Chapter - II

CONCEPTUAL FRAMEWORK OF THE STUDY

2.1 The Concept of Economies of Scale

The concept of economies of scale, which is derived from the theory of costs, examines the relationship between size and costs of production per unit of output with size as the cause and cost as the consequence. Silberston offers a precise definition of economies of scale: "Classical economies of scale relates to the effect on average costs of production of different rates of output, per unit of time, of a given commodity, when all possible adaptations have been carried out to make production at each scale as efficient as possible".[1] This definition makes it clear that 'economies of scale' refers to the relationship between average cost and the scale of output, where output is assumed to be homogeneous. Since necessary adaptations to various scales of output cannot be done in the short-run, the economies of scale is a long-run concept. Though it is not mentioned explicitly, it is implied that the relationship between the cost and the scale is valid with a given state of technology. In this sense the concept is static.

It would be more appropriate to restrict the scope of economies of scale, more particularly technological economies at plant level. This is in view of the fact that plant is an operational unit integrating factors of production, whereas

firm is more of an organisational unit, dealing with larger issues of finance and policy.

There may be a large firm with a large number of small size plants, while another firm may be smaller one with only a few but larger plants. In such a situation, it would be more appropriate to look for economies of scale at a plant level.

In the above context as Haldi and Whitcomb[2] point out, real economies, in terms of technological economies, arises at plant level due to following reasons :

Firstly, due to indivisibilities of certain productive resources, i.e., capital equipment, plant will experience economies of scale upto the point where each item is at the optimal size.

Secondly, specialization breeds expertise and expertise enhance efficiency. Moreover, through the adoption of division of labour, skill increases by learning effects.

Thirdly, with given technology in terms of labour/capital ratio, appropriate scale is necessary for producing certain commodity. Though, the capital/labour ratio may be same in the two process of production, the large scale technique may tend to have a higher productivity in comparison to small-scale

technique.

Fourthly, technological economies at plant level are associated with the length of production run. A longer production run means lower cost. Because long production run may permit the use of specialised tools and altogether greater automation in a production line.

It follows from the foregoing discussion that scale economies arise from more efficient use of inputs i.e. labour and capital. That is to say, scale economies result from the characteristics of the production process. Since plant is actual producing unit integrating various factors for productive purposes, economies of scale, more particularly technological economies, are akin to it.

However, economies at Plant level omits many attributes of real firm. Managerial and financial economies and economies from multi-plant operations are normally occuring at firm level and shared by different plants. Therefore, plant is not independent of managerial and financial economies.[3] But as they are indivisible and therefore, cannot be specifically measured at plant level. Hence, it would be more appropriate to restrict the scope of economies of scale with reference to technological economies at plant level.

The analogy of plant and firm is extended to the bank

where the bank is a firm and the branches are the plants. Bank is a decision making unit, whereas branches are actual operating unit. Hence, it would be more appropriate to see economies of scale at branch level.

As economies of scale arise from more efficient use of inputs, i.e., labour and capital, it is necessary to examine the efficiency at which inputs, particularly labour is used at branch level. This is in view of the fact that banking is a labour intensive industry and wage cost is a major component of operating cost.

Secondly, basic activity of each branch is same, i.e., financial intermediation. However, their activities differ substantially in terms of size, product-mix and environment. This would affect costs and earnings differently in different branches.

Thus, it would be more appropriate to study economies of scale at branch level.

2.2 Studies on Economies of Scale in Banking : A Survey of Literature.

There are a number of studies in banking which test the hypothesis of economies of scale.

Alhadeff[4] and Horvitz[5] have analysed the relationship between bank size and total operating cost as a per cent of loans and investments. Both have found that costs as a per-cent of loans and investments decline for banks with less than approximately $ 5 million of total deposits, remaining fairly constant for banks holding between $5 and $25 to $50 million in deposits and then decline again for larger banks.

Gramely[6] used multiple regression technique to examine the relationship between size and cost from a sample of 270 member banks of the Fourth Federal Reserve District. He found that the coefficient for the logarithm of total assets was negative, that is to say the ratio of total cost to total assets fell as bank size increased. The rate of decrease, however, fell as bank size increased. Bank size and other five characteristics, namely ratio of time deposits to total deposits, the ratio of total loans to total assets, the ratio of consumer loans to total loans and the percentage growth of assets from 1956-1959, accounted for 62 per cent of the variation in total cost.

Gramely, Alhadeff and Horvitz believe that the Smithian division of labour accounts for economies of scale in banking. Larger banks are able to organise their operations in ways that permit a larger share of banking functions to be performed

by less skilled labour resources. Moreover, specialisation in large banks is conducive to greater efficiency of labour and lower unit costs.

Benston[7] and Bell-Murphy[8] estimated activity wise cost, using cobb-Douglass production function. Economies of scale were found for many bank functions, namely demand deposits, time deposits, mortgage loans, instalment loans, business loans and securities. The respective cost elasticities, in Benston's study, were found to be 0.870, 0.246, 0.907, 0.650, 0.963 and 0.736 respectively.

Bell-Murphy found that labour specialisation accounts for at least a portion of the observed increase in labour productivity. However, the relationship between shift in technology and increasing scale was found to be statistically significant in the demand deposit, instalment loan and business loan functions.

Rangrajan and Mampilly[9] using cost data relating to top 30 banks in India for the years 1967 and 1968 employed multiple regression technique for estimating operating cost. In their study, R^2 explains 99 per cent variation in total operating cost with the help of selected explanatory variables. Since wage cost is a major component in operating cost, they maintain that the search for variables influencing the cost should be found in the activities of the bank that attract labour time.[10]

From the foregoing account, it appears that empirical findings of these studies support the hypothesis of economies of scale and labour specialisation explain the observed economies of scale. However, the explanations differ because of different methodology.

2.3 Concept and Measurement of Size in Banking

To examine the relationship between size and cost and the effect of changes in the level of production on the cost per unit of output, the measurement of size assumes importance.

In the traditional theory of firm, the concept of size or scale is normally denoted by output of homogenous product per unit of time. Accordingly, size or scale is also defined sometimes in terms of assets or number of employees, etc. However, it is argued that within the same industry, the volume of output is the simplest measure of size of the plant and firm.[11]

In the above context, a question arises as to how to define and measure the output in banking industry?

Like manufacturing firms, banks are multi-product and multi-plant firms having different branches producing different products. But the essential difference between manufacturing

product and banking product is, that the product of manufacturing firm is in the nature of physical quantity, whereas product of a bank is in the form of services. As multi-product-firms, banks are engaged in creating various types of financial services provided to customers, namely :

i) Services provided when accepting deposits, allowing funds to be withdrawn and servicing loans.

ii) Services related to the operation of payments mechanism, including foreign exchange.

iii) Miscellaneous services which consist of business information, trade advices, remittances, clearing of cheques, safe deposit vaults, etc.

Thus, flow of different services, as indicated above in the form of lending and non-lending activities, are good proxy for output or scale in the banking industry. These flows of services are again reflected in size of a bank and the size of the bank, in turn, is represented either in number of accounts or size of account in monetary terms by rupee amount. In other words, the flow of services is in general a function of the number and size of accounts. Thus, banking output can be defined in terms of size of the bank/branch. In various studies on economies of scale in banking, banking

output is either defined in terms of number of accounts or in terms of size of account.[12]

The problem of measuring output in a bank, ~~though not so severe as in a bank~~, though not as severe as in a multi-product firm, arises mainly due to the very nature of banking industry.

As indicated above, banks are basically multi-product firms producing services rather than output in physical quantity. Since banking product is in the form of services, it is very difficult to reduce the services to a standard unit that can be valued or measured. Further, the nature and the composition of these services vary from bank to bank and from branch to branch. Location of branches also affect the working of branches differently. Hence, costs and earnings in different banks and branches substantially differ. In this connection, Joel Dean observes that "the measurement of output is usually the hardest problem in the statistical determination of cost, and it should be apparent that it is essentially true of commercial banking output".[13]

In the earlier bank cost studies by Alhadeff, Horvitz, Schweiger and Kelso and Gravely, uni-dimensional approach is used for measuring bank output. Accordingly, various balance-sheet items, such as total deposits, total assets, total loans,

etc., have been used as proxy for bank size. Alhadeff[14], Horvits[15] and Schweiger-Gidlee[16] have employed total deposits as proxy for bank size, whereas Gramley[17] has used total assets as proxy for commercial bank size. In all these studies, monetary measure has been used for denoting bank size.

In the later studies, 'flow' measure of output is used in the form of adjusted or weighted stock of assets. Greenbaum's,[18] study focussed principally on the development of a concept of bank output. In order to overcome the bias towards identical weights assigned to all components of the balance-sheet in the earlier studies, he constructed a measure which assigns weights to the various components of the earning assets. Weights were obtained by regressing total lending revenue against the earning asset. The output measure for each bank was then computed by multiplying the average interest rate for the asset category by the dollar value of the bank's holding of that asset. Current revenue obtained from non-lending sources was added to the weighted revenue measure to exhaust total revenue. Thus, Greenbaum's study incorporates all operations of bank, i.e., lending as well as non-lending output.

Power's approach was quite similar to Greenbaum's, except that output prices were allowed to vary and the

opportunity cost of holding time deposits was included in the measure of output". Thus, "level of services are a direct function of both the amount of funds outstanding and of the corresponding interest rates".[19]

Benston[20] and Bell-Murphy[24] have chosen multi-dimensional approach for measuring bank output. Bank has been visualised as producing demand deposits, time deposits, mortgage loans, instalment loans, business loans and securities. Each of these commercial bank output is measured in terms of number of loans or deposit accounts.

Rangrajan and Nampilly in their study have used total deposits - amount and number of accounts - as proxy for bank output. The authors themselves have pointed out that deposits is not a reliable measure of output, however, the unavailability of product-wise data for different services compelled them to treat level of deposits as an index of size.[22]

The study group on banking costs[23] has used composite measure of output from different lines of operation.Output comprises of number of accounts, outstanding balances, amount of transactions, number of vouchers and commission/exchange earned.

From the foregoing account, it appears that different studies have either used uni-dimensional or multi-dimensional

approach for measuring bank output. Accordingly, total deposits, total assets, total gross revenue, number of deposit and loan accounts, etc., have been used as proxy for bank output. Bank output is represented either by size of the account in monetary terms or by number of accounts.

2.4 The Measurement of Size at Branch Level

In search of finding an appropriate measure for size at branchlevel, we have considered in all eight indicators.

Lending activities of the branches have been represented by total deposits (X_1), total advances (X_2) and volume of business (X_3), i.e., deposits plus advances. All the three indicators are expressed in lakhs of rupees per annum.

Non-lending activities of the branches have been represented by other inland business (X_4) (i.e., remittances, collectionsf bills and cheques, safe-deposit vaults, etc.), foreign business (X_5), other inland plus foreign business(X_6). In inland business, remittances, collectionsf bills and cheques are in terms of total amounts handled per annum and safe-deposit vaults is in terms of fees charged by the branch per annum. Inland and foreign business are expressed in lakhs of rupees. Size of the branch may also be indicated in terms of total assets (X_7) and gross earnings (X_8). Total assets and gross earnings are expressed in lakhs of rupees.

lending and non-lending activities of the branches have been considered in monetary amount rather than number of accounts.*

Since it would be inappropriate to aggregate all the variables into one and unwieldy to handle all of them as indicators of size, it is necessary to select one variable, which may be considered more appropriate as proxy for scale of operation of a branch. The consideration from which the variables are selected would be (a) the variable represents the main business of the branches and (b) its scale is also fairly representative of the scale of the other activities. Keeping these considerations in mind, correlation coefficients between all the pairs of variables (enumerated above) were calculated as shown in Table 2.1, (on next page)

It is observed from Table 2.1 that the coefficients of correlation (R) for all the eight variables are very high and found to be statistically significant at 1 per cent level. This implies that all these variables are highly correlated with each other and therefore, any one of these eight indicators could be selected as proxy for size.

On empirical grounds as well as for other justifications given below, volume of business (i.e. deposits + advances)

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* Size of the branches represented by volume of business (monetary term) and number of accounts are found to be highly correlated. The coefficient of correlation(R) between the two in rural and urban branches ... for 1975 found to be 0.7441 and 0.8041 respectively. Hence, size of the branches is represented in terms of monetary amount.

Table 2.1 : Coefficient of Correlation Matrix For All Branches - 1979

Variables		X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8
Deposits	X_1								
Advances	X_2	.6714**							
Volume of Business	X_3	.9566**	.9575**						
Other Inland Business	X_4	.6975**	.9894**	.7956**					
Foreign Business	X_5	.4316**	.8610**	.6295**	.8883**				
Other Inland+Foreign Business	X_6	.5597**	.9034**	.7399**	.9705**	.9670**			
Gross Earnings	X_7	.6708**	.9339**	.7601**	.9055**	.7211**	.8185**		
Total Assets	X_8	.6633**	.9908**	.8426**	.8775**	.8660**	.8832**	.9695**	

Note: 1. ** Significant at 1% level.

2. Correlation matrix is calculated on the basis of individual branch for the year 1979.

has been selected as proxy for size, rather than deposits or advances separately or gross earnings or total assets.

(i) In search of appropriate measure of size for examining size-cost relationship, we have run regression of operating cost on selected eight indicators of size, with 1979 data, namely volume of business, deposits, advances, gross earnings, total assets, other inland business, foreign business, other inland plus foreign business. Regression results presented in Table 2.2 show that volume of business (X_1), gives better explanation in terms of R^2 than any other indicator chosen as proxy for size. Its regression coefficient, b, is also having expected negative sign.

(ii) Volume of business has a wider coverage than deposits or advances or any other indicator and represents both the two main activities of a branch .

(iii) Product-mix (i.e. deposit-mix and advance-mix) in different size groups in rural and urban branches differ considerably which is seen from tables 2.3 and 2.4. These differences in structural characteristics may affect size cost relationship differently in rural and urban branches. Differences in structural characteristics are reflected in volume of business of rural and urban branches. Moreover, deposits and advances are highly correlated with volume of business. The coefficient of correlation (R) of volume of business with deposits and advances is 0.9533 and 0.8515 respectively.

Table 2.2 : Regression Results - Size-Cost Relationship in All Branches - 1979.

Dependent Variable: Ratio of operating cost to Volume of Business C_1

Independent Variables		Constant a	Regression coefficient b	R	R^2	F-Ratio
Total Deposits	X_1	3.0378	-.0016 (.0009)	-.1194	.0143	3.1771 (1,219)
Total Advances	X_2	2.9942	-.0023 (1.6455)	-.0943	.0089	1.9666 (1,219)
Volume of Business	X_3	3.5036	-.0010* (1.7130)	-.1250*	.0156*	3.4765 (1,219)
Inland Business	X_4	2.9736	-.0002 (.0010)	-.1095	.0121	2.6824 (1,219)
Foreign Business	X_5	2.9059	-.0005 (.0005)	-.1066	.0114	2.5254 (1,219)
Inland/Foreign Business	X_6	2.9143	-.00055 (.0006)	-.0656	.0043	.9458 (1,219)
Gross Earnings	X_7	3.0715	-.0269 (1.6705)	-.1102	.0131	3.0643 (1,219)
Total Assets	X_8	3.0399	-.0029* (1.6551)	-0.1244*	.0148*	3.2544 (1,219)

Note :

1. * Significant at 5% level.
2. Figures in the parentheses below regression coefficients are t-values and below F-ratio are degree of freedom.
3. Results obtained from computer on the basis of individual branch data for 1979.

Table 2.3 : Size-wise Distribution of Different Types of Loans in Rural, Urban and All Branches - 1979.

Size-group of Branches and No. of Branches (Volume of Business in Lakhs and crores of Rs.)		Percentage of agricultural loans to total loans	Percentage of command institution loans to total loans	Percentage of S.I. & S.B. loans to total loans	Percentage of individual loans to total loans	Percentage of loans to Volume of Business.
RURAL BRANCHES						
Less than 10 lakhs	19	52.00	5.00	38.00	06.00	29.00
10-50 lakhs	61	61.00	05.00	30.00	03.00	37.00
50 lakhs-1 crore	32	66.00	05.00	25.00	05.00	33.00
1-5 crores	29	28.00	35.00	34.00	03.00	40.00
5-10 crores	-	-	-	-	-	-
Above 10 crores	-	-	-	-	-	-
All Rural Branches	141	42.00	25.00	31.00	04.00	37.00
URBAN BRANCHES						
Less than 10 lakhs	-	-	-	-	-	-
10-50 lakhs	6	-	47.00	49.00	04.00	37.00
50 lakhs-1 crore	15	12.00	35.00	44.00	09.00	22.00
1-5 crores	48	19.00	31.00	46.00	04.00	32.00
5-10 crores	6	08.00	52.00	38.00	02.00	31.00
Above 10 crore	5	10.00	61.00	18.00	03.00	23.00
All Urban Branches	80	17.00	46.00	34.00	03.00	30.00
ALL BRANCHES						
Less than 10 lakhs	19	52.00	05.00	38.00	06.00	29.00
10-50 lakhs	67	54.00	09.00	32.00	05.00	37.00
50 lakhs-1 crore	47	55.00	12.00	29.00	06.00	29.00
1-5 crores	77	22.00	32.00	42.00	04.00	34.00
5-10 crores	6	08.00	52.00	38.00	02.00	31.00
Above 10 crores	5	10.00	61.00	18.00	03.00	23.00
All Branches (Avg.)	221	24.00	40.00	33.00	03.00	31.00

Source: Table in progress on the basis of compiled data for the year 1979 given in appendix table-2.

Note: In rural branches, there are no branches having volume of business more than Rs.5 crore. Similarly, in urban branches, there are no branches having volume of business less than Rs.10 lakh.

Table 2.4 : Size-Wise Distribution of Different Types of Deposits in Rural, Urban and All Branches - 1979.

Size-Group of Branches and No.of Branches (Volume of Business in Lakhs-Crores of Rs.)		Percentage of total deposits to volume of business	Percentage of fixed deposits to total deposits	Percentage of savings deposits to total deposits	Percentage of Demand deposits to total deposits
RURAL BRANCHES					
Less than 10 lakhs	13	71.00	40.00	56.00	04.00
10-50 lakhs	61	65.00	50.00	45.00	05.00
50 lakhs-1 crore	52	67.00	55.00	39.00	06.00
1-5 crores	25	60.00	51.00	42.00	07.00
5-10 crores	-	-	-	-	-
Above 10 crores	-	-	-	-	-
All Rural Branches	141	65.00	52.00	42.00	06.00
URBAN BRANCHES					
Less than 10 lakhs	-	-	-	-	-
10-50 lakhs	6	65.00	48.00	30.00	22.00
50 lakhs-1 crore	15	79.00	52.00	37.00	11.00
1-5 crores	48	69.00	56.00	32.00	13.00
5-10 crores	6	69.00	56.00	30.00	14.00
Above 10 crores	5	72.00	77.00	16.00	07.00
All Urban Branches	80	70.00	65.00	25.00	10.00
ALL BRANCHES					
Less than 10 lakhs	13	71.00	40.00	56.00	04.00
10-50 lakhs	67	63.00	49.00	44.00	07.00
50 lakhs-1 crore	67	71.00	54.00	36.00	09.00
1-5 crores	77	66.00	55.00	35.00	11.00
5-10 crores	6	69.00	56.00	30.00	14.00
Above 10 crores	5	72.00	77.00	16.00	07.00
All Branches(Avg.)	221	67.00	52.00	29.00	09.00

Note: Table is prepared on the basis of compiled data for 1979 given in appendix table-3.

2. In rural branches, there are no branches having volume of business more than Rs.5 crore. Similarly, in urban branches, there are no branches having volume of business less than Rs.10 lakh.

(iv) One more justification for selecting volume of business as proxy for size is that gross earnings and total assets are also reflected in it. This is because, volume of business is highly correlated with gross earnings and total assets. The corresponding coefficients of correlation are found to be 0.7621 and 0.6426 respectively.

(v) Further, volume of business as proxy for size is in conformity with Pillai Committee's recommendation that the asset of the branch should be considered on the basis of volume of business.[24]

(vi) Other inland business and foreign business, (i.e. remittances, bills of exchange, clearance of cheques, etc.) are not included in volume of business. However, they are highly correlated with volume of business. The coefficient of correlation of volume of business with other inland business, foreign business and other inland + foreignbusiness is 0.7956, 0.6295 and 0.7359 respectively.

It has been observed that in rural branches other inland and foreign business is higher than volume of business, but the earnings from them are less than earnings from advances. Further, wide fluctuations are observed in other inland and foreign business and therefore, no systematic relationship is found between the two in rural and urban branches. Generally,

all branches are doing other inland business along with their funds activities, but foreign business is limited to very few urban branches. Because of these characteristics of other inland and foreign business, there is no standard method for measurement of these non-lending activities. In earlier studies also efforts to find plausible measure of other inland and foreign business, i.e., non-lending activities, were largely unsuccessful.[25] In the absence of any plausible measure for measuring non-lending activities, it is difficult to say categorically about their effect on size-cost relationship. Hence, other inland business and foreign business have not been included in volume of business in the present study.

2.5 Conclusion

As branch is an actual operational unit and the activities of the branch differ substantially in terms of size, product-mix and environment, it would be more appropriate to study economies of scale at branch level.

However, the problem of measurement of output is complex in view of the nature of banking products, i.e., services. Hence, deposits, advances, gross earnings, total assets are used as proxy for size in other studies. Since volume of business represent major activities at branch level and is highly correlated with other selected indicators, it has finally been selected as proxy for size in the present study to test the hypothesis of economies of scale at branch level.

References

1. A.Silberston, "Economies of Scale in Theory and Practice", Economic Journal, Vol.82, March 1972 (Supplement), pp.368-80.

2. J.Haldi and D.Whitcomb, "Economies of Scale in Industrial Plants", Journal of Political Economy, Vol.75, 1967, pp.373-85.

3. Penrose, E.T., The Theory of Growth of The Firm, Oxford Basil Blackwell, 1959, p.89.

4. Alhadeff, David A., Monopoly and Competition in Banking Univorsity of California, Berkeley, 1954.

5. Horvitz, Paul M., "Economies of Scale in Banking", The Journal of Finance, XXp May 1965, pp.1-54.

6. Gramely, Lyle E., A Study of Scale Economies in Banking, Federal Reserve Bank of Kansas city, 1962.

7. Benston, George J., Economies of Scale in Financial Institutions, Rochester, USA.

8. Bell, G. and Murphy, N.B., Costs in Commercial Banking : A Quantitative Analysis of Bank Behaviour and Its Relation to Bank Regulation, Federal Reserve Bank of Boston, 1962, Research Report, No.41.

9. Rangrajan, C. and Mampilly, Paul."Economies of Scale in Banking", Technical Studies Prepared for the Banking Commission, Reserve Bank of India, Vol.II, 1972, pp.244-268.

10. Rangrajan, C. and Mampilly, Paul, op.cit., p.247.

11. Penrose, E.T., op.cit., p.92.

12. Benston, George J., op.cit., p.11.

13. Joel Dean, Managerial Economics, New York, 1951, p.254.

14. Alhadeff, David A. op.cit.

15. Horvitz, Paul M., op.cit.

16. Schweiger, I. and McGee, J.S., "Chicago Banking", Journal of Business , University of Chicago, XXXIV, July 1961.

17. Cromwely, Lyle E., op.cit.

18. Greenbaum, Stuart I., "A Study of Bank Costs", The National Banking Review, June 1967.

19. Powers, John Anthony, "Branch Versus Unit Banking: Bank Output and Cost Economies," The Southern Economic Journal, Vol.36, No.2, Oct.1969, p.154.

20. Benston, George J., op.cit.

21. Bell, W. and Murphy, N.B., op.cit.

22. Mangrujan, C. and Bumpilly, Paul., op.cit., p.246.

23. Divatia, V.V., "Cost of Banking Services", Report of the Study Group on Banking Costs, Reserve Bank of India Bulletin, April 197-, pp.244-259.

24. Pillai Committee, Working of Public Sector Banks, Reserve Bank of India.

25. Greenbaum, Stuart I., "Competition and Efficiency in the Banking System: Empirical Research and Its Implications", Journal of Political Economy, August 1967, p.469.