184	0.00528	0.000323	0.003727	0.005606
	(0.285978)	(0.656967)	(0.857104)	(0.19466)	(0.588189)	(0.938789)
R2	0.357834	0.654252	0.703618	0.359312	0.654857	0.721575
Adj.R2	0.326356	0.559584	0.593424	0.327906	0.560353	0.618059
H_0: η=0	—	4.000853***	4.270762***	—	3.996053***	4.876473***
H_0: λ=0	—	—	2.165268*	—	—	3.115172***
Schwartz.	-8.353185	-8.191968	-8.085908	-8.355489	-8.193717	-8.148411
F	11.3675	6.91095	6.385295	11.44076	6.929448	6.970608
Obs.	108	108	108	108	108	108

Note: (i) each figure below the coefficients is t-value., (ii) *** significant at 1%, ** significant at 5%, * significant at 10%.
Source: *Financial statement of national credit associations, Financial statement of national credit cooperatives.*

Table A. I.33 Empirical results of SCP hypothesis for Japanese credit associations and credit cooperatives in Area6 with financial statement data, Dependent variable: ln(1+ROA)

Loan	Normal	1-way	2-way	Normal	1-way	2-way
Constant	-0.068469***	-0.073585	-0.030017	-0.071224***	-0.037973	0.018644
	(-2.871504)	(-0.759491)	(-0.289688)	(-2.897613)	(-0.384386)	(0.173549)
CRL3	-0.001285	0.003034	-0.013771			
	(-0.172215)	(0.349144)	(-0.606362)			
CRL5				-0.003371	0.013127	0.016419
				(-0.473007)	(1.260199)	(1.498446)
MSL	-0.052233***	-0.10556**	-0.108151*	-0.059945**	-0.110646**	-0.121291**
	(-2.820707)	(-2.064626)	(-1.779049)	(-2.449286)	(-2.228464)	(-2.085081)
lnAST	0.004504***	0.003452	0.00128	0.004767***	0.00061	-0.002949
	(2.980153)	(0.673695)	(0.22778)	(2.96368)	(0.110637)	(-0.484283)
ln LOAN/DEP	-0.00588*	0.018533	0.016496	-0.005464*	0.018499	0.015549
	(-1.942539)	(1.426501)	(1.155083)	(-1.733018)	(1.473191)	(1.100588)
lnBR	-0.000231	0.0055	0.007788	-0.000374	0.009878	0.013621*
	(-0.138353)	(0.939721)	(1.254428)	(-0.220738)	(1.457389)	(1.910796)
R2	0.33652	0.664547	0.711899	0.337779	0.670294	0.71864
Adj.R2	0.303996	0.572697	0.604784	0.305317	0.580017	0.614032
H_0: η=0	—	4.563363***	4.900451***	—	4.706409***	5.116737***
H_0: λ=0	—	—	2.136649*	—	—	2.233801**
Schwartz	-8.320532	-8.222194	-8.114245	-8.322433	-8.239474	-8.137923
F	10.34695	7.235113	6.646138	10.40544	7.424873	6.869821
Obs.	108	108	108	108	108	108

Note: (i) each figure below the coefficients is t-value., (ii) *** significant at 1%, ** significant at 5%, * significant at 10%.
Source: *Financial statement of national credit associations, Financial statement of national credit cooperatives.*

Table A. I.34 Empirical results of SCP hypothesis for Japanese credit associations and credit cooperatives in Area6 with financial statement data, Dependent variable: lnREV

Asset	Normal	1-way	2-way	Normal	1-way	2-way
Constant	1.758933	9.367311	-0.710008	2.287496	15.12057***	-0.646467
	(1.253242)	(1.824133)	(-0.159821)	(1.6235)	(3.316041)	(-0.14647)
CRA3	-0.93625***	-0.648812*	0.390953			
	(-2.664786)	(-1.693649)	(1.27149)			
CRA5				-0.6436*	-0.053723	0.372191
				(-1.683718)	(-0.171573)	(1.478629)
MSA	-2.046651	2.681008	0.664915	-1.940789	6.417537***	0.619717
	(-1.635555)	(0.979713)	(0.337628)	(-1.190583)	(2.959069)	(0.332857)
lnAST	0.703058***	0.250221	0.822184***	0.666945***	-0.09558	0.815242***
	(7.766171)	(0.841069)	(3.214488)	(7.249106)	(-0.365951)	(3.206072)
ln LOAN/DEP	-0.998719***	0.742538*	-0.296658	-0.902127***	0.839918**	-0.284341
	(-4.237976)	(1.798872)	(-0.946649)	(-3.827987)	(2.01659)	(-0.911204)
lnBR	0.469697***	0.206146	0.080041	0.476215***	0.207827	0.088553
	(4.83509)	(1.160806)	(0.596227)	(4.799254)	(1.150528)	(0.669179)
R2	0.970109	0.994251	0.997517	0.968893	0.994057	0.997535
Adj.R2	0.968644	0.992677	0.996594	0.967368	0.99243	0.996618
H_0: η=0	—	19.597513***	37.766652***	—	19.759661***	38.088685***
H_0: λ=0	—	—	17.1012***	—	—	18.340847***
Schwartz	-0.259312	-1.127513	-1.70701	-0.219424	-1.094285	-1.714139
F	662.0889	631.6432	1080.642	635.4015	610.8806	1088.393
Obs.	108	108	108	108	108	108

Note: (i) each figure below the coefficients is t-value., (ii) *** significant at 1%, ** significant at 5%, * significant at 10%.
Source: *Financial statement of national credit associations, Financial statement of national credit cooperatives.*

Table A. I.35 Empirical results of SCP hypothesis for Japanese credit associations and credit cooperatives in Area6 with financial statement data, Dependent variable: lnREV

Deposit	Normal	1-way	2-way	Normal	1-way	2-way
Constant	0.641932	8.705399**	2.314166	0.207303	5.846608	2.076241
	(0.48074)	(2.398721)	(0.7299)	(0.160293)	(1.529076)	(0.632582)
CRD3	-1.202084***	-1.78821***	-1.240464**			
	(-2.830597)	(-6.883729)	(-2.267882)			
CRD5				-1.478512***	-1.651093***	0.227393
				(-3.985067)	(-6.216972)	(0.758456)
MSD	-5.112231***	3.267703	2.292359	-7.328087***	0.317002	2.880296
	(-3.840368)	(1.167735)	(1.076718)	(-4.822869)	(0.106948)	(1.292562)
lnAST	0.778465***	0.35603*	0.699467***	0.827147***	0.538493**	0.670542***
	(8.943948)	(1.836613)	(4.103158)	(9.704137)	(2.608093)	(3.835751)
ln LOAN/DEP	-1.316206***	0.074036	-0.243675	-1.215169***	0.153217	-0.276722
	(-6.647507)	(0.196398)	(-0.833886)	(-6.894806)	(0.393988)	(-0.921728)
lnBR	0.556784***	0.024981	0.041999	0.537405***	-0.05995	0.038913
	(6.047703)	(0.125809)	(0.289092)	(6.061118)	(-0.292906)	(0.260323)
R2	0.972168	0.995222	0.997656	0.974026	0.994882	0.99752
Adj.R2	0.970804	0.993914	0.996785	0.972753	0.99348	0.996598
H_0: η=0	—	22.51726***	35.230313***	—	19.016097***	33.096069***
H_0: λ=0	—	—	13.502387***	—	—	13.830059***
Schwartz	-0.330669	-1.312495	-1.764662	-0.399751	-1.243698	-1.708153
F	712.5691	760.7332	1144.933	764.9938	709.9141	1081.881
Obs.	108	108	108	108	108	108

Note: (i) each figure below the coefficients is t-value., (ii) *** significant at 1%, ** significant at 5%, * significant at 10%.
Source: *Financial statement of national credit associations, Financial statement of national credit cooperatives.*

Table A. I.36 Empirical results of SCP hypothesis for Japanese credit associations and credit cooperatives in Area6 with financial statement data, Dependent variable: lnREV

Loan	Normal	1-way	2-way	Normal	1-way	2-way
Constant	1.426818	4.398912	0.18589	0.83674	0.804293	-0.10419
	(1.07143)	(1.346679)	(0.075178)	(0.617942)	(0.224795)	(-0.038604)
CRL3	-0.636558	-1.218787***	-1.389135**			
	(-1.526938)	(-4.160496)	(-2.563234)			
CRL5				-0.915729**	-0.870132**	-0.097669
				(-2.33278)	(-2.306493)	(-0.354792)
MSL	-2.907614***	-5.012152***	1.867512	-4.446896***	-6.177143***	0.947833
	(-2.811439)	(-2.907709)	(1.287335)	(-3.298292)	(-3.435117)	(0.648556)
lnAST	0.706288***	0.526339***	0.822947***	0.759528***	0.749791***	0.808112***
	(8.366689)	(3.046613)	(6.137245)	(8.571944)	(3.75242)	(5.282218)
ln LOAN/DEP	-0.927118***	0.810934*	-0.389995	-0.815684***	1.164727**	-0.345988
	(-5.484449)	(1.851405)	(-1.144348)	(-4.69642)	(2.560984)	(-0.974752)
lnBR	0.517846***	0.463075**	0.04452	0.479686***	0.185699	0.045484
	(5.556556)	(2.346688)	(0.300511)	(5.135109)	(0.756503)	(0.253975)
R2	0.970581	0.99458	0.997668	0.971432	0.993852	0.997475
Adj.R2	0.969139	0.993096	0.996801	0.970032	0.992169	0.996537
H_0: η=0	—	20.662225***	36.167259***	—	17.018133***	33.762134***
H_0: λ=0	—	—	17.213634***	—	—	18.658004***
Schwartz	-0.275205	-1.186351	-1.769576	-0.304581	-1.060393	-1.690316
F	673.0226	670.1442	1150.587	693.6948	590.4017	1062.707
Obs.	108	108	108	108	108	108

Note: (i) each figure below the coefficients is t-value., (ii) *** significant at 1%, ** significant at 5%, * significant at 10%.
Source: *Financial statement of national credit associations, Financial statement of national credit cooperatives.*

[Area 7]

Table A. I.37 Empirical results of SCP hypothesis for Japanese credit associations and credit cooperatives in Area7 with financial statement data, Dependent variable: ln(1+ROA)

Asset	Normal	1-way	2-way	Normal	1-way	2-way
Constant	-0.053581***	-0.027448	0.013947	-0.053112***	-0.02025	0.012853
	(-4.211857)	(-0.481301)	(0.249802)	(-4.182652)	(-0.352382)	(0.22893)
CRA3	0.009779	-0.00255	-0.004625			
	(0.788445)	(-0.20339)	(-0.087451)			
CRA5				0.005432	-0.00613	0.003509
				(0.555416)	(-0.592285)	(0.079385)
MSA	-0.034522	0.025015	0.032185	-0.03141	0.03236	0.056378
	(-0.841229)	(0.18857)	(0.166168)	(-0.695973)	(0.245244)	(0.271337)
lnAST	0.003307***	0.002267	1.96E-05	0.003306***	0.002	-4.72E-05
	(4.196374)	(0.74526)	(0.006468)	(4.161284)	(0.655125)	(-0.01562)
ln LOAN/DEP	0.000202	0.006324	-0.001236	0.000138	0.005454	-0.001189
	(0.055727)	(0.767094)	(-0.150638)	(0.038077)	(0.659292)	(-0.144782)
lnBR	-0.001539*	-0.005863	-0.0045	-0.001541*	-0.006242	-0.004569
	(-1.705377)	(-1.19725)	(-0.942076)	(-1.70579)	(-1.275891)	(-0.956624)
R2	0.06472	0.416693	0.470198	0.064082	0.417174	0.470196
Adj.R2	0.054532	0.278255	0.333799	0.053887	0.27885	0.333797
H_0: η=0	—	2.693792***	2.927604***	—	2.704582***	2.926803***
H_0: λ=0	—	—	6.210954***	—	—	6.154888***
Schwartz.	-6.499859	-5.862462	-5.879421	-6.499178	-5.863287	-5.879417
F	6.352401	3.009954	3.447229	6.285526	3.015914	3.447202
Obs.	465	465	465	465	465	465

Note: (i) each figure below the coefficients is t-value., (ii) *** significant at 1%, ** significant at 5%, * significant at 10%.
Source: *Financial statement of national credit associations, Financial statement of national credit cooperatives.*

Table A. I.38 Empirical results of SCP hypothesis for Japanese credit associations and credit cooperatives in Area7 with financial statement data, Dependent variable: ln(1+ROA)

Deposit	Normal	1-way	2-way	Normal	1-way	2-way
Constant	-0.053688***	-0.031916	0.011347	-0.053138***	-0.023299	0.009655
	(-4.227331)	(-0.572952)	(0.205966)	(-4.190464)	(-0.414719)	(0.174336)
CRD3	0.010935	-0.000268	-0.003665			
	(0.874386)	(-0.021053)	(-0.064771)			
CRD5				0.005557	-0.005522	0.003378
				(0.562081)	(-0.527479)	(0.083246)
MSD	-0.034325	0.011847	0.023681	-0.031728	0.021438	0.04347
	(-0.832127)	(0.091107)	(0.127579)	(-0.696375)	(0.166547)	(0.224871)
lnAST	0.003299***	0.002448	0.000134	0.003304***	0.002139	0.00012
	(4.196598)	(0.821681)	(0.045834)	(4.169269)	(0.714832)	(0.040961)
ln LOAN/DEP	0.000248	0.006713	-0.001158	0.000163	0.005585	-0.001132
	(0.068506)	(0.811918)	(-0.140641)	(0.04501)	(0.673057)	(-0.137412)
lnBR	-0.001533*	-0.005515	-0.004294	-0.001534*	-0.006011	-0.004365
	(-1.697105)	(-1.115552)	(-0.888562)	(-1.695652)	(-1.218558)	(-0.903441)
R2	0.065057	0.416605	0.470128	0.064144	0.417037	0.470132
Adj.R2	0.054873	0.278146	0.333711	0.05395	0.27868	0.333716
H_0: η=0	—	2.690128***	2.92543***	—	2.702421***	2.924907***
H_0: λ=0	—	—	6.212171***	—	—	6.16255***
Schwartz.	-6.50022	-5.862311	-5.879288	-6.499244	-5.863052	-5.879295
F	6.387837	3.008864	3.446254	6.29203	3.014214	3.446308
Obs.	465	465	465	465	465	465

Note: (i) each figure below the coefficients is t-value., (ii) *** significant at 1%, ** significant at 5%, * significant at 10%.
Source: *Financial statement of national credit associations, Financial statement of national credit cooperatives.*

Table A. I.39 Empirical results of SCP hypothesis for Japanese credit associations and credit cooperatives in Area7 with financial statement data, Dependent variable: ln(1+ROA)

Loan	Normal	1-way	2-way	Normal	1-way	2-way
Constant	-0.053819***	-0.043667	0.015932	-0.052685***	-0.026977	0.015016
	(-4.222414)	(-0.745272)	(0.271407)	(-4.154164)	(-0.456303)	(0.259508)
CRL3	0.015825	0.007287	-0.009307			
	(1.020415)	(0.424723)	(-0.105004)			
CRL5				0.00619	-0.005489	-0.002472
				(0.591901)	(-0.463229)	(-0.049756)
MSL	-0.02303	-0.035298	0.035469	-0.02385	0.000137	0.039843
	(-0.581944)	(-0.244366)	(0.191508)	(-0.548734)	(0.000966)	(0.193722)
lnAST	0.003224***	0.002896	-3.02E-05	0.00325***	0.002292	-5.06E-05
	(4.127038)	(0.935484)	(-0.009671)	(4.130312)	(0.73624)	(-0.016051)
ln LOAN/DEP	0.000756	0.00818	-0.001807	0.00063	0.005865	-0.001858
	(0.212355)	(0.939271)	(-0.199274)	(0.176914)	(0.670704)	(-0.201695)
lnBR	-0.001589*	-0.004534	-0.00441	-0.001578*	-0.005467	-0.00442
	(-1.768248)	(-0.960674)	(-0.960648)	(-1.754446)	(-1.156689)	(-0.962962)
R2	0.065137	0.416894	0.470196	0.063731	0.416948	0.470184
Adj.R2	0.054953	0.278504	0.333797	0.053532	0.27857	0.333781
H_0: η=0	—	2.693073***	2.93342***	—	2.704492***	2.931516***
H_0: λ=0	—	—	6.187296***	—	—	6.17956***
Schwartz	-6.500305	-5.862808	-5.879417	-6.498802	-5.862899	-5.879394
F	6.39621	3.012453	3.447202	6.248736	3.013112	3.447032
Obs.	465	465	465	465	465	465

Note: (i) each figure below the coefficients is t-value., (ii) *** significant at 1%, ** significant at 5%, * significant at 10%.
Source: *Financial statement of national credit associations, Financial statement of national credit cooperatives.*

Table A. I.40 Empirical results of SCP hypothesis for Japanese credit associations and credit cooperatives in Area7 with financial statement data, Dependent variable: lnREV

Asset	Normal	1-way	2-way	Normal	1-way	2-way
Constant	0.733282**	10.40305***	11.43049***	0.685355**	10.80987***	11.29614***
	(2.206523)	(9.300383)	(10.68767)	(2.066496)	(9.684667)	(10.51892)
CRA3	-1.741812***	-2.031739***	1.80972*			
	(-5.347248)	(-8.257973)	(1.783337)			
CRA5				-1.369737***	-1.768303***	1.758108**
				(-5.335963)	(-8.793956)	(2.076036)
MSA	-1.340821	1.208919	13.24675***	-2.79685**	0.780267	14.77401***
	(-1.25399)	(0.463794)	(3.565444)	(-2.377355)	(0.303879)	(3.712393)
lnAST	0.722941***	0.176225***	0.077186	0.728685***	0.161001***	0.075533
	(35.19033)	(2.952538)	(1.331664)	(35.19045)	(2.714239)	(1.305968)
ln LOAN/DEP	0.526069***	0.492651***	0.250289	0.529809***	0.4534***	0.260358*
	(5.691559)	(3.045248)	(1.591044)	(5.733918)	(2.820297)	(1.655922)
lnBR	0.302968***	0.336656***	0.271221***	0.304914***	0.330393***	0.269007***
	(12.79653)	(3.498381)	(2.959324)	(12.86989)	(3.470369)	(2.939711)
R2	0.963886	0.987404	0.989089	0.963877	0.987657	0.989122
Adj.R2	0.963495	0.984438	0.986303	0.963486	0.984751	0.986344
H_0: η=0	—	8.402015***	9.3159***	—	8.669528***	9.349847***
H_0: λ=0	—	—	9.576645***	—	—	8.35113***
Schwartz	0.038712	0.088977	0.024169	0.038958	0.068701	0.021163
F	2466.158	332.9393	354.9791	2465.529	339.846	356.0597
Obs.	468	468	468	468	468	468

Note: (i) each figure below the coefficients is t-value., (ii) *** significant at 1%, ** significant at 5%, * significant at 10%.
Source: *Financial statement of national credit associations, Financial statement of national credit cooperatives.*

Table A. I.41 Empirical results of SCP hypothesis for Japanese credit associations and credit cooperatives in Area7 with financial statement data, Dependent variable: lnREV

Deposit	Normal	1-way	2-way	Normal	1-way	2-way
Constant	0.777083**	10.35881***	11.04755***	0.731585**	10.7806***	10.93147***
	(2.339771)	(9.467248)	(10.48399)	(2.203316)	(9.862804)	(10.33443)
CRD3	-1.725002***	-2.054607***	1.963362*			
	(-5.245983)	(-8.196157)	(1.811197)			
CRD5				-1.32197***	-1.776885***	1.632197**
				(-5.08101)	(-8.718863)	(2.102599)
MSD	-0.920218	1.866388	13.21146***	-2.337519*	0.875346	14.35613***
	(-0.855098)	(0.729439)	(3.716046)	(-1.962486)	(0.348881)	(3.883187)
lnAST	0.719698***	0.179491***	0.099744*	0.724863***	0.163373***	0.101139*
	(35.08584)	(3.06507)	(1.781737)	(35.00201)	(2.805172)	(1.810506)
ln LOAN/DEP	0.53144***	0.486701***	0.230756	0.536704***	0.448116***	0.238584
	(5.752497)	(2.995399)	(1.463416)	(5.802572)	(2.774589)	(1.514678)
lnBR	0.301391***	0.326986***	0.255183***	0.303413***	0.326324***	0.252961***
	(12.70265)	(3.361142)	(2.756511)	(12.75681)	(3.394196)	(2.737298)
R2	0.963831	0.987368	0.989121	0.963705	0.987614	0.989154
Adj.R2	0.96344	0.984393	0.986343	0.963312	0.984697	0.986384
H_0: η=0	—	8.384262***	9.303685***	—	8.686045***	9.300289***
H_0: λ=0	—	—	9.994679***	—	—	8.807183***
Schwartz.	0.040228	0.09187	0.021238	0.043714	0.072204	0.018204
F	2462.283	331.9653	356.0325	2453.392	338.6428	357.1264
Obs.	468	468	468	468	468	468

Note: (i) each figure below the coefficients is t-value., (ii) *** significant at 1%, ** significant at 5%, * significant at 10%.
Source: *Financial statement of national credit associations, Financial statement of national credit cooperatives.*

Table A. I.42 Empirical results of SCP hypothesis for Japanese credit associations and credit cooperatives in Area7 with financial statement data, Dependent variable: lnREV

Loan	Normal	1-way	2-way	Normal	1-way	2-way
Constant	0.756721**	9.977788***	11.74686***	0.674059**	10.648***	11.78072***
	(2.261039)	(8.55828)	(10.39739)	(2.031214)	(9.265371)	(10.58599)
CRL3	-2.059822***	-2.490979***	0.911823			
	(-5.03794)	(-7.289226)	(0.53364)			
CRL5				-1.452538***	-1.979353***	0.837848
				(-5.288031)	(-8.588961)	(0.875312)
MSL	-1.896156*	1.270835	10.21715***	-3.197996***	0.785854	11.47076***
	(-1.825216)	(0.441376)	(2.862317)	(-2.810564)	(0.284191)	(2.895696)
lnAST	0.725821***	0.199905***	0.073304	0.731047***	0.172048***	0.067592
	(35.45015)	(3.244058)	(1.217874)	(35.56602)	(2.841337)	(1.114305)
ln LOAN/DEP	0.536153***	0.535803***	0.083288	0.550623***	0.460047***	0.0614
	(5.858841)	(3.090673)	(0.476845)	(6.037265)	(2.705319)	(0.346253)
lnBR	0.304852***	0.37824***	0.307037***	0.305756***	0.35058***	0.307217***
	(12.87666)	(4.019514)	(3.469521)	(12.94623)	(3.808383)	(3.474675)
R2	0.963643	0.987037	0.988988	0.963834	0.987629	0.989002
Adj.R2	0.963249	0.983985	0.986175	0.963443	0.984716	0.986193
H_0: η=0	—	8.121036***	9.229417***	—	8.655474***	9.238418***
H_0: λ=0	—	—	10.983015***	—	—	7.739123***
Schwartz.	0.045427	0.117711	0.033445	0.040143	0.070953	0.032153
F	2449.034	323.3884	351.6654	2462.5	339.0717	352.1252
Obs.	468	468	468	468	468	468

Note: (i) each figure below the coefficients is t-value., (ii) *** significant at 1%, ** significant at 5%, * significant at 10%.
Source: *Financial statement of national credit associations, Financial statement of national credit cooperatives.*

Appendix II Geographical results on Market competitiveness: H statistics

[Area 1]

Table A. II.1 Empirical results of H statistics of Japanese credit associations and credit cooperatives in Area1 with financial statement data

	Normal	1-way Fixed Effects	2-way Fixed Effects
Constant	-1.14535***	5.70673***	5.591019***
	(-3.281077)	(5.179989)	(4.977489)
lnPL	0.072811*	0.077778**	0.106475***
	(1.874889)	(2.130994)	(2.971368)
lnPK	0.015048	0.001079	-0.02083
	(1.286721)	(0.034977)	(-0.684816)
lnPF	0.080742***	0.097646***	0.06145***
	(10.56824)	(14.00098)	(3.7013)
lnAST	0.818699***	0.43053***	0.403358
	(47.58434)	(6.736292)	(6.207398)
LLR/AST	1.370549***	0.10116	0.68241
	(2.753585)	(0.108678)	(0.747619)
LOAN/DEP	0.313494***	0.226779***	0.172787**
	(5.492743)	(2.631292)	(2.013461)
lnBR	0.199066***	0.347734***	0.40157***
	(8.813977)	(4.907994)	(5.649439)
R^2	0.976976	0.990558	0.991182
R^2 adj.	0.976727	0.988501	0.989139
H_0: η=0	----	F(110,537)= 7.022656***	F(110,531)= 7.178114***
H_0: λ=0	----	----	F(6,531)= 6.259391***
H-stat	**0.168601**	**0.176504**	**0.147093**
H_0:H=0	16.03376***	15.50804***	10.09699***
H_0:H=1	389.8844***	337.5766***	339.4775***
Schwartz	-0.901433	-0.703807	-0.712744
F	3921.959	481.5153	485.2476
Obs.	655	655	655

Note: (i) each figure below the coefficients is t-value., (ii) *** significant at the 1%, ** significant at the 5%, * significant at the 10%.

Source: *Financial statement of national credit associations, Financial statement of national credit cooperatives.*

Table A. II.2 Empirical results of E statistics of Japanese credit associations and credit cooperatives in Area1 with financial statement data

	Normal	1-way Fixed Effects	2-way Fixed Effects
Constant	-0.03437***	-0.00947	0.022766
	(-4.041479)	(-0.308611)	(0.735559)
lnPL	-0.00035	-0.00284***	-0.00216**
	(-0.366628)	(-2.852995)	(-2.237778)
lnPK	0.000241	-0.0014*	-0.00185**
	(0.845414)	(-1.651941)	(-2.253395)
lnPF	0.000238	0.000432**	0.001589***
	(1.290284)	(2.236585)	(3.559769)
lnAST	0.002793***	0.002261	3.22E-04
	(6.683196)	(1.265294)	(0.179637)
LLR/AST	0.022293*	0.093589***	0.101823***
	(1.82439)	(3.264669)	(3.656205)
LOAN/DEP	0.000185	0.008303***	0.008036***
	(0.130162)	(3.381642)	(3.309393)
lnBR	-0.00286***	-0.00234	-0.00043
	(-5.207632)	(-1.200558)	(-0.224882)
R^2	0.094283	0.523174	0.567172
R^2 adj.	0.084393	0.419204	0.466782
H_0: η=0	----	F(109,532)= 4.390069***	F(109,526)= 4.822684***
H_0: λ=0	----	----	F(6,526)= 8.911527***
E-stat	**0.000133**	**-0.0038**	**-0.002416**
H_0:E=0	0.016894	9.647631***	3.753651*
Schwartz	-8.356878	-7.910899	-7.947845
F	9.53242	5.031988	5.649696
Obs.	649	649	649

Note: (i) each figure below the coefficients is t-value., (ii) *** significant at the 1%, ** significant at the 5%, * significant at the 10%.

Source: *Financial statement of national credit associations, Financial statement of national credit cooperatives.*

[Area 2]

Table A. II.3 Empirical results of H statistics of Japanese credit associations and credit cooperatives in Area2 with financial statement data

	Normal	1-way Fixed Effects	2-way Fixed Effects
Constant	-3.28404***	1.761826*	0.533447
	(-9.134021)	(1.90815)	(0.57053)
lnPL	0.442522***	0.206742***	0.302158***
	(8.736461)	(3.299692)	(4.966104)
lnPK	-0.00416	0.020458	-0.01817
	(-0.444214)	(0.68264)	(-0.626786)
lnPF	0.159693***	0.14755***	0.052498**
	(19.72926)	(17.13089)	(2.376884)
lnAST	0.794078***	0.642556***	0.629655***
	(47.77106)	(15.00276)	(15.24302)
LLR/AST	-0.02243	0.10432	0.380613**
	(-0.202774)	(0.643963)	(2.426184)
LOAN/DEP	0.061373	-0.01374	-0.09945
	(1.395175)	(-0.216445)	(-1.623059)
lnBR	0.206408***	0.13621***	0.137743***
	(10.96142)	(3.686324)	(3.90547)
R^2	0.977131	0.990286	0.991389
R^2 adj.	0.976944	0.987914	0.989193
H_0: η=0	----	F(162,692)= 5.784557***	F(162,686)= 6.639512***
H_0: λ=0	----	----	F(6,686)= 14.652693***
H-stat	**0.598051**	**0.37475**	**0.336486**
H_0:H=0	141.0532***	35.50264***	31.10795***
H_0:H=1	63.71619***	98.82921***	120.959***
Schwartz	-0.503631	-0.089526	-0.163064
F	5212.812	417.4269	451.3367
Obs.	862	862	862

Note: (i) each figure below the coefficients is t-value., (ii) *** significant at the 1%, ** significant at the 5%, * significant at the 10%.

Source: *Financial statement of national credit associations, Financial statement of national credit cooperatives.*

Table A. II.4 Empirical results of E statistics of Japanese credit associations and credit cooperatives in Area2 with financial statement data

	Normal	1-way Fixed Effects	2-way Fixed Effects
Constant	0.130274	-0.3311	-0.41401
	(1.240764)	(-1.088894)	(-1.270956)
lnPL	-0.0168	-0.00942	-0.00304
	(-1.128337)	(-0.475847)	(-0.149474)
lnPK	0.000771	0.002014	0.000773
	(0.282812)	(0.209451)	(0.078465)
lnPF	0.002422	-0.00057	-0.00455
	(1.033042)	(-0.208053)	(-0.619308)
lnAST	0.00242	0.022415	0.022624
	(0.4935)	(1.564961)	(1.544967)
LLR/AST	0.031255	-0.34747***	-0.30142***
	(0.807767)	(-3.429427)	(-2.906025)
LOAN/DEP	-0.00828	0.05052**	0.03964*
	(-0.628448)	(2.166149)	(1.65207)
lnBR	0.000201	-0.00897	-0.00868
	(0.036175)	(-0.746742)	(-0.713362)
R^2	0.004084	0.49684	0.500471
R^2 adj.	-0.00424	0.372905	0.371872
H_0: η=0	----	F(160,678)= 4.149869***	F(160,672)= 4.114147***
H_0: λ=0	----	----	F(6,672)= 0.814162
E-stat	**-0.01361**	**-0.007976**	**-0.00682**
H_0:E=0	0.842939	0.160958	0.114191
Schwartz	-3.011593	-2.419544	-2.378982
F	0.490973	4.008879	3.891715
Obs.	846	846	846

Note: (i) each figure below the coefficients is t-value., (ii) *** significant at the 1%, ** significant at the 5%, * significant at the 10%.
Source: *Financial statement of national credit associations, Financial statement of national credit cooperatives.*

[Area 3]

Table A. II.5 Empirical results of H statistics of Japanese credit associations and credit cooperatives in Area3 with financial statement data

	Normal	1-way Fixed Effects	2-way Fixed Effects
Constant	-1.3781***	3.460842***	2.110735***
	(-4.340362)	(4.851109)	(2.826363)
lnPL	0.305137***	0.432461***	0.536986***
	(7.243458)	(8.358944)	(10.23484)
lnPK	-0.00801	0.100405***	0.090893***
	(-0.92012)	(6.126529)	(5.788356)
lnPF	0.182906***	0.162845***	0.102459***
	(22.89084)	(23.71906)	(5.842311)
lnAST	0.756889***	0.412101***	0.40937***
	(61.35953)	(11.90051)	(12.3238)
LLR/AST	0.728489***	0.30536*	0.410516**
	(3.935594)	(1.801762)	(2.521525)
LOAN/DEP	-0.01464	-0.05372***	-0.04605***
	(-1.541409)	(-6.812421)	(-5.889404)
lnBR	0.264504***	0.472288***	0.49956***
	(17.38232)	(13.04799)	(14.31173)
R^2	0.986079	0.994994	0.99549
R^2 adj.	0.985965	0.993827	0.994391
H_0: η=0	----	F(156,699)= 7.979426***	F(156,693)= 8.586374***
H_0: λ=0	----	----	F(6,693)= 12.713623***
H-stat	**0.480033**	**0.69571**	**0.730338**
H_0:H=0	128.0667***	171.3629***	204.3651***
H_0:H=1	150.2602***	32.782***	27.86107***
Schwartz	-0.680254	-0.480954	-0.53838
F	8651.913	852.3434	905.1913
Obs.	863	863	863

Note: (i) each figure below the coefficients is t-value., (ii) *** significant at the 1%, ** significant at the 5%, * significant at the 10%.

Source: *Financial statement of national credit associations, Financial statement of national credit cooperatives.*

Table A. II.6 Empirical results of E statistics of Japanese credit associations and credit cooperatives in Area3 with financial statement data

	Normal	1-way Fixed Effects	2-way Fixed Effects
Constant	-0.04303**	-0.01104	-0.10301*
	(-2.193375)	(-0.217383)	(-1.905553)
lnPL	-0.00048	0.001627	0.008417**
	(-0.173165)	(0.441469)	(2.21561)
lnPK	0.000488	0.001528	0.001296
	(1.002787)	(1.303839)	(1.13453)
lnPF	-0.00018	-3.65E-06	-0.00415***
	(-0.402716)	(-0.007479)	(-3.272394)
lnAST	0.003173***	0.000337	0.000294
	(4.355376)	(0.136336)	(0.121973)
LLR/AST	-0.09612***	-0.06592***	-0.06017***
	(-7.697671)	(-4.608498)	(-4.320055)
LOAN/DEP	-0.00257***	-0.00358***	-0.00295***
	(-4.776186)	(-6.275213)	(-5.141025)
lnBR	-0.00282***	-0.00072	0.001253
	(-3.234338)	(-0.278658)	(0.492459)
R^2	0.219995	0.527265	0.559702
R^2 adj.	0.213557	0.417595	0.452827
H_0: η=0	-----	F(154,694)= 2.929138***	F(154,688)= 3.257793***
H_0: λ=0	-----	-----	F(6,688)= 8.447536***
E-stat	**-0.000166**	**0.003151**	**0.005567**
H_0:E=0	0.003689	0.694419	2.267934
Schwartz	-6.489988	-5.775974	-5.799728
F	34.16757	4.807775	5.236985
Obs.	856	856	856

Note: (i) each figure below the coefficients is t-value., (ii) *** significant at the 1%, ** significant at the 5%, * significant at the 10%.

Source: *Financial statement of national credit associations, Financial statement of national credit cooperatives.*

[Area 4]

Table A. II.7 Empirical results of H statistics of Japanese credit associations and credit cooperatives in Area4 with financial statement data

	Normal	1-way Fixed Effects	2-way Fixed Effects
Constant	-3.71581***	1.717598**	2.199665**
	(-8.281511)	(2.246106)	(2.512189)
lnPL	0.479234***	0.467274***	0.442949***
	(9.160246)	(8.422304)	(7.399808)
lnPK	0.021543**	0.045942**	0.045671**
	(2.087026)	(2.245296)	(2.279633)
lnPF	0.11969***	0.099376***	0.091205***
	(9.812915)	(8.199219)	(3.737168)
lnAST	0.757033***	0.493019***	0.479181***
	(41.52716)	(15.21022)	(14.80769)
LLR/AST	2.604589***	2.838149***	2.440986***
	(4.811025)	(3.762455)	(3.293011)
LOAN/DEP	0.731041***	0.310429***	0.226565*
	(10.82126)	(2.705776)	(1.934307)
lnBR	0.251387***	0.189183***	0.187612***
	(12.49953)	(5.377285)	(5.476706)
R^2	0.980753	0.993314	0.993808
R^2 adj.	0.980469	0.991691	0.992183
H_0: η=0	----	F(87,387)= 8.357663***	F(87,381)= 8.873408***
H_0: λ=0	----	----	F(6,381)= 5.062066***
H-stat	**0.620467**	**0.612591**	**0.579825**
H_0:H=0	147.7366***	129.7221***	116.6471***
H_0:H=1	55.27766***	51.88142***	61.25492***
Schwartz	-0.525892	-0.468179	-0.467974
F	3450.533	611.696	611.5098
Obs.	482	482	482

Note: (i) each figure below the coefficients is t-value., (ii) *** significant at the 1%, ** significant at the 5%, * significant at the 10%.
Source: *Financial statement of national credit associations, Financial statement of national credit cooperatives.*

Table A. II.8 Empirical results of E statistics of Japanese credit associations and credit cooperatives in Area4 with financial statement data

	Normal	1-way Fixed Effects	2-way Fixed Effects
Constant	-0.0148	0.073592**	0.103393***
	(-0.875186)	(2.147084)	(2.655308)
lnPL	0.000244	0.005564**	0.00438
	(0.123741)	(2.237433)	(1.645257)
lnPK	0.001384***	-0.00071	-0.00054
	(3.556531)	(-0.778662)	(-0.607251)
lnPF	0.000454	-8.67E-05	-0.00032
	(0.985116)	(-0.15934)	(-0.291698)
lnAST	0.001306*	-0.00635***	-0.00735***
	(1.898486)	(-4.370308)	(-5.10592)
LLR/AST	0.066247***	0.1216***	0.096179***
	(3.244528)	(3.595837)	(2.917588)
LOAN/DEP	-0.00637**	-0.01361***	-0.01675***
	(-2.501202)	(-2.645696)	(-3.214671)
lnBR	-8.77E-05	0.003476**	0.003607**
	(-0.115499)	(2.203829)	(2.367404)
R^2	0.070131	0.541904	0.582391
R^2 adj.	0.05634	0.431534	0.473593
H_0: η=0	----	F(86,386)= 4.622387***	F(86,380)= 4.985067***
H_0: λ=0	----	----	F(6,380)= 6.140044***
E-stat	**0.002082**	**0.004763**	**0.003522**
H_0:E=0	1.171961	3.903165**	2.175805
Schwartz	-7.083393	-6.685222	-6.700582
F	5.085475	4.909881	5.352946
Obs.	480	480	480

Note: (i) each figure below the coefficients is t-value., (ii) *** significant at the 1%, ** significant at the 5%, * significant at the 10%.

Source: *Financial statement of national credit associations, Financial statement of national credit cooperatives.*

[Area 5]

Table A. II.9 Empirical results of H statistics of Japanese credit associations and credit cooperatives in Area5 with financial statement data

	Normal	1-way Fixed Effects	2-way Fixed Effects
Constant	-1.25357**	7.334252***	6.555919***
	(-2.505764)	(7.386983)	(6.392744)
lnPL	-0.00478	0.002767	0.04463***
	(-0.545486)	(0.302771)	(3.086417)
lnPK	0.003587	0.046132**	0.038071*
	(0.255934)	(2.291996)	(1.84665)
lnPF	0.128639***	0.126126***	0.159293***
	(9.004317)	(10.15715)	(5.42991)
lnAST	0.877307***	0.390685***	0.419199***
	(29.2287)	(6.54649)	(6.563996)
LLR/AST	-0.13611	-2.44753***	-2.21908***
	(-1.561175)	(-5.720368)	(-5.208329)
LOAN/DEP	0.365919***	0.107564*	0.124404**
	(5.216529)	(1.743406)	(2.025851)
lnBR	0.167723***	0.364002***	0.373468***
	(4.455372)	(4.229338)	(4.346789)
R^2	0.980719	0.993298	0.993712
R^2 adj.	0.98026	0.991766	0.992081
H_0: η=0	----	F(49,245)= 9.383879***	F(49,239)= 9.797615***
H_0: λ=0	----	----	F(6,239)= 2.625342**
H-stat	**0.127447**	**0.175024**	**0.241994**
H_0:H=0	27.57345***	42.59409***	45.02224***
H_0:H=1	1292.452***	946.3118***	441.7368***
Schwartz	-0.759178	-0.889322	-0.839697
F	2136.281	648.3776	609.1961
Obs.	302	302	302

Note: (i) each figure below the coefficients is t-value., (ii) *** significant at the 1%, ** significant at the 5%, * significant at the 10%.

Source: *Financial statement of national credit associations, Financial statement of national credit cooperatives.*

Table A. II.10 Empirical results of E statistics of Japanese credit associations and credit cooperatives in Area5 with financial statement data

	Normal	1-way Fixed Effects	2-way Fixed Effects
Constant	-0.01676	0.049504	0.041466
	(-1.20958)	(1.598486)	(1.2808)
lnPL	-0.00047*	0.000192	6.37E-05
	(-1.960211)	(0.677647)	(0.140135)
lnPK	0.000697*	2.64E-05	-0.00029
	(1.80147)	(0.042279)	(-0.441147)
lnPF	0.000149	0.000399	0.002128**
	(0.378094)	(1.036489)	(2.302453)
lnAST	0.001628*	-0.00117	-7.77E-05
	(1.957007)	(-0.630738)	(-0.038687)
LLR/AST	-0.01511***	-0.04267	-0.03463
	(-6.252673)	(-1.57497)	(-1.267026)
LOAN/DEP	0.002365	0.001612	0.00208
	(1.220711)	(0.839827)	(1.071998)
lnBR	-0.00134	-0.00909***	-0.00915***
	(-1.285467)	(-3.342913)	(-3.324463)
R^2	0.154006	0.628812	0.641947
R^2 adj.	0.133794	0.543622	0.548672
H_0: η=0	----	F(49,244)= 6.369667***	F(49,238)= 6.129838***
H_0: λ=0	----	-----	F(6,238)= 1.455082
E-stat	**0.000372**	**0.000617**	**0.001906**
H_0:E=0	0.308743	0.551315	2.817819*
Schwartz	-7.940325	-7.835065	-7.757328
F	7.619724	7.381237	6.882345
Obs.	301	301	301

Note: (i) each figure below the coefficients is t-value., (ii) *** significant at the 1%, ** significant at the 5%, * significant at the 10%.
Source: *Financial statement of national credit associations, Financial statement of national credit cooperatives.*

[Area 6]

Table A. II.11 Empirical results of H statistics of Japanese credit associations and credit cooperatives in Area6 with financial statement data

	Normal	1-way Fixed Effects	2-way Fixed Effects
Constant	2.578576	-0.80844	-1.89822
	(1.649624)	(-0.278188)	(-0.618232)
lnPL	-0.36318*	0.105518	0.282396
	(-1.907856)	(0.580652)	(1.626155)
lnPK	-0.02792	-0.03483	-0.12671*
	(-0.584086)	(-0.474843)	(-1.804278)
lnPF	0.191252***	0.179116***	0.111742*
	(6.084782)	(10.65078)	(1.848877)
lnAST	0.892485***	0.824621***	0.767707***
	(8.343048)	(6.630703)	(5.898742)
LLR/AST	-0.52823	-0.91009	-2.38392
	(-0.133377)	(-0.416953)	(-1.162451)
LOAN/DEP	-0.57211***	-0.10886	-0.19846
	(-3.528189)	(-0.421855)	(-0.811519)
lnBR	0.186345	0.254445*	0.289939**
	(1.572475)	(1.890256)	(2.216066)
R^2	0.972597	0.996936	0.997645
R^2 adj.	0.97066	0.996039	0.996715
H_0: η=0	----	F(17,82)= 38.311429***	F(17,76)= 41.727509***
H_0: λ=0	----	----	F(6,76)= 3.814427***
H-stat	**-0.199853**	**0.249808**	**0.267433**
H_0:H=0	1.026087	1.922315	2.348883
H_0:H=1	36.9845***	17.33637***	17.62483***
Schwartz.	-0.28915	-1.737566	-1.738778
F	501.9716	1111.586	1073.162
Obs.	107	107	107

Note: (i) each figure below the coefficients is t-value., (ii) *** significant at the 1%, ** significant at the 5%, * significant at the 10%.

Source: *Financial statement of national credit associations, Financial statement of national credit cooperatives.*

Table A. II.12 Empirical results of E statistics of Japanese credit associations and credit cooperatives in Area6 with financial statement data

	Normal	1-way Fixed Effects	2-way Fixed Effects
Constant	-0.02563	-0.15212	-0.15779
	(-0.870963)	(-1.326545)	(-1.231889)
lnPL	-0.00361	0.003756	0.006215
	(-1.006866)	(0.523778)	(0.857918)
lnPK	-0.00338***	-0.00037	-0.00142
	(-3.751872)	(-0.126161)	(-0.484694)
lnPF	0.001307**	0.001116*	0.00012
	(2.208443)	(1.681558)	(0.047594)
lnAST	0.004281**	0.006553	0.005193
	(2.125463)	(1.335345)	(0.956386)
LLR/AST	-0.12005	-0.19277**	-0.21589**
	(-1.610021)	(-2.238195)	(-2.523476)
LOAN/DEP	-6.55E-05	0.014103	0.012477
	(-0.021461)	(1.385027)	(1.222963)
lnBR	-0.00408*	0.001936	0.002879
	(-1.830356)	(0.364431)	(0.527435)
R^2	0.329957	0.670852	0.717243
R^2 adj.	0.28258	0.574516	0.605628
H_0: η=0	----	F(17,82)= 4.995686***	F(17,76)= 5.05119***
H_0: λ=0	----	----	F(6,76)= 2.078144*
E-stat	**-0.005678**	**0.004507**	**0.004915**
H_0:E=0	2.337038	0.401803	0.455931
Schwartz	-8.234135	-8.202558	-8.092448
F	6.964535	6.96368	6.426057
Obs.	107	107	107

Note: (i) each figure below the coefficients is t-value., (ii) *** significant at the 1%, ** significant at the 5%, * significant at the 10%.

Source: *Financial statement of national credit associations, Financial statement of national credit cooperatives.*

[Area 7]

Table A. II.13 Empirical results of H statistics of Japanese credit associations and credit cooperatives in Area7 with financial statement data

	Normal	1-way Fixed Effects	2-way Fixed Effects
Constant	-0.51756	11.82874***	11.20894***
	(-1.033904)	(11.88002)	(11.28057)
lnPL	0.332665***	0.07487	0.080254
	(5.056218)	(1.280643)	(1.393533)
lnPK	-0.00631	0.101769***	0.090942***
	(-0.456665)	(3.071523)	(2.79306)
lnPF	0.110641***	0.133112***	0.028989
	(6.930909)	(8.819143)	(0.78336)
lnAST	0.647777***	0.078418*	0.082102*
	(28.14871)	(1.683581)	(1.775751)
LLR/AST	-0.30398	-0.21265	0.190319
	(-1.285669)	(-0.356156)	(0.322513)
LOAN/DEP	0.130489	0.029921	-0.07716
	(1.330173)	(0.207603)	(-0.535489)
lnBR	0.398145***	0.536534***	0.483783***
	(15.95633)	(6.961529)	(6.246093)
R^2	0.965388	0.988115	0.988877
R^2 adj.	0.964862	0.985239	0.985961
H_0: η=0	----	F(84,376)= 8.559925***	F(84,370)= 8.807355***
H_0: λ=0	----	----	F(6,370)= 4.223643***
H-stat	**0.436997**	**0.309751**	**0.200186**
H_0:H=0	45.74847***	21.43283***	7.049987***
H_0:H=1	75.93511***	106.4301***	112.5386***
Schwartz	0.022495	0.057115	0.069694
F	1832.903	343.5353	339.1257
Obs.	468	468	468

Note: (i) each figure below the coefficients is t-value., (ii) *** significant at the 1%, ** significant at the 5%, * significant at the 10%.

Source: *Financial statement of national credit associations, Financial statement of national credit cooperatives.*

Table A. II.14 Empirical results of E statistics of Japanese credit associations and credit cooperatives in Area7 with financial statement data

	Normal	1-way Fixed Effects	2-way Fixed Effects
Constant	0.001457	0.049244	0.027678
	(0.078797)	(0.932682)	(0.529577)
lnPL	-0.00482**	-0.0045	-0.0033
	(-1.98138)	(-1.46442)	(-1.103956)
lnPK	0.000563	0.002717	0.002713
	(1.096405)	(1.575487)	(1.624168)
lnPF	-0.00041	-0.00026	-0.00256
	(-0.693392)	(-0.329874)	(-1.319978)
lnAST	0.002298***	-0.00026	-0.0002
	(2.692714)	(-0.106077)	(-0.084424)
LLR/AST	-0.0658***	-0.04902	-0.01969
	(-6.435429)	(-1.444017)	(-0.592841)
LOAN/DEP	0.010685***	0.008121	0.002637
	(2.946675)	(1.083763)	(0.356663)
lnBR	-0.00204**	-0.0026	-0.00351
	(-2.211392)	(-0.647125)	(-0.877077)
R^2	0.157023	0.428105	0.479439
R^2 adj.	0.144111	0.288581	0.341852
H_0: η=0	----	F(84,373)= 2.104813***	F(84,367)= 2.332987***
H_0: λ=0	----	----	F(6,367)= 6.031837***
E-stat	**-0.004661**	**-0.002043**	**-0.003149**
H_0:E=0	3.809787*	0.335721	0.664915
Schwartz	-6.577348	-5.855803	-5.870599
F	12.16088	3.068322	3.484624
Obs.	465	465	465

Note: (i) each figure below the coefficients is t-value., (ii) *** significant at the 1%, ** significant at the 5%, * significant at the 10%.
Source: *Financial statement of national credit associations, Financial statement of national credit cooperatives.*