

“Comparative Performance Evaluation of Small, Medium and Large U.S. Commercial Banks”

AUTHORS

Chiaku Chukwuogor
Jill Wetmore

ARTICLE INFO

Chiaku Chukwuogor and Jill Wetmore (2006). Comparative Performance Evaluation of Small, Medium and Large U.S. Commercial Banks. *Banks and Bank Systems*, 1(2)

RELEASED ON

Monday, 05 June 2006

JOURNAL

"Banks and Bank Systems"

FOUNDER

LLC “Consulting Publishing Company “Business Perspectives”



NUMBER OF REFERENCES

0



NUMBER OF FIGURES

0



NUMBER OF TABLES

0

© The author(s) 2025. This publication is an open access article.

COMPARATIVE PERFORMANCE EVALUATION OF SMALL, MEDIUM AND LARGE U.S. COMMERCIAL BANKS

Chiaku Chukwuogor-Ndu, Jill Wetmore

Abstract

This paper examines the comparative performance of small U.S. commercial banks (\$100million to \$300million) in assets with medium size (\$1billion-\$5billion) and large (greater than \$5billion) for the period of 1997-2002. In view of the banking system deregulation and bank consolidation in the United States, it is necessary to constantly evaluate the performance of the various categories of banks to document the possible impact of these policy measures. We use profit efficiency (PROFEFF), return-on-assets (ROA), interest income, non interest income and loan loss reserve as criteria for this comparison. We find that between 1997 and 1999, small banks were more profit efficient (PROFEFF) than large banks but less than medium- size banks. Since 1999, the PROFEFF of all sizes of banks has been on the decline but the PROFEFF of small banks declined more than that of large and medium-size banks. The ROA for all the banks under evaluation declined between 2000 and 2002. Small banks suffered the largest decline. An examination of the trend in net interest income as a percentage of average assets (NII) for the three groups of banks reveals that small banks' NII is greater than that of large banks for the entire period. And in contrast, small banks have the lowest level of non-interest income as a percentage of average assets (NONII). It is apparent that the small banks are vulnerable to increased competition offered by deregulation, technological advances, e-commerce and negative economic situation such as the current recession. These results suggest the survival of small U.S. commercial banks is in jeopardy. Since these observations result from the present policy of consolidation and bank system deregulation there is need for the Reserve Banks revisit of this policy stance.

Key words: Profit efficiency, Return-on- assets, Commercial banking, Net interest income, Non interest income, non-current loan, loan-loss reserve.

JEL classification: G21

1. Introduction

A number of studies comparing the profitability and safety of peer groups of banks have been written. Most of these studies focus on small banks with different asset sizes than we study. For example, Akhigbe and McNulty (2003) study a minimum size bank of \$500 million in assets. DeYoung and Hassan (1998) refer to a specific category of small such as novo banks. Elyasiani and Mehdiian (1995) focus on a risk threshold of small commercial banks with average assets of less than \$50 million and with one branch office¹. The period of 1997-2002 is significant because of the perceived vulnerability of small commercial banks caused by deregulation and increased competition offered by technological advances and e-commerce. The period also encompasses periods of economic booms and recessions.

The issue of survival of small banks in the present era of bank consolidation is of tremendous interest to scholars of financial services and regulators. Regulatory changes contributing to the threat of survival of small banks include: introduction of interest bearing checking accounts, the removal of regulatory ceilings on bank deposit rates, relaxation of branching laws, increased competition from non-bank firms and the emergence of mega banks through mergers and acquisitions. Moreover, during the second half of the 20th century, advances in communications technology,

¹ (Shaffer, 1989) reports in "1985", the annual number of failures had risen over 100, of which 77 were smallest banks with total assets of less than \$25 million dollars. Some 200 banks in 1987, of which 130 had less than 25 million dollars in assets and 167 had less than \$50 million in assets.

financial markets and banking production techniques have contributed to the erosion of the fundamental advantages of community banks namely: the personal interaction between bankers, borrowers and depositors, especially small, unsophisticated borrowers and depositors. These developments have led to the marginalization of some small banks that flourished when the regulations and environment favored small-sized banks. Research results concerning the danger to small banks are mixed. The literature finds a dramatic increase in the proportion of failures occurring among the small banks and they cite performance data as evidence corroborating this view. (See, for example, Shaffer, 1998; Kutter, 1991 and Fix, 1988). The survival of small banks is important because if they do not survive, credit to small businesses may diminish with the resulting negative effect on job creation. However, other researchers find that small banks may have both an inherent information advantage over large banks (Nakumura, 1993; and Mester, Nakumura and Renoult, 1998). Berger, Alan, Miller, Peterson, Rjan and Stein (2002) suggest that small banks may have a comparative advantage in developing and using the “soft” information often associated with small business lending.

Differences in bank asset and liability composition, expenses, non-interest income, capital ratio, competition and access to credit information, all emanating from the differences in their asset sizes pose problems for scholars wishing to conduct comparative evaluation of bank performance. To mitigate this difficulty in evaluating small banks in comparison to other banks, we use the profit efficiency (PROFEFF) analysis as one of our instruments of analysis in this paper. We estimate the PROFEFF measure for each peer group of U.S. banks based on asset sizes but we do not regress it on variables reflecting differences in asset and liability composition, competition, location, organizational structure and other factors (Akhigbe and McNulty, 2003 and DeYoung and Hassan, 1998). Rather we determine the PROFEFF, absolute profitability using (ROA), the operational risk threshold of each category of banks. This analysis provides a comprehensive picture of the differences in profit efficiency, absolute profitability and the risk profile between small banks and other categories of banks for the period of 1997-2002.

2. Literature Review

There are significant empirical findings in support of theories advanced to explain why small banks' financial performance may differ from that of other banks. The literature suggests *ceteris paribus*, small banks in small communities can charge higher rates on loans and pay lower rates on deposits than other banks because there is less competition in small banking markets. (See, for example, Gilbert, 1984; Hannan, 1991a, b; Berger, Hanweck and Humphrey, 1987; and Gilligan and Smirlock, 1984). Moreover, many researchers find that little cost saving can be achieved by increasing the size of the banking firms (Berger, Hanweck and Humphrey, 1987 and Gilligan and Smirlock, 1984). Other research suggests the presence of significant scale economics for banks whose asset size extends well into the multibillion dollar range. (See, for example, Shaffer, 1985; Hunter and Timm, 1986; Evanoff, Israilevich and Merris, 1990; Noulas, Ray and Miller, 1990 and Shaffer and David, 1999).

Nakumura (1993) and Mester et al. (1998) find that small banks have access to better credit information than large banks, such as daily data on firm cash flows, which is available through monitoring checking accounts. Several authors find managers of banks in less competitive markets may dissipate part of their advantage by enjoying perquisites such as higher salaries, more assistants, lavish office quarters, etc. (See, for example, Arnold, 1985; Berger and Hannan, 1998; Hannan and Mavinga, 1980; Purroy and Salas, 2000; and Rhoades, 1980). Rhoades and Rutz (1982) and Clark (1986) find that bank managers in smaller, less competitive markets may also shift the bank's asset composition to less risky loans and securities out of a desire to enjoy a “quiet life”. Many studies of bank performance report that small banks have higher ROA (but not necessarily equity) than large ones. Boyd and Runkle (1993) study banks with assets of more than \$1 billion and find an inverse relationship between bank size and ROA, which they attribute to monopoly rents. Berger and Mester (1997) report greater PROFEFF at small banks than at large banks. Elyasiani and Mehdian (1995) suggest that because of deregulation, the future survival of small banks is in serious question. McNulty et. al. (2001) find no consistent evidence of superior loan quality at small banks. However this analysis is

restricted to one large state (Florida) in the U.S. The result is evidence on the viability of small banks is mixed and the question of viability deserves further study.

3. Data and Methodology

The sample studied includes all U.S. banks with asset sizes \$100 million-\$300 million for the small peer group, \$1billion-\$5 billion for the medium-size peer group, and with assets greater than \$5 billion for the large peer group. These banks are found in the Report of Condition and Income (call report) database available at the Federal Reserve Bank of Kansas, <http://www.kc.frb.org/BS&S/Bankpeer>, which contain data for different bank peers from 1997 to 2002 and the Federal Reserve Bank of Chicago's web page "<http://www.frbchi.org>" (www.frbchi.org) for which at least one year of data are available, including newly chartered banks. The number of observations is 2579 in 1997, 2651 in 1998, 2655 in 1999, 2693 in 2000, 2724 in 2001 and 2728 in 2002.

This paper adopts several techniques in evaluating different asset categories of U.S commercial banks. We estimate the profit efficiency (PROFEFF) for the small, medium and large banks in order to determine their operational efficiency during the period.

We calculate the return on assets (ROA) for small, medium and large banks. We compare the annual mean PROFEFF and ROA of the various size banks and we apply the t-stats at 1, 2, and 5 percent levels to determine the significance. The PROFEFF test and ROA analysis give an indication of profitability and degree of management effectiveness in the utilization of bank assets. We examine the two main sources of bank income, the net interest income and the non interest income. We use the Man-Whitney (U) test, non parametric variance analysis test two sample test, to test the significance of the differences in net interest income and non interest income as percentages of average assets for the small, medium and large banks for the period of 1997-2002.

We compare the operational risk for the various size banks as indicated by the level of non-current loan, loan-loss reserve and net actual loan loss each as a percentage of total loans.

3.1. Profit Efficiency (PROFEFF) Analysis

Virtually all profit efficiency studies use a linear function to analyze the correlates of the profit efficiency function¹. PROFEFF is a sophisticated financial performance statistic, measuring how actual financial performance compares to a theoretical best practice frontier. For a bank under evaluation, it is measured as a percentage of the PROFEFF of the best practice bank. The frontier is estimated separately for each year and each bank's PROFEFF is also estimated using the following non-standard, Fourier-flexible²:

$$\begin{aligned}
 PREROA = & \alpha_0 + \sum_i^3 \beta_i Y_i + \frac{1}{2} \sum_i^3 \sum_i^3 \beta_{ij} Y_i Y_j + \sum \gamma_{mn} W_m W_n \\
 & + \sum_k^3 \phi_k Z_k + \frac{1}{2} \sum_k^3 \sum_l^3 \phi_{kl} Z_k Z_l + \sum_i^3 \sum_m^3 \rho_{im} Y_i W_m + \sum_i^3 \sum_k^3 \phi_{ik} Y_i Z_k \\
 & + \sum_m^3 \sum_k^3 \phi_{mk} W_m Z_k + \sum_{i=1}^9 [\delta_i \cos X_i + \theta_i \sin X_i] \\
 & + \sum_{i=1}^9 \sum_{j=1}^9 [\delta_{ij} \cos(X_i + X_j) + \phi_{ij} \sin(X_i + X_j)] \\
 & + \sum_{i=1}^9 \sum_{j=1}^9 \sum_{k=1}^9 [\delta_k \cos(X_i + X_j + X_k) + \phi_{ijk} \sin(X_i + X_j + X_k)] \\
 & + \nu + \mu,
 \end{aligned} \tag{1}$$

¹ Non-current loans are loans that are past due for 90 days or more.

² Berger and Mester (1997), Altunbas, Evans, and Molyneux (2001), Akhigbe and McNulty (2003), DeYoung and Nolle (1996).

where: *PREROA* = operating profits (earnings before taxes, extraordinary items, and loan losses) measured as a percentage of total assets.

Y represents a vector of three outputs defined for each bank as:

total loans (the sum of consumer, commercial/industrial and real estate loans)
 retail deposits (the sum of demand deposits and time deposits) and
 non-interest income (representing fee-based financial services).

W represents a vector of three market prices for bank inputs, measured at the country level:

the wage rate for labor
 the average interest rate for borrowed funds
 a price for physical capital¹.

Z vector contains three variables:

equity capital (defined separately for each bank) to control for the potential increased cost of funds due to financial risk,
 a Hirschman-Herfindahl Index (HHI, defined at the country level) to control for differences in market structure among countries, and
 the average non-performing loan ratio (defined at the country level) to control for differences in economic conditions across markets.

X represents a set of nine variables that transform the output (*Y*) variables to place them on an interval from 0 to 2².

We assume that profits depend on input prices and output quantities. This is a reasonable assumption for loans, deposits and fee-based services. The Fourier function has been used in a large number of recent cost and profit efficiency studies. (See, for example, Akhigbe and McNulty, 2003; Berger and Mester, 1997, 2001; DeYoung and Hassan, 1998; DeYoung and Nolle, 1996; McAllister and McMamus, 1993; and Mitchell and Onvural, 1996). For banks in which *Y*, *W*, and *Z* differ markedly from the sample mean, the Fourier form provides a better fit than other functions, such as the translog functions. The non-standard Fourier form assumes that banks have some control over output prices (DeYoung and Hasan, 1998 and Humphrey and Pulley, 1997). Profits are assumed to depend on input prices and output quantities.

Since output prices are not exogenous under these assumptions, Equation (1) is very similar to the function used by Akhigbe and McNulty (2003) and DeYoung and Hassan (1998). This function avoids the difficulty in measuring output prices. Output quantities, rather than output prices explain a larger portion of variation in profitability.

We apply the stochastic frontier approach suggested by Jondrow et al. (1982) and used by Akhigbe and McNulty, (2002) and DeYoung and Hassan, (1998) to capture the bank's divergence from the best practice frontier. The stochastic frontier approach assumes that deviations from the frontier include inefficiencies (profit inefficiencies in our case) and random errors. Inefficiencies are assumed to follow an asymmetric, half normal distribution, and the random errors follow a symmetric normal distribution. We estimate the inefficiency term as the expected value of profit inefficiency, conditional on the residuals from each year's profit function.

Equation (1) reflects the non-standard Fourier hybrid form since it contains both a quadratic profit function and a series of trigonometric (Fourier) terms. Because of software limitations and limitations on the number of observations, we estimate a slightly modified version of this function. Our function contains 18 trigonometric terms and 54 other terms for a total of 72 independent variables. Limiting the number of terms (especially the third-order terms) is consistent with other re-

¹ The wage rate for labor equals total salaries and benefits divided by the number of full-time employees. The price of capital equals expenses of premises and equipment divided by premises and fixed assets. The price of deposits and purchased funds total interest expense divided by total deposits and purchased funds.

² See Berger and Mester (1997, p. 917 n) for the methodology for performing these transformations.

cent PROFEFF studies. (See Akhigbe and McNulty, 2002; DeYoung and Hassan, 1998; DeYoung, Spong and Sullivan, 2000; and Berger and Mester, 1997, 2001).

POTENTIAL PREROA is defined as the estimated profitability of the bank if it is operated on the best-practice frontier. Since efficiency cannot be negative, as in other PROFEFF studies we define:

$$PROFEFF = (ACTUAL REROA/POTENTIAL PREROA), \text{ if } PREROA > 0$$

$$PROFEFF = 0 \text{ if } PREROA < 0. \quad (2)$$

PROFEFF is an efficiency measure which ranges from zero for banks experiencing losses to one for banks operating on the best practice frontier. We estimate a separate PROFEFF function (frontier) for each year. This approach allows the regression coefficients and the efficiency measures to vary over time, thereby allowing flexibility in the estimation procedure.

3.2. Return on Assets

Return on Asset is the best ratio for comparing profitability performance of companies across industries. Whereas the ROA indicates the overall profitability of a company, it can be distorted by the occurrence of nonrecurring gains and losses, changes in the company's leverage and the incidence of restructuring and acquisitions. The ROA is used in this paper subject to these limitations.

$$ROA = \text{Net Income} / \text{Total Assets} \quad (3)$$

We examined the trends in the two main sources of bank income, net interest and non interest income. We used the Mann-Whitney U Test, a nonparametric variance analysis test, to test the equality of the small banks mean net interest income and non net interest income with first that of large banks and second with that of medium banks for the period of 1997 to 2002.

$$U = n_1 n_2 + \frac{n_1(n_1 + 1)}{2} - R_1,$$

where: n_1 = number of observations for small banks;

n_2 = number of observations for large banks;

R_1 = sum of the ranks of observations for small banks;

R_2 = sum of the ranks of observations for large banks.

We test the hypothesis:

$H_0 : \mu_1 = \mu_2$ ← null hypothesis: There is no difference between the net interest income of small and large banks, in particular, both have the same mean.

$H_0 : \mu_1 \neq \mu_2$ ← alternative hypothesis: There is no difference between the net interest income of small and large banks: in particular, they have different means.

$\alpha = .05$ ← level of significance for testing these hypotheses

We repeat this test for small and medium banks. We also tested the hypothesis on the non interest income of small, medium and large banks for the period of 1997-2002.

3.3. Risk Analysis

We evaluate the major commercial bank risk factor, credit risk by examining the loan loss reserve as a percentage of total loans and non-current loan as a percentage of total loans. Since banks hold little owners' capital relative to aggregate value of their assets, only a relative small percentage of total loans need to turn bad in order to push any bank to the brink of failure (Rose, 1999). The loan-loss reserve indicates the extent to which a bank is preparing for loan losses through annual charges against current income. The non-current loans are loans that are past due for 90 days or more. Finally we analyze the actual charge-off by examining the net loan-losses as a percentage of average loans.

4. Empirical Results

Table 1 contains the summary statistics data for our estimated PROFEFF for three classes of banks for the period 1990-2002. Panel A presents the results when a single PROFEFF frontier is estimated for small and large banks. Panel B contains the results when a single PROFEFF frontier is estimated for small and medium size banks. Between 1997 and 1999, the small banks, with asset size between \$100 million and \$300 million were more profit efficient than the large banks but less than medium-size banks. Since 1999, even though the PROFEFF of all the asset size has been on the decline, the PROFEFF of small banks declined more than that of large banks and medium-size banks. Medium-size banks, with asset size of between \$1 billion and \$5 billion achieved the highest PROFEFF during the period of 1997-2002.

Table 1

Summary Statistics for Profit Efficiency of a Sample of U.S. Banks, 1997-2002

Year	Small banks			Medium-size banks				
	(Asset size \$100m-\$300m)			(Asset size \$1b-\$5b)				
	Panel A	Small versus Medium banks using a single frontier for all banks					Difference	
	<i>N</i>	Mean	Std	<i>N</i>	Mean	Std	Mean	<i>t-stat</i>
1997	2216	0.8024	0.1464	239	0.8624	0.1568	-0.06	10.1***
1998	2265	0.8555	0.1464	266	0.8624	0.1671	-0.0069	0.94
1999	2271	0.7789	0.1464	255	0.9141	0.1821	-0.1352	21.98***
2000	2306	0.6776	0.1551	256	0.8528	0.2055	-0.1752	25.1***
2001	2334	0.6776	0.1658	262	0.9273	0.2055	-0.2497	33.98***
2002	2340	0.6442	0.2023	266	0.758	0.2162	-0.0113	.12
1997-2002	13732	0.7394	0.1604	1544	0.8628	0.1888	0.1063	6.09
Year	Small banks			Large banks			Difference	
	Asset size \$100m-\$300m			Asset size greater than \$5b			Mean	<i>t-stat</i>
	Panel B	Small versus Large banks using a single frontier for all banks						
	<i>N</i>	Mean	Std	<i>N</i>	Mean	Std		
1997	2216	0.8024	0.1464	124	0.7953	0.1503	0.0071	.59
1998	2265	0.8555	0.1464	120	0.7532	0.1582	0.1023	6.11***
1999	2271	0.7789	0.1464	129	0.8662	0.1819	-0.0873	20.73***
2000	2306	0.6776	0.1551	131	0.7899	0.1975	-0.1123	7.02***
2001	2334	0.6776	0.1658	128	0.7227	0.1993	-0.0451	11.58***
2002	2340	0.6442	0.2023	122	0.6671	0.2293	-0.0229	3.58***
1997-2002	13732	0.7394	0.1604	754	0.7657	0.186	-0.0263	3.65

This table presents our PROFEFF estimates for the three classes of banks for the period of 1997-2002. Panel A presents the results when a single PROFEFF frontier is estimated for small and large banks. Panel B presents the results when a single PROFEFF frontier is estimated for small and medium size banks.

*** Significant at the 1 percent level.

Figure 1 depicts the comparative PROFEFF performance of the small, medium and large banks.

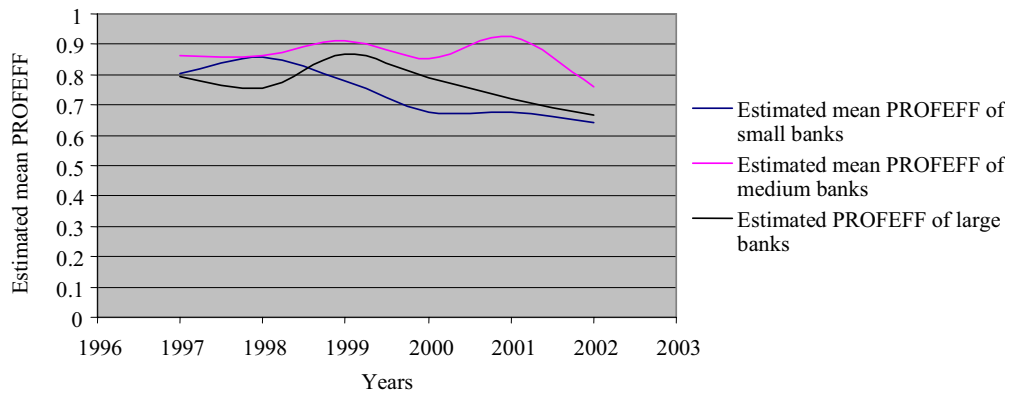


Fig. 1. Comparative PROFEFF, 1997-2002

All categories of banks under evaluation achieved approximately the same return on asset in 2000. The calculated ROA is 1.16% for small banks, 1.15% for medium- size banks and 1.15% for large banks. The ROA for all the banks under evaluation declined between 2000 and 2002. The small banks suffered the highest decline. Between 1997 and 2000, the small banks were more profitable than the large banks. Again as was the case with the PROFEFF analysis, the medium size banks achieved the highest profitability during the period of 1997-2002. Table 2 contains the ROA summary statistics data and the comparative ROA of the three classes of the banks under evaluation is contained in Figure 2 below.

Table 2

Summary of ROA Statistics for ROA for each sample of US banks, 1997-2002

		Small banks		Medium banks				
		Asset size \$100m-\$300m		Asset size \$1b - \$ b				
Panel A. Small banks versus Medium banks								
Year	N	Mean	Std	N	Mean	Std	Difference	
							Mean	t-stat
1997	2216	0.0123	0.1492	239	0.0136	0.1244	-0.0013	0.54
1998	2265	0.0123	0.1573	266	0.0145	0.1246	-0.0022	0.75
1999	2271	0.0122	0.1682	255	0.0132	0.1344	-0.001	0.04
2000	2306	0.0116	0.2258	256	0.0115	0.1336	0.0001	0.004
2001	2334	0.0109	0.2687	262	0.0115	0.145	-0.0006	0.007
2002	2340	0.0087	0.3358	266	0.0109	0.1556	-0.0022	0.75
1997-2002	13732	0.0113	0.2175	1544	0.0125	1.363	0.0012	0.52

Table 2 (continuous)

	Small banks			Large banks				
	Asset size \$100m-\$300m			Asset size greater than \$5b				
Panel A. Small banks versus Large banks								
Year	N	Mean	Std	N	Mean	Std	Difference	
							Mean	t-stat
1997	2216	0.0123	0.1492	124	0.0114	0.1532	0.0009	.049
1998	2265	0.0123	0.1573	120	0.0108	0.1634	0.0015	0.61
1999	2271	0.0122	0.1682	129	0.0125	0.1745	-0.0003	0.002
2000	2306	0.0116	0.2258	131	0.0114	0.3358	0.0002	0.001
2001	2334	0.0109	0.2687	128	0.0115	0.3577	-0.0006	0.007
2002	2340	0.0087	0.3358	122	0.0098	0.2788	-0.0011	0.49

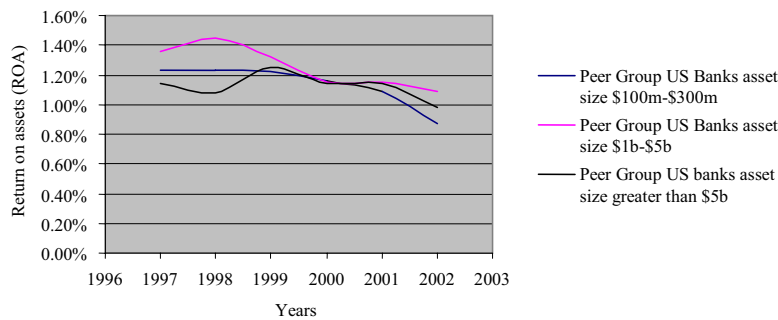


Fig. 2. Comparative Return on assets (ROA) 1997-2002

The two main sources of commercial bank income are interest on loans and non interest income such as fees and commissions. The net interest income, sometimes referred to as interest margin is a key determinant of bank profitability. An examination of the trend in net interest income as a percentage of average assets for the three peers of banks reveals that small banks' net interest income as a percentage of average assets is greater than that of large banks for the whole period, greater than that of medium banks between 1997 and 1999 but less than that of medium banks for the period from 2000 to 2002. The large banks had the lowest level of net interest income (Figure 3).

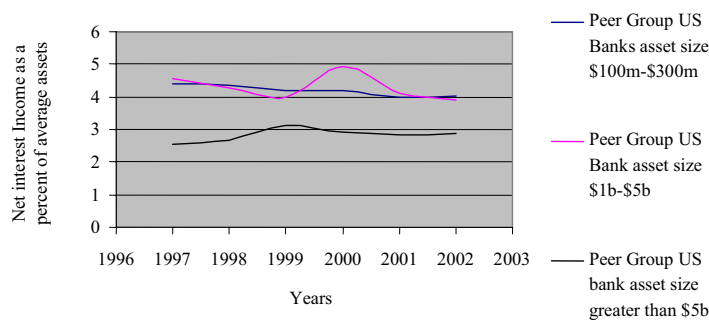


Fig. 3. Comparative Net Interest Income as a percent of average assets, 1997-2002

It is believed that new communications' technology enables large banks to erode the domain of community banks and compete in local markets through the use of networks of ATMs, Internet kiosks, and transactional Internet websites. The credit-worthiness of local community bank loan

customers can now be evaluated by financial institutions located outside the market using new lending and financial technologies. Use of internet financial models, questionnaires for credit scoring and on-line credit applications permits large banks to build up a huge data base of the credit risk of small customers at low cost. The large banks also benefit from economies of scale by combining a high volume of loans with the use of asset securitization risk management techniques. It appears that despite these advantages, the small banks with asset size \$100 million - \$300 million relative to their asset size are still deriving more income from loans than large banks.

Table 3 below shows the results of the normality on the Net interest income for small, medium and large banks for the period of 1997-2002. The W Test results indicate the non normality of the distribution.

Table 3

Results of W Test, Test for Normality

Year	R	P value	StDev	R	P value	StDev	R	P value	StDev
2002	0.9154	0.01	1.45	0.9417	0.01	1.1027	0.8771	0.01	0.9533
2001	0.8781	0.01	1.4018	0.7653	0.01	1.7728	0.877	0.01	1.0425
2000	0.9056	0.01	1.1546	0.6529	0.01	2.0631	0.8723	0.01	1.0195
1999	0.9288	0.01	1.8549	0.6862	0.01	1.5254	0.8799	0.01	1.1151
1998	0.8553	0.01	1.3858	0.6524	0.01	2.5742	0.8675	0.01	1.5511
1997	0.8854	0.01	1.3854	0.6522	0.01	2.4786	0.8672	0.01	1.55

The results of the Mann-Whitney test on the equality of the Net interest income for small and large banks, small and medium banks for the period of 1997-2002 are shown in Table 4. The results indicate that for both comparisons the differences were not significant at 5% significant level. So we accept the Null hypotheses that there is no difference between the net interest income of small, medium and large banks between 1997 and 2002. However, the Mann-Whitney (U) test shows that the differences for some years were significant at very low levels. For example in 1999, the difference between the net interest income as a percent of average assets for small and large banks was significant at .24% level. In 1999 and 2000, the difference between the net interest income as a percent of average assets for small and medium banks was significant at .24% level, in 1998 it was significant at 1.77% and in 2001 at .02%.

Table 4

Results of the Mann-Whitney tests

Year	Small banks/Large banks		Small banks / Medium banks	
	W	C1	W	C1
1997	5346*	0.4101/ 1.042	-	-
1998	5346*	0.5101/ 1.042	3721****	-0.612/ -0.0637
1999	4913***	0.2059/ 0.7139	3472***	-0.9198/ -0.2059
2000	5279*	0.3937/ 0.891	3490***	-0.6188/ -0.135
2001	5642*	0.6652/ 1.2156	3421**	-0.7459/ -0.2454
2002	5632*	0.7378/ 1.3243	3361*	-0.8427/ -0.2792

* Significant at zero percent
 ** Significant at 0.0002
 *** Significant at 0.0024
 **** Significant at 0.0177

Small banks have the lowest level of non-interest income as a percentage of average assets. The large banks have the highest level of non-interest income earnings (Figure 4). It must be noted that in recent times the relative importance of loan revenue versus non interest revenue sources (fee income for example) has been changing rapidly as fee income grows much faster than interest income on loans. This is because bankers are working hard towards developing fee-based services.

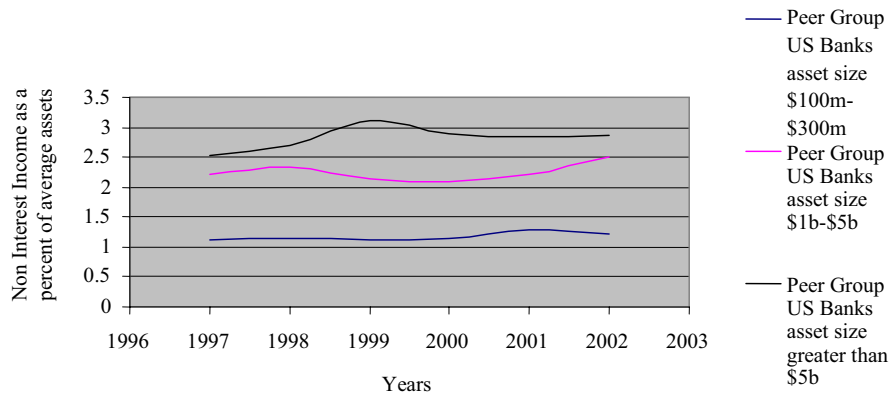


Fig. 4. Comparative Non Interest Income as a percent of average assets

According to the results of the U test in Table 5, we also accept the Null hypotheses that equality of small, medium and large non interest income as a percent of average assets for the period of 1997-2002 at 5% significant level. Some of the differences tested significant at very low levels of between .02% and 1.7%.

Table 5

Results of the Mann-Whitney tests

Year	Small banks		Large banks		Small banks = Medium banks	
	W	C1	W	C1	W	C1
1997	2568*	-6.2311/	4213	-0.5587/		
		-5.114		-0.0678		
1998	2693*	-6.1441/	4198*****	-0.5691/		
		-5.5929		-0.0571		
1999	3303*	-1.138/	4035*****	-0.5837/		
		-0.67		-0.1336		
2000	3351*	-1.1002/	3994*****	-0.5481/		
		-0.5975		-0.1261		
2001	3462*	-1.1293/	4144*****	-0.4958/		
		-0.6202		-0.0582		
2002	3473*	-1.1169/	4133*****	-0.5097/		
		-0.5934		-0.0899		
* Significant at 0 percent			***** Significant at 0.0097			
** Significant at 0.0002			***** Significant at 0.0007			
*** Significant at 0.0024			***** Significant at 0.0014			
**** Significant at 0.0177			***** Significant at 0.0134			
***** Significant at 0.0058			***** Significant at 0.0124			

The small banks have the lowest loan loss reserve provisions. This indicates better credit management and greater stability in generating income from loans. The large banks have the highest provision for loan loss during the period. With the lowest net interest income as earlier observed, large banks seem to be experiencing greater risk in their loan management operations (Figure 5).

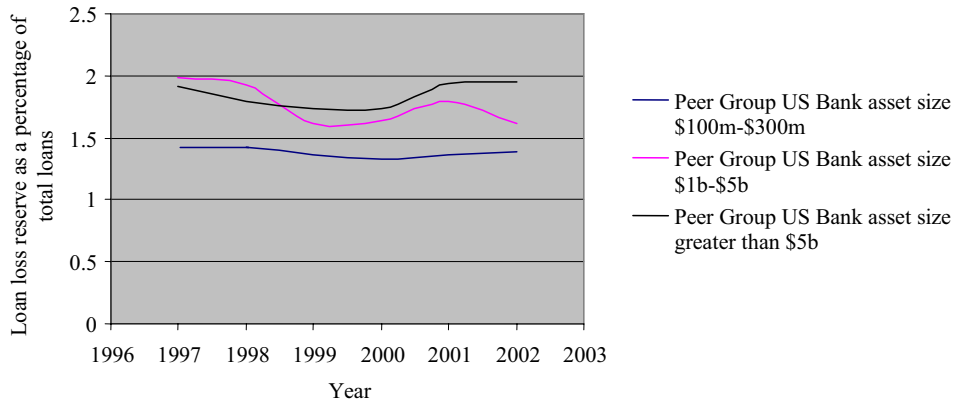


Fig. 5. Comparative Loan loss reserve provisions, 1997-2002

Small banks consistently maintained the lowest level of net actual loan losses. Medium banks experienced the highest level of loan loss in 1997 and 1998. From 1999 to 2002 large banks suffered the highest level of loan losses (Figure 6).

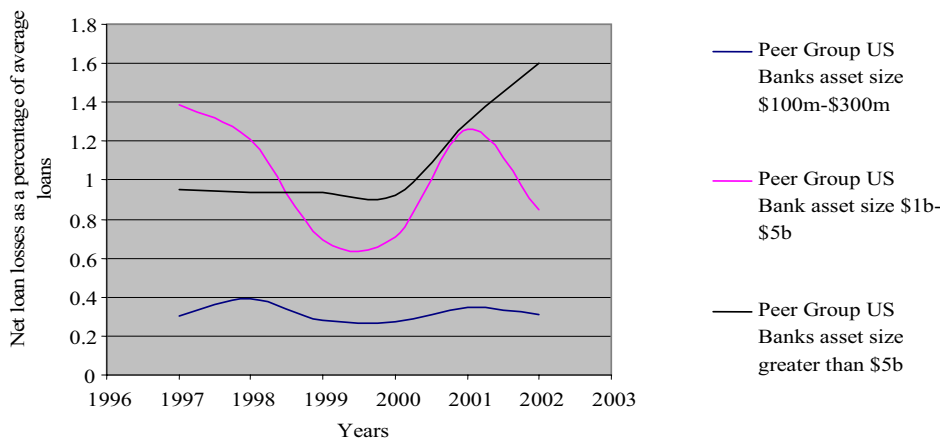


Fig. 6. Comparative net actual loan losses, 1997-2002

Small banks maintained the lowest level of non-current loan as a percentage of total loans. From 1998 to 2002, the large banks maintained the highest level of non current loan. The medium size banks maintained the highest in 1997 and 1998 (Figure 7).

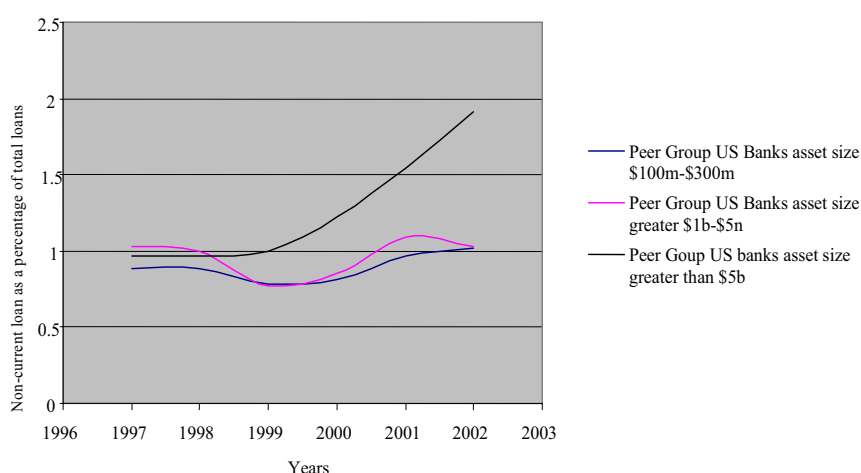


Fig. 7. Comparative actual Non-current loan 1997-2002

5. Conclusions

Small banks were more profit efficient than the large banks but less than medium size banks. Since 1999, even though the PROFEFF of all the asset size has been on the decline, the PROFEFF of small banks declined more than that of large banks and medium banks. Medium size banks, with asset size of between \$1billion and \$5billion achieved the highest PROFEFF during the period. The differences in the PROFEFF for small, medium and large banks tested significant only at 1%, T test significance level.

With respect to ROA, all categories of banks under evaluation achieved approximately the same return on asset in 2000. The ROA for all the banks under evaluation declined between 2000 and 2002. The small banks suffered the highest decline. Between 1997 and 2000, the small banks were more profitable than the large banks. Again as was the case with the PROFEFF analysis, the medium size achieved the highest profitability during the period of 1997-2002. The differences in the ROA for small, medium and large banks tested significant only at 1%, T test significance level.

An examination of the trend in net interest income as a percentage of average assets for the three peers of banks reveals that small banks' net interest income as a percentage of average assets is greater than that of large banks for the whole period, greater than that of medium banks between 1997 and 1999 but less than for the period from 2000 to 2002. The result of the Mann-Whitney equality of means on net interest income for all the banks tested significant only at very low significant levels for some years during the period.

In contrast, small banks have the lowest level of non interest income as a percentage of average assets. The large banks have the highest level of non interest income earnings. Again the result of the Mann-Whitney equality of means on non interest income for all the banks tested significant only at very low significant levels for some years during the period.

The small banks have the lowest loan loss reserve provisions. This indicates better credit management and greater stability in generating income from loans. The large banks have the highest provision for loan loss during the period. With the lowest net interest income as earlier observed, large banks seem to be experiencing greater risk in their loan management operations.

Small banks maintained the lowest level of non-current loan as a percentage of total loans. From 1998 to 2002, the large banks maintained the highest level of non current loan. The medium size banks maintained the highest level in 1997 and 1998.

Small banks consistently maintained the lowest level of net actual loan losses. Medium banks experienced the highest level of loan loss in 1997 and 1998. From 1999 to 2002 suffered the highest level of loan losses.

It is apparent that the small banks are vulnerable to increased competition offered by deregulation, technological advances, e-commerce and negative economic situation such as the current recession. These results suggest the survival of small U.S. commercial banks is in jeopardy. Historically, the regulatory protection afforded small banks could have been considered part of a broader public policy designed to preserve smaller, more rural communities. Whether the decline in small banks adversely impacts the economies of smaller communities is an open issue as is whether the public sector should intervene to support small communities. In any case, the evidence suggests the continued consolidation of the U.S. banking industry and the continued decline of small banks. The general lower levels of PROFEFF, ROA and non interest income especially during recessionary periods underscore the continued vulnerability of small US banks in the present era of bank consolidation and banking system deregulation.

References

1. Akhigbe A., J.E. McNulty. The Profit Efficiency of Small U.S. Commercial Banks// *Journal of Banking and Finance*, 2003. – № 27. – pp. 307-325.
2. Arnold R., J. Agency. Costs in Banking Firms: An Analysis of Expense Preference Behavior // *Journal of Economics and Business*. 1985. – 3 – № 7. pp.103-112.
3. Berger A.N., L.J. Mester. Inside the Black Box: What Explains Differences in the Efficiencies of Financial Institutions?// *Journal of Banking and Finance*. 1997. – № 21. – pp. 895-947.
4. Berger, A.N., N.H. Miller., M.A. Peterson., R.G. Rajan and J. Stein. Does Function Follow Organizational Form? Evidence From the Lending Practices of Large and Small Banks, Paper presented at the Annual Conference on Bank Structure and Composition, Federal Reserve Bank of Chicago, May 2002.
5. Berger A.N., G.A. Hanweck, D.B. Humphrey. Competitive Viability in Banking Scale, Scope, and Product Mix Economics // *Journal of Monetary Economics*. 1987. – № 20. – pp. 501-520.
6. Berger A.N., T. Hannan. The Efficiency Cost of Market Power in the Banking Industry: A Test of the Quiet Life and Related Hypotheses// *Review of Economics and Statistics*. 1998. – № 80. – pp 454-465.
7. Boyd J.H., D.E. Runkle. Size and Performance of Banking Firms, Testing the Predictions of Theory// *Journal of Monetary Economics*. 1993. – №31. – pp. 47-67.
8. Clark J.A. Market Structure, Risk and Profitability: The Quiet-Life Hypothesis Revisited, *Quarterly Review of Economics and Business*.1986. – № 26. – pp. 45-56.
9. De Young R. and I. Hassan. The Performance of De Novo Commercial Banks: A Profit Efficiency Approach, *Journal of Banking and Finance*.1998. – № 22. – pp. 565-587.
10. DeYoung R., W. Hunter. Deregulation, the Internet and Competitive Viability of Large Banks and Community Banks, *The Future of Banking*, Benton Gup(ed.) West-port, CT: Quorum Books, 2002.
11. DeYoung R., D.E. Nolle. Foreign-Owned Banks in the United States: Earning Market Share or Buying It? // *Journal of Money, Credit and Banking*. 1996. – № 28. – pp. 622-636.
12. Elyasiani E.S. Mehdian. The Comparative Efficiency Performance of Small and Large U.S. Commercial Banks in the Pre- and Post-Deregulation Era. // *Journal of Applied Economics*. 1995. – № 27. – pp. 1069-1079.
13. Evanoff D.D., P.R. Israilevich., R. Merris. Relative Price Efficiencies, Technical Change, and Scale Economies for Large Commercial Banks // *Journal of Regulatory Economics*. 1990. – № 2. – pp. 281-98.
14. Evanoff D.D., O Evren. Banking Industry Consolidation and Productive Efficiency Proceedings of a Conference on Bank Structure and Competition, Federal Reserve Bank of Chicago. 2001. – pp. 216-226.
15. Federal Deposit Insurance Corporation website, <http://www.fdic.gov.org>.

16. Federal Reserve Bank of Chicago website, <http://www.stls.frb.org/fred>.
17. Fix J. Big banks Live-The Small to Die, Why the FDIC has a Dual Policy, Philadelphia Inquirer. 1988. 27, March 1.
18. Gilbert R.A. Bank Market, Structure and Competition: A Survey. //Journal of Money, Credit and Banking. 1984. – № 16. – pp. 617-645.
19. Gilligan T., M. Smirlock. An Empirical Study of Joint Production and Scale Economics in Commercial Banking // Journal of Banking and Finance. 1984 – № 8 March, 67-77.
20. Hannan T. H. Bank Commercial Loan Markets and the Role of Market Structure: Evidence From Surveys of Commercial Lending // Journal of Banking and Finance. 1991a. – № 15, – pp. 133-149.
21. Hannan T.H. Foundations of the Structure-Conduct-Performance Paradigm in Banking // Journal of Money, Credit, and Banking. 1991b – № 23. – pp. 68-84.
22. Hanna T.H., F. Mavinga. Expense Preference and Managerial Control: The Case of the Banking Firm // Bell Journal of Economics. 1980 – № 11. – pp. 671-682.
23. Hughes J.P., L.J. Meister., C. Moon. Are Scale Economics in Banking Elusive or Illusive? Evidence Obtained by Incorporating Capital Structure and Risk-Taking into Models of Bank Production // Journal of Banking and Finance. 2001 – № 25. – pp. 2169-2208.
24. Hunter W.C., S.G. Timm. Technical Change, Organization Form, and the Structure of Bank Production // Journal of Money, Credit and Banking. 1986 – № 18. – pp. 152-66.
25. Jondrow J.C., C.A. Knox Lovell., I. Materov., P. Schmidt. On the Estimation of Technical Inefficiency in the Stochastic Frontier Production Function Model // Journal of Econometrics. 1982. – №19. – pp. 233-238.
26. Kutter J. Forecast for Year 2000: 24% Fewer Banks, American Banker, October, 1991, 10.
27. McAllister P.H., D. McMamus. Resolving the Scale Efficiency Puzzle in Banking// Journal of Banking and Finance. 1993. – № 17. – pp. 389-405.
28. McNulty J.E., A. Akhigbe., J.A. Verbrugge. Small Bank Loan Quality in a Deregulated Environment: The Information Advantage Hypothesis //Journal of Economics and Business. 2001. – № 53. – pp. 325-339.
29. Mester L.J., L.I. Nakamura., M. Renault. Checking Accounts and Bank Monitoring, Federal Reserve Bank of Philadelphia, Working Paper. 1998. WP 98-25.
30. Nakamura L. Recent Research in Commercial Banking: Information and Lending. Financial Markets, Institutions and Instruments. 1993. – № 2. – pp. 73-88.
31. Noulas A.G., S.G. Ray., S.M. Miller. Return to Scale and Input Substitution for Large U.S. Banks // Journal of Money, Credit, and Banking. 1990. – № 22. – pp. 94-108.
32. Purroy P. and V. Salas. Strategic Competition in Retail Banking Under Expense Preference Behavior // Journal of Banking and Finance . 2000. – № 24. – pp. 809-824.
33. Rhoades S.A. Monopoly and Expense Preference Behavior: An Empirical Test of a Behavioralist Hypothesis // Southern Economic Journal. 1980. – № 47. – pp. 419-432.
34. Rhoades S.A., R.D. Rutz. Market Power and Firm Risk: A Test of the “Quiet-Life” Hypothesis// Journal of Monetary Economics. 1982. – № 9. – pp. 73-85.
35. Rose P. Commercial Bank Management, 4th edition, McGraw Hill, 1999.
36. Shaffer S. Competition, Economies of Scale, and Diversity of Firm Sizes Applied Economics. 1985 – № 17. – pp. 467-76.
37. Shaffer S. A Revenue Restricted Cost Study of 100 Banks. Unpublished working paper, Federal Reserve Bank of New York, 1989.
38. Shaffer S., E. David. Economics of Superscale in Commercial Banking// Applied Economics, 1991. – № 21. – pp. 283-93.
39. Small Business Administration. Small Business Lending in the District of Columbia// 1997. Washington, DC. U.S.
40. U.S. Banker website, <http://www.us-banker.com/usb/articles>.