Cost Efficiencies, Profitability, and Strategic Behavior: Evidence from Japanese Commercial Banks[1]

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Abstract

This paper examines cost efficiencies in physical branch networks across different sizes and types of Japanese banks, as well as examines the strategic management implications of network usage and expansion for efficiency and growth. The findings indicate that larger banks are more likely to be at constant or decreasing returns to scale and density than smaller banks for each type of bank (regional banks, city banks, trust banks), as well as across types. The within-type and across-type results suggests the effects of size-related factors, such as managerial diseconomies of scale, as well as size-related differences in the form of non-price competition chosen by larger banks, which are often city or trust banks, versus smaller banks, which are often regional banks. City banks and trust banks are more likely to be at constant / decreasing returns to scale and density than regional banks. The diseconomies of trust banks are reflected in lower profitability, although the diseconomies of city banks are not. Regional banks could raise profitability by exploiting cost efficiencies through more output production. Cost efficiencies from branch utilization are more likely through consolidation between city banks and regional banks since more output could be pushed through underutilized networks to improve scale and density cost efficiencies.

EFMA Classifications: 510, 520, and 620

I. Introduction

The Japanese banking sector is confronted with the need for substantive reform in a variety of areas. An understanding of the role of size and bank type on cost efficiency can assist in developing constructive strategies. This analysis examines the impact of size and bank type (city banks, trust banks, or regional banks) on cost-efficiency and profitability, using 1998-1999 data. The issue of whether large banks are more profitable or more efficient than smaller banks, as well as the issue of whether city banks, trust banks, or regional banks manifest the greatest efficiency and profitability has implications for optimal consolidation in the sector. Current consolidation trends involve large city banks joining with

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each other and attaining substantial market power. The findings of this analysis suggest that cost efficiencies from more efficient utilization of underutilized branch networks can be achieved between by mergers between city banks / trust banks and regional banks, or between larger regional banks and smaller regional banks.

The findings of this analysis indicate that smaller regional Japanese banks tend to be in the increasing returns region, while larger city banks and trust banks are in the diseconomies region. The finding that larger banks are more likely to have exhausted cost efficiencies is supported by other recent studies on the banking sectors in different countries. For example Hensel's (2001) cross-sectional analysis on European banking during 1998-1999 found similar results for banks in that smaller banks, especially regional banks, were in the increasing returns region. Unlike Japan, however, the largest European banks were in the constant returns region, rather than the decreasing returns region, as will be discussed later. In Allen and Rai's (1996) cross-country piece on Europe, they found scale economies only for the smallest banks, with constant returns thereafter, and diseconomies for the largest bank. The European Commission (1997) used cross-sectional data on Europe and found increasing returns to scale for the small banks. Fanjul and Maravall (1985) and Rodriguez (1993) did single country studies on Spain and found evidence of scale economies for medium-sized banks in Spain, and diseconomies for the larger institutions. Similarly, Gathon and Grosjean (1991) did a single country study for Belgium and found evidence of scale economies for small Belgian institutions and diseconomies of scale as size increases.

Since few works have examined efficiency in the Japanese banking sector since the crisis, this study fills a niche by using 1998-1999 data. This analysis includes the different types of banks (city banks, trust banks, regional banks) and emphasizes both type-specific and cross-sectional results to a greater degree than some of the other studies. McKillop, Glass, and Morikawa (1996) examined scale efficiencies for the five largest Japanese banks (city banks) during 1978-1991 and found increasing returns to scale during the period, and then constant returns from the late 1980's until 1991. Fukuyama (1993), using a cross-sectional dataset over 1990-1991, found constant returns to scale for the majority of the larger city banks. These results, combined with the finding of this analysis that the larger city banks

exhibited decreasing returns to scale by 1998-1999, suggest a gradual movement by the larger banks toward inefficiency. This analysis, like Altumbas et. al (2000) finds evidence of diseconomies of scale for the larger Japanese banks. Nevertheless, Batchelor et. al. (2000), using data during 1992-1998 finds constant returns across all sizes of Japanese banks

The recent consolidation of large city banks with each other has resulted in the formation of five banking groups--the Mizuho Financial Group, the UFJ Group, the Mitsubishi Tokyo Group, the Daiwa / Asahi Group, and the Sumitomo Mitsui Group—and two trust banks—Sumitomo Trust and Chuo Mitsui Trust. [2] These consolidations have created tremendous market power. For example, 50% of Japanese banking assets in 2000 were controlled by these new mega-banks—Tokyo Mitsubishi-Mitsubishi Trust, the Mizuho Group (formerly Fuji Bank, Dai Ichi Kangyo Bank, and Industrial Bank of Japan), the Mitsui-Sumitomo Group (formerly the Sakura Bank and the Sumitomo Bank), and the Asahi Bank. [3] The three banks composing the new Mizuho Financial Group, the world's largest bank (as measured by assets), lend to four of the five largest steel makers, half of the large Japanese construction companies, three of the largest distributors of oil, and three of the largest retailers. [4] These consolidations have not yielded synergistic cost efficiencies or systems integration, [5] and some analysts suggests that these mergers were driven by a desire of these banks to become "too big to fail," which would give them government protection in the event of a financial crisis. [6]

An understanding of the determinants and implications of cost efficiencies in Japanese banks enables one to better evaluate the potential benefits from current or future consolidations by determining which types of banks are cost efficient. Consolidation that enables cost-cutting, more efficient use of facilities, or cross-selling opportunities could strengthen domestic Japanese banks relative to foreign banks, which are increasingly gaining market share. Furthermore, it would enable banks to offer more

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[2] " Profile: Japan's Banking Industry," Asia Pulse, May 16, 2002.
[3] "Japan Now and the United States Then: Lessons from the Parallels," by Benjamin Friedman, p. 33-35, 37, 53. In Japan's Financial Crisis and its Parallels to the U.S. Experience.
[4] EIU Country Finance Report for Japan, June, 2000, p. 16.
[5] "Finance and Economics: Outsmarting their city cousins: Regional banks in Japan." The Economist, April 6, 2002.
[6] "World's Biggest Bank Crashes on Takeoff," Retail Banker International, April 15, 2002.

favorable terms to high quality borrowers, which were lured away from banks (resulting in a decline in the quality of their loan portfolios) with the growth of Japanese bond and commercial paper markets after deregulation in 1975. [7] Indeed, some believe that the movement of high quality borrowers away from banks as sources of funds and toward the newly deregulated financial markets was at the heart of the banking crisis because the high exposure of banks to the real estate market [8]was due to their inability to keep high quality borrowers and due to their consequent increased lending to risky borrowers who relied more heavily on real estate collateral.[9]

An understanding of existing cost efficiencies is particularly important since recent legislative developments on deposit insurance are likely to heighten existing cost structure conditions in particular bank types. On March 31, 2002, the Japanese government capped deposit insurance at 10 million yen per deposit, which has led to significant fund reallocation between types of Japanese banks. Depositors at city banks increased their deposit holdings—deposits jumped 25%---while depositors at smaller regional banks pulled out their deposits, and deposits at larger regional banks remained stable. This will accelerate exhaustion of capacity utilization in city banks, which are already in the decreasing returns to density region, as well as result in more underutilized capacity in branches of regional banks, which are already in the increasing returns to density region. The withdrawal or influx of deposits could also affect cost efficiencies for banks in terms of loan contraction or loan expansion. Smaller Japanese regional banks are expanding short-term lending and rolling over loans for periods of under 3 months, so that they won't get locked into long-term loans which can't be called in during periods of deposit withdrawal. [10]

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[7] EIU Country Finance Report for Japan, June, 2000, p. 16.

[8] Total real estate loans rose from 6% in 1980 to 12% in 1990, while the fraction of bank credit which was dependent on real estate collateral in some way rose even more ("Japan Now and the United States Then: Lessons from the Parallels," In Japan's Financial Crisis and its Parallels to the U.S. Experience, p. 45).

[9] "Introduction: Financial Similarities and Monetary Differences," In Japan's Financial Crisis and its Parallels to the U.S. Experience, p. 5, 7.

[10] "Japanese regional banks under threat" Retail Banker International, July 31, 2002.

Some have proposed mergers between regional banks, which would enable the spreading of a customer's money across deposits in different banks (which would be part of the combined entity). [11] The government has suggested that it would offer greater protection of deposits for merged banks and have included larger city banks in that proposal. Mergers between city banks and smaller regional banks may be more cost efficient because they would provide underutilized distribution channels for the capacity-constrained city banks, and financial stability for the regional banks to stem the deposit outflow and prevent bank failures. Mergers between regional banks would merely combine weak partners with underutilized capacity.

Section 2 provides some background on the Japanese banking sector and discusses the data. The model and methodology are developed in section 3, while section 4 describes the empirical findings. Section 5 describes the linkage between efficiency and profitability, while section 6 discusses the impact of branch network utilization on the selection of a given type of expansion strategy and hence on optimally managing network growth. Section 7 discusses the impact of branch network utilization on consolidation strategies, and section 8 presents the conclusions.

2. Background on the Japanese banking sector and data

The Japanese banking sector has traditionally been highly concentrated with high barriers to entry. At the beginning of the last decade, there were 21 "large" banks—11 city banks, 7 trust banks, and 3 long-term credit banks—which jointly controlled 73% of banking assets in Japan. By 2000, two had failed and / or been nationalized, and five of the remaining 17 had merged into two new entities, reducing the number to 14. [12] Banks and companies have historically been closely linked together through the main bank system, in which a particular bank and associated banks are the principal lenders to networks of companies (keiretsus) and hold shares in them as a corporate governance mechanism—a topic which is thoroughly dealt with in Hoshi, Kashyap, and Scharfstein (1990) and Kester's Japanese Takeovers: The Global Contest for Corporate Control (1991).

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[11] Ibid

[12] "Japan Now and the United States Then: Lessons from the Parallels," In Japan's Financial Crisis and its Parallels to U.S. Experience, p. 37, 40.

The data consist of balance sheet, income statement, and cash flow measures for 7 of the city banks, the 89 largest regional banks, and the 6 trust banks. These data cover the Japanese banking industry well because there were only 9 trust banks, 121 regional banks, and 6 trust banks as of 2000. Although city banks, regional banks, and trust banks have historically been different, all three types are included in the analysis because the differences between them have been disappearing since the passage of the Financial System Reform Law of 1992, which removed barriers between securities, banking, and trust businesses. [13]

Traditionally, the city banks served large corporations, rather than individual depositors, but as the financial markets developed as alternative sources of capital, city banks began servicing smaller companies and, in the 1980's, began expanding internationally. Most Japanese banks have few overseas offices now because they curtailed their overseas operations shortly after the crisis began, particularly as the "Japan premium" on funds lent to Japanese banks in overseas markets rose. [14] The city banks have extensive branch networks stretching throughout the country, although their name derives from their offices in all the major cities. Basic summary statistics for the three types of banks and the overall sample are in table 9. On average, city banks, relative to trust banks and regional banks, have the greatest number of employees, the greatest number of domestic offices and foreign offices, and the highest average value of investments.

The six trust banks do both banking and trust management—asset management—although since deregulation in 1993, competition from the other types of banks has increased such that mergers of trust banks with other banks is likely.[15] They have a strong metropolitan presence and an extensive corporate clientele. As is evident in table 9, on average, the trust banks have the smallest branch networks, the lowest value of investments, and the highest average value of deposits and loans of the three types of banks.

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[13] EIU Country Finance Report for Japan, June, 2000, p. 12.
[14] EIU Country Finance Report for Japan, June, 1999, p. 15. "Japan: The World's Slowest Crisis" by Richard P. Mattione. In The Asian Financial Crisis: Lessons for a Resilient Asia (Cambridge: MIT Press, 2000). Edited by Wing Thye Woo, Jeffrey Sachs, and Klaus Schwab, p. 191.
[15] Ibid, p. 13.

The 121 regional banks have branch networks concentrated in a particular prefecture and engage in relationship-lending to local small and medium size businesses and local depositors. They lack the diversity of products, the extensive metropolitan presence, and the close relationships with large companies that the city banks and trust banks have. Regional banks tend to differentiate themselves through geographic location and spatial convenience, rather than through product diversity and hence are monopolistically competitive within their prefectures (depending on the degree of concentration). Trust banks and city banks, due to their smaller number, reflect a more oligopolistic market structure. The stronger regional banks have capital adequacy ratios equal to those of the city banks, and, unlike some of the larger city banks, have fewer public funds in their capital base. Regional banks have reduced exposure to the larger problem borrowers because they lend much less to them relative to the larger city banks.[16]

3. Methodology

The model in this paper is based on a modified version of Jorgenson, Christensen, and Lau's translog cost function, a similar version of which appears in Caves, Christensen, Trethaway, and Windle (1984). Its basic form appears below with the input prices, outputs, and the variables representing the branch network (number of branches) entering linearly, quadratically, and interacted with each other. **Y** represents output, **P** represents the input price, **B** represents the number of branches, and **S** represents the share of the input cost in total cost. The basic translog (equation 1) was estimated together with the associated cost share equations (equation 2 shows the functional form of the cost share equation) and symmetry and homogeneity conditions were imposed. To get a nonsingular system, one of the share equations is dropped, so the model was estimated using Zellner's iterated SUR methodology to obtain results which are asymptotically equivalent to maximum likelihood estimation, and hence invariant with respect to the share equation deleted.

$$\textbf{(1)} \qquad \ln C = \ln \alpha_0 + \sum_i \alpha_i \ln P_i + 1/2 * \sum_i \sum_j \gamma_{ij} \ln P_i \ln P_j + \alpha_Y \ln Y + 1/2\, \gamma_{YY} (\ln Y)^2 +$$

$$\sum_i \gamma_{iY} \ln P \ln Y + \gamma_B \ln B + 1/2\ \gamma_{BB} (\ln B)^2 + \Sigma_i \gamma_{iB} \ln B * \ln P_i +$$

[16] "Finance and Economics: Outsmarting their city cousins: Regional banks in Japan." The Economist. April 6, 2002.

γ_{BY} ln B^* ln Y

(2) $S_i = \alpha_i + \Sigma_j \gamma_{ij} \ln P_j + \gamma_{iY} \ln Y + \gamma_{BY} \ln B$

The model used three outputs and three inputs. Loans, deposits, and investments were used as output (**Y**) measures, thus following the "value-added" rather than the "intermediation" approach in including deposits as an output. The likelihood ratio test between the unrestricted model including deposits and the restricted model without deposits confirmed the importance of deposit inclusion for this dataset—Chi2 (9) was 175.68 with a p-value of 0.0000. The likelihood ratio test between the unrestricted model including investments and the restricted model without investments also confirmed the importance of investment inclusion—Chi2(9) was 25.23 with a p-value of 0.0027. The input costs—the **P**'s--included: the cost of deposits (interest expense divided by deposits), the cost of loans (loan loss provisions divided by loans), and the cost of overhead (physical capital and salary expenses divided by employees). The model included branch variables, which were the sum of the total number of offices. The data did not allow for a more detailed breakdown of outputs or input costs.

The model does not include dummy variables for each type of bank because they did not improve the fit of the model. The likelihood ratio test of the model with city bank and trust bank dummies versus no dummies yielded a chi2 statistic of 1.17, with a p-value of 0.5557. The likelihood ratio test of the model with city bank and regional bank dummies versus no dummies yielded a chi2 statistic of 1.42, with a p-value of 0.4914. The likelihood ratio test of the model with regional bank and trust bank dummies versus no dummies yielded a chi2 statistic of 1.30, with a p-value of 0.5227.

Nevertheless, if these dummies were included, their coefficients would be different, indicating the differences between the various markets of the three bank types. The test that the coefficients of the city bank dummy and the trust bank dummy were equal yielded a chi2 statistic of 0.20, with a p-value of 0.6513. The test that the coefficients of the city bank dummy and the regional bank dummy were equal yielded a chi2 statistic of 0.90, with a p-value of 0.3420. The test that the coefficients of the regional bank dummy and the trust bank dummy were equal yielded a chi2 statistic of 0.80, with a p-value of 0.37.

This model distinguishes between economies of density and economies of scale. Economies of density are cost efficiencies from undertaking more transactions within a given branch network, holding the number of branches fixed, and measures the utilization of a branch network. Economies of scale are cost efficiencies from undertaking more transactions within a given branch network, and expanding the size of the network. These two measures help to determine whether a bank should undertake more transactions within existing branch network (are there increasing returns to density) or whether it should build more branches to undertake the greater volume of transactions (are there increasing returns to scale). Density efficiencies for total output are estimated as the sum of the elasticity of cost with respect to each output. When the sum of these elasticities is less than one, then there are increasing returns to density; when it is greater than one, then there are decreasing returns to density. Scale efficiencies for total output are estimated as the sum of not only the elasticity of cost with respect to each output, but also the elasticity of cost with respect to branch. This is because the number of branches is held fixed in density measurements, but allowed to vary in scale measurements.

This functional form provided several advantages over other methodologies. First, unlike the Cobb-Douglas function, it does not make assumptions involving constant returns to scale or input cost elasticities. Second, it provides point estimates of efficiency for each bank using cross-sectional data—parametric approaches such as thick frontier analysis would not provide estimates for particular banks, while distribution free analysis would provide estimates of average efficiency over time and could only be used for panel data, not cross-sectional data. Given the regulatory changes in the Japanese banking sector, as well as bank consolidation and failure, cross-sectional data was more appropriate for this period. Third, in parametric approaches such as stochastic frontier analysis, the more flexible the distributional assumptions placed on the inefficiency component of the error term for the specified cost function, the harder it is to disentangle the inefficiency component of the error term from the random error component of the error term. Fourth, nonparametric approaches, such as data envelope analysis, assume that there is no random component affecting the performance of the firm. A more full discussion of the various

methodologies can be found in Goddard, Molyneux, and Wilson (2001). Fifth, none of the alternative methodologies provide a distinction between density and scale measures of efficiency.

4. Empirical Evidence

The empirical evidence indicates that larger banks are more likely to have exhausted opportunities for scale and density efficiencies than smaller banks. Table 1 shows strong positive correlations for scale and density measures, and assets (one measure of size). The positive correlation indicates that as assets (size) increase, the elasticity of cost with respect to output (density) and the elasticity of cost with respect to output and branch (scale) increase. As the elasticity approaches 1, constant returns are found; as it exceeds 1, decreasing returns set in.

I find this result for the sample overall across types of banks, as well as within each type of bank. I repeated the exercise for other measures of size besides assets-- number of employees, number of branches, and values of output processed-- and found similarly strong results for the overall sample, as well as for each category of bank (city banks, regional banks, trust banks). This relation between size and efficiency was also found in European commercial banks at the same time, as discussed in Hensel (2001).

The relationship between size and efficiency is not surprising. Density economies are more likely to be exhausted on the margin for larger banks because larger banks process more transactions than smaller banks precisely because they are larger, so their branch network is more likely to have reached capacity, holding the number of branches fixed. This is supported by the strong, positive correlations between output measures and density estimates in table 2, which indicate that the greater the loans, deposits, and investments processed by a physical branch network, the more likely the branch network is to be saturated and therefore operating subject to constant and decreasing returns to density. The reasons for diminishing returns to density within a given branch network include diminishing returns in the ability to further spread the fixed costs of production over the large volumes of output, [17] as well as diminishing returns in the ability of labor to specialize.[18]

[17] Diseconomies of density may occur because of congestion at branches. For example, as the demand for loans increases, the resources of the existing branch facilities and loan officers can become sufficiently strained such that

Larger banks are more likely than smaller banks to have exhausted opportunities to further exploit scale economies on the margin for several reasons. First, larger banks can exhibit managerial diseconomies (discussed in Williamson (1967), Williamson (1970), and Keren and Levhari (1983)) because they have more layers of management than smaller banks; since monitoring and bureaucracy costs from increasing the number of branches are convex in the number of branches, these higher costs for larger banks can limit their cost efficiencies from opening new branches. Consequently, scale economies will become more easily exhausted or become diseconomies for larger banks.

Second, the overhead costs for larger banks for opening up a new branch can be higher for larger banks than smaller banks. Larger banks often compete on non-price aspects, such as knowledgeability of staff, and are often located in more metropolitan areas with higher rents. As a result, the overhead costs and labor costs are higher for larger banks because the branches are staffed by more skilled employees and are more elaborate. Consequently, the cost-structure is less favorable for opening a new branch—constant or decreasing returns to scale—because overhead costs are higher. Table 4 indicates that branches are both employee-intensive and property, plant and equipment-intensive. The correlations are lowest for trust banks and highest for regional banks because the category of regional banks is broader and less homogeneous in terms of size and diversity of products.

The concept that larger banks have more elaborate and expensive branches than smaller banks is further supported by the positive correlations of property, plant and equipment with scale measures for the sample overall and for each type of bank in the first column of table 3. The positive correlation between property, plant and equipment and density is size-related--larger banks, which also have higher property, plant and equipment measures, are more likely to reach capacity within a given network (higher density) because they have greater volumes (table 2). Furthermore, the second column of table 3 similarly shows strong positive correlations between scale and density, and number of employees for

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in-depth credit analyses are not possible; as a result, more bad loans are made, which increases the input cost of a loan—the loan loss provisions—and lowers returns to density in loans.

[18] Industrial Market Structure and Economic Performance, by F.M. Scherer and David Ross. (Boston: Houghton Mifflin, 1990), p. 98, 103.

the sample overall and for each type of bank.

The finding that as size increases, opportunities for scale and density are more likely to be exhausted, is found within each bank type category, as well as across bank type categories. The within type result highlights the impact of size on efficiency. The across type result for the sample as a whole highlights the impact of differences in non-price competition and market structures faced by different types of banks. If the relation between size and efficiency had been found for the overall sample, but had not been found within each type of bank, then the relation would have been due to the inclusion in the sample of the larger city banks and trust banks. Type-specific factors related to the city bank and trust bank markets would really have been driving the result because if size-related factors were playing a role, the relation would have been apparent within each type of bank.

The larger city banks and trust banks are more likely than smaller regional banks to be in the constant to decreasing returns to scale region due to higher overhead costs, which are a function of the type of bank, as well as its size. City banks and trust banks have higher overhead costs for opening up new branches than regional banks because a given branch of a city bank or trust bank undertakes more functions and has more skilled employees. Consequently, city banks and trust banks are more likely to have exploited cost efficiencies in opening up more branches (have exhausted economies of scale) than regional banks due to higher overhead costs. [19]

City banks and trust banks have much higher property plant and equipment per branch and a greater number of employees per branch than regional banks, as is evident in the first and last columns of table 6. This maps into higher costs in that physical capital and salary costs (non-interest expenses) per branch at trust banks are six times that of regional banks and physical capital and salary costs per branch at city banks are four times those at regional banks, as is evident in table 10. The average physical capital and salary costs (non-interest expenses) are much greater at city banks and trust banks than at regional banks,

[19] This is because if the marginal increase in total physical costs across branches from opening a new branch exceeds the marginal increase in transactions undertaken by that branch, then average cost rises, although quantity rises-such that the slope of the average cost curve connecting the points is positive and the firm is in the diseconomies region.

as is evident in table 8. Furthermore, the average cost of physical capital per employee at city banks and trust banks is almost twice that of regional banks, as is evident in table 7.

Smaller regional banks are more likely to be in the increasing returns to density region, with underutilized networks, as a function of market-structure specific factors which are related to the bank type, as well as of firm-specific factors, such as size. Regional banks compete more on spatial convenience—"a branch at every corner"—than do city banks or trust banks because they focus on relationship-lending. In addition, some of the regional markets are thinner and generate less volume than metropolitan markets, in which city banks and trust banks are located. This results in a dense network of underutilized branches. Regional banks do not necessarily have more branches than city banks or trust banks, but they often have more branches relative to the volumes that they process. The concept of underutilization or "under-production" of the smaller, more numerous regional banks relative to the larger, less numerous city and trust banks is consistent with the non-appropriability of social surplus effect, discussed in Dixit and Stiglitz (1977) and Spence (1976), which suggests that monopolistically competitive competition results in "the existing firms producing too little to exhaust returns to scale." [20]

5. Linkage Between Efficiency and Profitability

What is the relationship between scale and density efficiencies and bank profitability? Japanese banks which have fewer opportunities to exploit scale and density efficiencies have higher sales and lower net incomes, as is evident in table 1. Japanese banks differ from European banks during the same 1998-1999 period in that banks in Europe which have fewer opportunities to further exploit scale and density efficiencies have higher sales and higher net incomes (even when adjusted for size), as discussed in Hensel (2001). This is because many of the larger Japanese banks exhibit diseconomies on the cost-side, and hence have higher costs and lower net incomes, whereas the larger European banks exhibit constant returns and therefore have lower costs per unit of output and higher net incomes. Consequently, the mapping of efficiency into profitability suggests that diseconomies can result in lower net incomes-- the Japan results-- while increasing or constant returns on the cost side can result in higher net incomes-- the

[20] The Theory of Industrial Organization, by Jean Tirole (Cambridge: MIT Press, 1997), p. 288.

Europe results.

A large and inefficient bank might have higher sales and higher net income than a small, efficient bank because these profit measures do not control for size. Consequently, this analysis also uses measures which control for size: net income per branch, net income per asset (size-adjusted net income), and net income per asset per branch (size-adjusted net income per branch). Net income per branch gives some indication of overall profitability at a per branch level; size-adjusted net income--net income / assets--measures at the firm level the amount of net income generated by use of each asset unit; and per branch size-adjusted net income indicates at a branch level the amount of net income generated by use of each asset unit.

When adjusted for size, Japanese city banks and trust banks with fewer opportunities to further exploit efficiencies have higher net income per unit asset, as was the case for European banks. Size-adjusted net income and scale / density have little relation for regional banks (the correlation is close to zero), possibly due to the heterogeneity within the regional bank category in terms of size and exposure to failing firms, which would lead to heterogeneity in costs efficiencies.

Analysis of the impact of branch capacity utilization on profitability suggests that the smaller, regional banks have underutilized networks and could increase profitability by increasing the output over which costs are spread. The summary statistics of average per branch sales and average per branch net income in table 11 indicate that the average branch of a regional bank has lower sales and net income than the average branch of a city bank or a trust bank. The average net income per branch for regional banks is negative (table 11); this is a function of the underutilization of their branch networks and the low sales per branch relative to the costs per branch-more output production would enable them to take advantage of cost efficiencies on the margin, exploit density and scale economies, and raise their per branch net income. The size-adjusted per branch measures in table 12 narrow the gap in per branch interest income, sales, and net income between city banks and regional banks, but suggest that regional banks, relative to their size, could improve their overall profitability by exploiting scale and density efficiencies.

Trust banks have intensively used and expanded their branch networks to the point of

inefficiency, declining profits and congestion at the branch level. This is supported by their strongly negative average net income per branch (table 12), as well as their constant to decreasing returns in scale and density estimates. Furthermore, when branch measures of profitability are adjusted for size (divided by assets, as in table 11), trust banks still have lower interest income, sales, and net income per branch than city banks or regional banks. Indeed, net income adjusted for size is lower for trust banks than for regional banks or city banks on an aggregate basis (table 8), as well as at a branch level.

City banks are not yet exhibiting overall unprofitability on a per branch basis because their average net income per branch is still positive (table 11). This suggests that although they are using the full capacity of their branch networks (and some are even exhibiting decreasing returns), their revenue from their per branch volumes is still sufficiently high to offset the higher per unit costs from any diseconomies. Their positive per branch net income may also be due to their having lower loan input costs than regional banks or trust banks (see table 7); this will be discussed in greater detail in the next section.

6. Managing Networks: Strategic Expansion

Banks which have reached capacity within their existing networks and which have exhausted opportunities to further exploit scale efficiencies could expand in more cost-efficient ways through acquisition or online expansion, rather than through building new branches. The strategies of the large Japanese banks follow this pattern, just as the large, European banks did over the same period.

Large Japanese banks with few opportunities to further exploit economies of scale and density are expanding online—a lower cost distribution channel. US evidence suggests that branch banking costs on a per transaction basis are $1.07, while Internet banking costs on a per transaction basis are $0.01.[21] For example, Bank of Tokyo Mitsubishi, which is last in the sample in terms of scale and density (103rd in scale and density) has expanded online and has 138,000 retail banking customers; in addition, it plans to launch an online brokerage unit with TD Waterhouse. [22] Sanwa Bank (102nd in scale and density) which

[21] "The Internet's Place in the Banking Industry," by Robert DeYoung. Chicago Fed Letter, March, 2001.
[22] EIU Country Finance Report for Japan, June 2000, p. 17.

has the largest retail banking network in Japan and is merging with Asahi Bank (97th in scale and 98th in density) and Tokai Bank (99th in scale and density) has launched e-Wing Securities. [23] Sakura Bank (100th in scale and 101st in density), which has merged with Sumitomo Bank (101st in scale and 100th in density), has developed an online bank, Japan Net Bank, along with Fujitsu, Japan's largest computer manufacturer, in addition to developing an ATM network in convenience stores. [24] Fuji Bank has launched Fuji Cyberbank, which will be the online unit of the new Mizuho Financial Group (Fuji Bank, Industrial Japan Bank of Japan, Dai-Ichi Kangyo Bank). In addition, the ten largest Japanese banks, which have few opportunities to further exploit scale and density economies, have collectively reduced the number of branches 5.4% and the number of employees 3.8% between September 1998 and September 1999. [25] This will enable them to process transactions through the lower cost distribution channel of Internet banking rather than through the higher cost branch distribution channels.

The acquisition strategies of the European and Japanese banks differ in that the capacity-constrained European banks are acquiring (or engaging in cross-equity agreements with) smaller banks with underutilized branch networks such that clear opportunities to improve cost efficiencies exist. Capacity-constrained Japanese banks, on the other hand, are merging with other large, capacity-constrained Japanese banks with few opportunities to reduce overlapping branches or to reduce costs, but with tremendous opportunities to exercise market power, especially in retail banking, as well as opportunities to create an entity which is "too big to fail."

7. Policy Implications

Large, capacity-constrained city banks could improve cost efficiencies, as well as gain more customers domestically and more revenue by consolidating with regional banks and using their underutilized distribution channels. This would be particularly viable in view of the recent legislation limiting government guarantees on deposits. As discussed earlier, depositors have been transferring their

[23] Ibid, p. 17; EIU Country Finance Report for Japan, March, 2000, p. 2.
[24] EIU Country Finance Report for Japan, December, 1999, p.2; EIU Country Finance Report for Japan, June, 2000, p. 17.
[25] EIU Country Finance Report for Japan, December, 1999, p. 2.

deposits from the smaller regional banks to the larger city banks, which are less likely to fail. In doing so, they are exacerbating the problem of over-utilized capacity in city banks and underutilized capacity in regional banks. Consolidation between city banks and regional banks is more likely to improve cost efficiencies from capacity utilization than mergers between already capacity-constrained city banks, which have opportunities for market power, or mergers between regional banks with currently underutilized capacity.

More efficient capacity utilization and achievement of cost efficiencies could improve the overall financial strength of the consolidated banks and improve their ability to compete against foreign banks, as well as other unallied domestic firms. This is especially important since competition for corporate customers has accelerated with the deterioration in the traditional keiretsu ties between firms and banks due to the mega-mergers cutting across keiretsu lines. Consolidation with smaller regional banks would be a better strategy for domestic expansion for large banks than expanding by building new branches because it would enable larger banks to get around the barriers to entry in regional markets that they might otherwise face. These barriers to entry include relationships with local companies established through the relationship-lending practices of regional banks, and the associated switching costs for local customers moving to a new bank lacking the product attributes of their regional bank.

The smaller, regional banks would benefit from this consolidation because, as a result of an alliance with a city bank or trust bank, their banking services might become more differentiated from those of unmerged competitors and they could attain higher revenues from selling more output through previously underutilized branch networks. Consumers could benefit from lower prices if cost efficiencies were passed on, as well as from a greater diversity of products at their regional banks.

Larger banks would bring an improved knowledge of credit risk modeling to smaller regional banks and hence improve their cost efficiencies in loan issuance. Table 5 suggests that larger banks, as measured by assets and employees, and banks with higher property, plant and equipment measures, have increasing returns to density in loans relative to smaller banks; this result was also found for European banks over the same period. This may reflect a learning curve for larger banks in loan issuance in that as

the bank issues more loans, its average cost of "producing" loans would fall since larger banks would issue loans in sufficient quantities that they would become better at identifying good credit risks from bad credit risks and hence would be better able to avoid the input cost of loan production-the loan loss provision. This relationship is not specific to a particular type of bank-the negative correlation is found for all three types of banks.

The data for the city banks suggests a learning curve because the city banks have the lowest average cost of loans (table 7) of the three types of banks, as measured by the dollar value of loan loss provisions per dollar value of loan. Since the input cost-loan loss provisions-is only incurred when a loan is defaulted on, the low average cost of loans suggests that city banks have fewer defaults, controlling for the size of loan issuance. City banks have the highest average loan loss provisions (table 8), which is not surprising given their exposure in the recent financial crisis, but they also issue asubstantial volume of loans, such that loan loss provisions are smaller as a percentage of total loans issued. City banks issue more loans in value than regional banks, but fewer loans than trust banks (table 9). When loan loss provisions are adjusted for size (the first column in table 10), city banks have lower loan loss provisions than the other types of banks.

Smaller banks exhibit unexploited cost efficiencies in deposits relative to the larger banks, which could provide a cost advantage to the larger banks in an alliance. Table 5 shows that smaller banks, as measured by assets and employees, as well as banks with less elaborate premises, have lower returns to density estimates in deposits (increasing returns to density) than larger banks both within each type of bank, as well as across the overall sample; this result was also found for European banks. The average interest expense on deposits is lower (table 8) for regional banks than for trust banks or city banks because regional banks are smaller and have on average fewer deposits in value than trust banks or city banks (table 9). Nevertheless, the average cost of deposits-interest expense per dollar value of deposit-is lower (table 7), which is the source of the increasing returns to density in deposits.

Smaller banks may pay lower interest rates on deposits than larger banks because they are less concerned that they will lose customers to a competitor because they are more involved in relationship-

lending, which raises the switching costs for customers of moving to another bank. The possibility that monopolistically competitive banks are taking advantage of high customer switching costs and charging lower deposit rates is similar to the argument in Gale (1993) that banks exploit the high switching costs of customers by lowering product quality (assuming that a deposit account paying lower rates is an inferior product relative to a deposit account paying higher rates).

8. Conclusion

This paper studies the utilization of physical branch networks across different sizes and types of Japanese banks, as well as examines the strategic management implications of network usage and expansion for efficiency and growth. The findings indicate that larger banks are more likely to be at constant or decreasing returns to scale and density than smaller banks for each type of bank (regional banks, city banks, trust banks), as well as across types. The within-type and across-type results suggests the effects of size-related factors, such as managerial diseconomies of scale (beginning with Williamson (1970)), as well as size-related differences in the form of non-price competition chosen by larger banks, which are often city or trust banks, versus smaller banks, which are often regional banks.

City banks and trust banks are more likely to be at constant / decreasing returns to scale and density than regional banks. Constant / decreasing returns to density for the city banks and trust banks are a function of the larger size of the transactions processed, as well as markets which are more dense in volume than regional markets, both of which lead to greater output processed, holding the number of branches fixed. Diseconomies of scale for larger city banks and trust banks are largely due to higher per branch overhead costs and therefore higher costs in opening up new branches. These higher overhead costs are related to the tendency of larger city banks to have larger offices with more employees in high rental areas, relative to smaller regional banks. Smaller regional banks exhibit increasing returns to density because they compete on spatial convenience and are in thin markets, resulting in a dense network of underutilized branches. They have smaller premises, with fewer employees in lower rental areas, such that the cost of opening up another branch is not as high, leading to increasing returns to scale.

The findings of this analysis suggest that more efficient branch capacity utilization would improve profitability for the different types of banks. The evidence suggests that trust banks are inefficiently large because they exhibit low per branch and size-adjusted per branch profitability measures, as well as decreasing returns to density and scale. Regional banks exhibit low per branch profitability because of their low revenue figures; they need to increase the transactions processed through their underutilized branches and take advantage of scale and density efficiencies to increase profitability. City banks exhibit diseconomies of scale and density on the cost side, but this is not yet reflected in per branch profitability measures. Subsequent growth in the output production of city banks through their existing channels, however, could erode per branch profitability. This is why expansion of retail banking activities of city banks and trust banks using the underutilized branch network capacity of regional banks would benefit all parties involved, including consumers if efficiencies were passed down in the form of lower prices. The problems of over-utilized capacity in city banks and under-utilized capacity in regional banks are being further exacerbated by the transference of deposits from regional banks to safer, larger city banks by depositors now that the government will only guarantee deposits of up to 10 million yen. Consolidation between city banks and regional banks would mitigate this problem.

This analysis suggests that the current wave of mergers between large city banks would be unlikely to yield cost efficiencies. I do not find evidence of opportunities for unexploited cost efficiencies in scale or density for larger banks in themselves; consequently, it is unclear how efficiencies could be achieved from combining their branch networks. While this work does not examine the potential role of managerial strategic decisions or economies of scope in generating efficiencies from these mergers, it does not refute concerns that issues of market power rather than improvements in efficiency are the motivating factors behind the mega- mergers.

In conclusion, efficient management of branch networks is key in rebuilding the competitiveness of the Japanese banking sector and in strengthening domestic and international confidence in the system. Nevertheless, efficient usage of branch networks is not a strategic variable that can be entirely controlled by management, since the volume of transactions undertaken within the

network is dependent on demand-side factors. While managers do have the ability to choose types of consolidation which have the potential for improving efficiency, large-scale economic and financial reforms, which are beyond the scope of managerial decision-making, need to be enacted by the government to stimulate the magnitude and growth of demand for the financial products of banks.

Table 1: Correlations of size, profitability, and size-adjusted profitability with cost efficiency measures

	Assets	Sales	Net Income	Net Income / Assets
Total sample				
Scale	0.782	0.758	-0.675	-0.118
Density	0.764	0.734	-0.631	-0.043
City banks				
Scale	0.953	0.933	-0.282	0.609
Density	0.934	0.903	-0.294	0.600
Regional banks				
Scale	0.913	0.843	-0.321	-0.058
Density	0.902	0.827	-0.275	-0.010
Trust banks				
Scale	0.883	0.803	-0.288	0.645
Density	0.841	0.764	-0.212	0.710

Table 2: Correlations between output measure, branch network size, and cost efficiency measures

	Loans	Deposits	Investments	Branches
Total sample				
Scale	0.982	0.988	0.968	0.804
Density	0.971	0.997	0.961	0.866
City banks				
Scale	0.983	0.993	0.972	0.796
Density	0.992	0.997	0.949	0.862
Regional banks				
Scale	0.988	0.994	0.953	0.890
Density	0.984	0.996	0.970	0.925
Trust banks				
Scale	0.986	0.992	0.986	0.688
Density	0.960	0.999	0.992	0.795

Tables 3 and 4: Correlations reflecting the importance of overhead on cost efficiencies

Table 3

	Property, plant, equipment	Employees
Total sample:		
Scale	0.737	0.883
Density	0.727	0.872
City banks:		
Scale	0.616	0.933
Density	0.597	0.960
Regional banks:		
Scale	0.790	0.940
Density	0.782	0.939
Trust banks:		
Scale	0.890	0.957
Density	0.864	0.983

Table 4

	Property, plant, and equipment	Employees
Total sample:		
Branches	0.793	0.895
City banks:		
Branches	0.517	0.905
Regional banks:		
Branches	0.799	0.922
Trust banks:		
Branches	0.396	0.715

Table 5: Correlations of size and efficiency measures for specific outputs

	Assets	Property, plant, and equipment (PPE)	Employees
Total sample			
Returns to density in loans	-0.732	-0.658	-0.777
Returns to density in deposits	0.782	0.743	0.883
Returns to density in investments	0.632	0.570	0.712
City banks			
Returns to density in loans	-0.649	-0.259	-0.401
Returns to density in deposits	0.918	0.528	0.927
Returns to density in investments	0.686	0.568	0.419
Regional banks			
Returns to density in loans	-0.614	-0.546	-0.576
Returns to density in deposits	0.926	0.812	0.952
Returns to density in investments	0.686	0.554	0.711
Trust banks			
Returns to density in loans	-0.902	-0.839	-0.838
Returns to density in deposits	0.844	0.866	0.971
Returns to density in investments	0.984	0.837	0.850

Table 6: Summary statistics of branch office utilization

	Average property, plant, and equipment / total offices	Average deposits / total offices	Average loans / total offices	Average investments / total offices	Average employees / total offices
Total Sample	5.1985	214.31	201.95	56.632	22.864
City Banks	16.846	688.32	668.40	177.07	39.065
Regional Banks	3.5719	156.14	131.31	31.112	18.532
Trust Banks	15.781	529.48	582.73	275.08	63.659

Table 7: Summary statistics of input prices

	Average cost of deposits: interest expense / deposits	Average cost of loans: loan loss provisions / loans	Average cost of overhead: overhead expenses / employees
Total sample	0.01111	0.01382	0.17676
City banks	0.02594	0.01187	0.35114
Regional banks	0.00692	0.01227	0.15639
Trust banks	0.03981	0.03979	0.28225

Table 8: Summary statistics on income and expenses

	Average interest expense	Average non-interest expense	Average loan loss provision	Average size-adjusted net income (net income/ assets)	Average interest income
Total sample	715.09	730.88	478.93	-0.0047	1341.53
City banks	6936.01	4820.46	3003.31	-0.0082	10927.26
Regional banks	148.60	370.01	213.27	-0.0030	518.28
Trust banks	1641.17	1317.57	1403.05	-0.0273	2059.38

Table 9: Summary statistics on output and physical infrastructure

	Average number of employees	Average value of loans	Average value of deposits	Average value of investments	Average number of domestic offices	Average number of foreign offices	Average number of offices
Total sample	3112	33823.85	35976.7	9009.67	125	3	128
City banks	13455	238031.7	24289.8	61912.49	315	30	345
Regional banks	2190	16575.11	19723.73	3995.35	114	1	115
Trust banks	4391	40955.08	38508.75	20179.73	65	6	71

Table 10: Summary statistics of size-adjusted expenses

	Average size-adjusted loan loss provisions (loan loss provisions / assets)	Average size-adjusted interest expenses (interest expenses / assets)	Average non-interest expense per branch
Total sample	0.0101	0.0078	4.650
City banks	0.0080	0.0175	13.95
Regional banks	0.0094	0.0061	2.969
Trust banks	0.0226	0.0188	18.38

Table 11: Summary statistics on income per branch

	Average sales per branch	Average net income per branch	Average interest income per branch
Total sample	10.44	-2.369	7.593
City banks	39.76	13.95	30.23
Regional banks	5.259	-0.580	4.135
Trust banks	49.41	-22.63	28.57

Table 12: Summary statistics on size-adjusted income per branch

	Average size-adjusted interest income (interest income / assets) per branch	Average size-adjusted sales (sales / assets) per branch	Average size-adjusted net income (net income / assets) per branch
Total sample	0.00024	0.00032	-0.000068
City banks	0.00008	0.00012	-0.000026
Regional banks	0.00024	0.00030	-0.000033
Trust banks	0.00041	0.00075	-0.00064

SOURCES

Allen L. and Rai A. "Operational Efficiency in Banking: An International Comparison." Journal of Banking and Finance, vol. 20 (1996), p. 655-672.

Altunbas, Y., Liu, H, Molyneux, P, and Seth R. "Efficiency and Risk in Japanese Banking." Journal of Banking and Finance, 24(10), pp. 1605-1628 (2000).

Batchelor, D., Drake, L., and Simper R. "Scale Economies and Technological Change In Japanese Banking: An Application of an Entry / Exit Model." Working Paper, November, 2000.

Berger, Allen N., Gerald Hanweck, and David Humphrey. "Competitive Viability in Banking: Scale, Scope, and Product Mix Economies." Research Papers in Banking and Financial Economics. Washington DC: Board of Governors of the Federal Reserve System, 1986.

Berger, A. N., and Humphrey D.B. "Efficiency of Financial Institutions: International Survey and Directions for Future Research." European Journal of Operations Research, 98, pp. 175-212 (1997).

Berger, A.N., Leusner J.H. and Mingo, J. J. "The Efficiency of Bank Branches," Journal of Monetary Economics, 40, pp. 141-162, (1997).

Berndt, Ernst. R. The Practice of Econometrics: Classic and Contemporary. Reading: Addison-Wesley, 1996.

Caves, Douglas W.; Laurits R. Christenson; and Michael W. Trethaway. "Economies of Density versus Economies of Scale: Why Trunk and Local Service Airline Costs Differ." RAND Journal of Economics. 15:4 (Winter, 1984), p. 471-489.

Caves, Douglas W.; Laurits W. Christenson; Michael W. Trethaway; and Robert J. Windle "Network Effects and the Measurement of Returns to Scale and Density for U.S. Railroads." Analytical Studies in Transport Economics. Cambridge: Cambridge UP, 1984, p. 97-120.

DeYoung, Robert. "The Internet's Place in the Banking Industry." Chicago Fed Letter. March, 2001.

Dixit, A. and J. Stiglitz. "Monopolistic Competition and Optimum Product Diversity." American Economic Review. 67: (1977), p. 297-308.

EIU Country Finance Report for Japan. New York: Economist Intelligence Unit, June, September, December, 1999; March, June, 2000.

European Commission. "Impact on Services: Credit Institutions and Banking." Single Market Review. Subseries II, vol. 4. London: Office for Official Publications of the European Communities (1997).

Fanjul, O. and Maravall F. "La eficiencia del sistema bancario Espanol," research paper, Madrid: Alianza University, 1985.

"Finance and Economics: Outsmarting their city cousins: Regional banks in Japan," The Economist, April 6, 2002.

Friedman, Benjamin. "Japan Now and the United States Then: Lessons from the Parallels." In Japan's Financial Crisis and its Parallels to the U.S. Experience. Edited by Ryoichi Mikitani and Adam Posen. Washington D.C.: Institute for International Economics, September, 2000, p. 37-56.

Fukuyama, H. "Technical and Scale Efficiency of Japanese Commercial Banks: A Non-Parametric Approach." Applied Economics, 25, pp. 1101-1112 (1993).

Gale, D. "Branch Banking, Unitary Banking, and Competition." 1993. Department of Economics, Boston University. Mimeograph.

Gathon H. and Grosjean, F. "Efficacite productive et rendement d'echelle dans les banques belges." Cahiers Economiques de Bruxelles, vol 144, (1991), p. 145-160.

Goddard, John; Philip Molyneux; and John Wilson. European Banking: Efficiency, Technology, and Growth. New York: John Wiley and Sons, 2001.

Goldberg, Lawrence G; Gerald A. Hanweck; Michael Keenan; and Allan Young. "Economies of Scale and Scope in the Securities Industry. Journal of Banking and Finance 15 (1991), p. 91-107.

Greene, William H. Econometric Analysis. Upper Saddle River: Prentice Hall, 1997.

Haggard, Stephan. The Political Economy of the Asian Financial Crisis. Washington D.C. : Institute for International Economics, August, 2000.

Hensel, Nayantara D. "Banking Regulation and Reform: Implications for the New Millennium," The New Millennium: Challenges and Strategies for the Globalizing World. Aldershot: Ashgate Press, 2000, p. 197-212.

Hensel, Nayantara D. "The Implications of Strategic Network Management for Firm Behavior." Journal of Financial Transformation, April, 2002, p. 29-35.

Hensel, Nayantara D. Essays on Consolidation and Efficiency in Network-Based Industries, Ph.D. Dissertation, Harvard University, 2001.

Hoshi, T., A. Kashyap and D. Scharfstein. "Bank Monitoring and Investment: Evidence From the Changing Structure of Japanese Corporate Banking Relationships. In Asymmetric Information, Corporate Finance, and Investment. Edited by R. GlenHubbard. Chicago: University of Chicago Press, 1990, p. 105-126.

Hoshi, T. and Kashyap A. "The Japanese Banking Crisis: Where Did It Come From and How Did it End?" NBER Working Paper No. W7259 (1999).

Jagtiani, Julapa and Anya Khanthavit. "Scale and Scope Economies at Large Banks: Including Off-Balance Sheet Products and Regulatory Effects: 1984-1991," Journal of Banking and Finance, 20 (1996), p. 1271-1287.

Jagtiani Julapa; Alli Nathan; and Gordon Sick. "Scale Economies and Cost Complementarities In Commercial Banks: On- and Off-Balance Sheet Activities," Journal of Banking And Finance, 19 (1995), p. 1175-1189.

"Japanese regional banks under threat," Retail Banker International, July 31, 2002.

"Japan Set to Duck Key Banking Reform," Financial Times, March 21, 2001, p. 8.

Jorgenson, Dale W. "Econometric Methods for Modeling Producer Behavior," Chapter 31. In Handbook of Econometrics, Vol. 3, Amsterdam: North-Holland, 1986. p. 1841-1915.

Kaplan, Steven N. and Bernadett A. Minton. "'Outside' Intervention in Japanese Companies: Its Determinants and its Implications for Managers." National Bureau of Economic Research. Working Paper No. 4276. February, 1993.

Keren, Michael and David Levhari. "The Internal Organization of the Firm and the Shape of Average Costs." Bell Journal of Economics. Vol. 14. (Autumn, 1983) p. 474-486.

Kester, W. Carl. "Banks in the Boardroom: The American Versus Japanese and German Experiences." Global Finance Journal. 5:2 (1994), p. 181-204.

Kester, W. Carl. Japanese Takeovers: The Global Contest for Corporate Control. Boston: Harvard Business School Press, 1991.

Mattione, Richard P. "Japan: The World's Slowest Crisis." In The Asian Financial Crisis: Lessons for a Resilient Asia. Edited by Wing Thye Woo, Jeffrey Sachs, and Klaus Schwab. Cambridge: MIT Press, 2000, p. 185-201.

McKillop, DG, Glass CJ and Morikawa Y. "The Composite Cost Function and Efficiency In Japanese Banks." Journal of Banking and Finance, Vol. 20, p. 1651-1671 (1996).

Mikitani, Ryoichi. "The Facts of the Japanese Financial Crisis." In Japan's Financial Crisis and its Parallels to the U.S. Experience. Edited by Ryoichi Mikitani and Adam S. Posen. Washington D.C.: Institute for International Economics, September, 2000, p. 27-36.

Piloff, Steven J. "Does the Presence of Big Banks Influence Competition in Local Markets?" Journal of Financial Services Research, 15:3 (1999), p. 159-177.

Posen, Adam S. "Introduction: Financial Similarities and Monetary Differences." In Japan's Financial Crisis and its Parallels to U.S. Experience. Edited by Ryoichi Mikitani and Adam S. Posen. Washington D.C.: Institute for International Economics, September, 2000, p. 1-26.

Prager, Robin A. and Timothy Hannan. " Do Substantial Horizontal Mergers Generate Significant Price Effects? Evidence from the Banking Industry," Journal of Industrial Economics, 46:4 (December, 1998), p. 433-451.

"Profile: Japan's Banking Industry." Asia Pulse, May 16, 2002.

Robinson, E.A.G. The Structure of Competitive Industry. Chicago: University of Chicago UP, 1958.

Rodriguez, JRO, Alvarez AA, and Gomez PP. Scale and Scope Economies in Banking: A Study of Savings Banks in Spain. Tenerife: Universidad De La Laguna, 1993.

Sachs, Jeffrey and Wing Thye Woo. "Understanding the Asian Crisis." In The Asian Crisis: Lessons for a Resilient Asia. Edited by Jeffrey Sachs and Wing Thye Woo. Cambridge: MIT Press, 2000, p. 13-43.

Shaffer, Sherrill. "Can Megamergers Improve Bank Efficiency?" Journal of Banking and Finance 17 (1993), p. 423-436.

Scherer, F.M. and David Ross. Industrial Market Structure and Economic Performance. Third edition. Boston: Houghton Mifflin, 1990.

Sheard, Paul. "Bank Executives on Japanese Corporate Boards." Bank of Japan Monetary and Economic Studies. 12:2 (December, 1994), p. 85-121.

Sheard, Paul. "Reciprocal Delegated Monitoring in the Japanese Main Bank System." Journal of the Japanese and International Economies. Vol. 8, 1994., p. 1-21.

Sheard, Paul. "The Role of the Japanese Main Bank When Borrowing Firms Are in Financial Distress." Center for Economic Policy Research Discussion Paper, Number 330. November, 1992.

Shimizu, Yoshinori. "Convoy Regulation, Bank Management, and the Financial Crisis in Japan." In Japan's Financial Crisis and its Parallels to the U.S. Experience. Edited by Ryoichi Mikitani and Adam S. Posen. Washington D.C.: Institute for International Economics, September, 2000, p. 57-100.

Spence, M. "Product Selection, Fixed Costs, and Monopolistic Competition." Review of Economic Studies. 43: (1976), p. 217-235.

Tirole, Jean. The Theory of Industrial Organization. Cambridge: MIT Press, 1997.

Williamson, Oliver E. "Hierarchical Control and Optimum Firm Size." Journal of Political Economy. Vol. 75 (April, 1967), p. 123-138.

Williamson, Oliver E. Corporate Control and Business Behavior. Englewood Cliffs: Prentice-Hall, 1970.

"World's Biggest Bank Crashes on Takeoff," Retail Banker International, April 15, 2002.