University of Connecticut

Department of Economics Working Paper Series

Labor-Use Efficiency in Indian Banking: A Branch Level Analysis

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Abstract

This paper uses Data Envelopment Analysis to measure labor use efficiency of individual branches of a large public sector bank with several thousand branches across India. We find considerable variation in the average levels of efficiency across the four metropolitan regions considered in this study. In this context, we introduce the concept of area or spatial efficiency for each region relative to the nation as a whole. Our findings suggest that the policies, procedures, and incentives handed down from the corporate level cannot fully neutralize the influence of the local work culture in the different regions. Most of the potential reduction in labor cost appears to be coming from possible downsizing the clerical and subordinate staff. Our analysis identifies branches that operate at very low levels of efficiency and may be gainfully merged with other branches wherever possible.

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Introduction

Although the last decade has witnessed a significant proliferation of research on cost efficiency of banks, the unit of analysis has typically been a bank as a whole rather than an individual branch. Given the lack of easy access to branch level data, this is understandable. It remains true, nonetheless, that commercial banking is based on the operation of a network of bank branches that act as the key contact points between the bank and its customers. Branches facilitate the banking production process by mobilizing deposits that generate funds to be invested by the bank. In a practical sense, they act as foot soldiers who ultimately win or lose the battle for sustaining the bottom line of the bank. They are involved in all the crucial steps of modern banking like cost management, recovery management, technology, risk management, and governance. Therefore, their performance is of considerable interest to the bank management and policymakers on the one hand and to academicians on the other. It is useful to benchmark the relative efficiency of an individual branch against the 'best practice' branch(es) because it sets specific goals to be attained by the management at the branch. Additionally, it identifies under-performing branches that may be candidates for merger with more efficient ones in the same area. This, obviously, helps in the process of consolidation. In a more general sense, benchmarking may help improve our understanding of the underpinnings of efficiency at bank level. For example, the presence of substantial variation in the measured X-inefficiencies of individual branches of the same bank would suggest that the standard analysis at the bank level understates the X-inefficiencies of all banks because they are being compared to an inadequate frontier. A 'true' best-practice bank frontier against which all banks could more accurately be compared would have branches that are all fully efficient. Every bank would have lower measured efficiency if compared to this 'true' frontier (Berger *et al.*, 1997). However, efficiency measurement at branch level is not straightforward because it is difficult to define and measure either inputs or outputs of a branch. Moreover, some branches may be quite specialized and produce only selected outputs. For example, a branch may be primarily handling a limited number of accounts and disbursing credit to a few large clients. The fact that there are alternative criteria for measuring efficiency further complicates the problem. Nevertheless, once inputs and

outputs are appropriately defined and a specific criterion of efficiency is chosen, analysis of empirical correlates of the measured efficiency score can throw light on the sources of observed inefficiency. Appropriate policies to enhance efficiency can be designed if the dimensions along which performers get clearly demarcated from non-performers are suitably identified.

In general, operating costs of Indian banks are fairly high and thus cost containment at branch level is a key to sustainability of bank profits as well as their long-term viability. For example, in 2003, operating costs of banks per million dollars of total assets were $21,200 in the UK, $20,300 in Switzerland, and less than $20,000 in other major European economies like Sweden, Austria, Germany and France. In India, however, in 2003, operating costs per million dollars of assets of scheduled commercial banks stood at $22,400. There is, thus, considerable room for cost reduction by eliminating inefficiency.

The focus of this paper is on branch banking in India. In particular, we address the following questions in our paper:

- What are the levels of labor use efficiency of the individual branches when measured against a benchmark constructed from the data from all branches in the sample?

- How much of the measured inefficiency can be ascribed to factors like the work culture in the area where the branch is located?

- How can one construct a summary measure of the efficiency of a region relative to the nation as a whole?

- Are there systemic factors that can account for differences in efficiency across branches?

Accordingly, in this paper we measure the branch-wise labor cost efficiency of a bank which has significant retail presence in the country using the nonparametric method of Data Envelopment Analysis (DEA). We then attempt to find out the possible sources of observed inefficiency.

Our study differs from the existing literature in several respects. First, we focus mainly on labor cost-inefficiency. Hence, our findings provide direct guidance for the

optimal deployment of labor inputs, separately for each category of employees. Second, the study is designed to judge the branch-level labor cost-inefficiency of a single bank across the four biggest metropolitan cities viz. Mumbai (erstwhile Bombay), Delhi, Kolkata (erstwhile Calcutta) and Chennai (erstwhile Madras), in India characterized by varied work culture. Because the administrative procedures and management style are fairly uniform across the branches of the same bank, our analysis permits one to measure the effects of differences in the work culture on efficiency across regions. We have introduced a new concept called *area* or *spatial efficiency* measure by decomposing the efficiency based on a *grand* frontier. Finally, we investigate why some branches perform better than others by examining their size, deployment of deposits, labor productivity, service quality, etc.

The rest of the paper unfolds as follows. Section II includes a brief review of the relevant literature. Given our focus on labor cost-(in)efficiency of four different metro cities of India, Section III provides a bird's eye view of the prevalent work-culture of these cities and puts the question of efficiency, the main theme of this paper, in its proper perspective. Section IV briefly outlines the nonparametric DEA methodology and its empirical variant that we have used. The data sources along with identification of inputs and outputs are reported in Section V. Section VI discusses the findings from the empirical analysis. Section VII concludes.

II. Brief Review of the Bank Branch Efficiency Literature

The literature on the efficiency of financial institutions has grown quite rapidly in recent years. For example, of the 130 studies of financial institution efficiency considered by Berger and Humphrey (1997), 116 were published between 1992 and 1997. Studies of efficiency at the branch level are far less common, however. Most of the branch efficiency studies are based on some kind of survey and use data on small numbers of branches of non-US banks.

The literature can be classified into two groups: one using the stochastic cost function approach and the other using the mathematical programming approach of Data Envelopment Analysis (DEA). The earlier studies of scale efficiency based on a cost function as the analytical format generally found scale economies at the branch level

(Murphy and Orgler, 1982; Pavlopoulos and Kouzelis, 1989; Doukas and Switzer, 1991; Zardkoohi and Kolari, 1994). However, a major limitation of these studies is that they fail to allow X-inefficiency, which has been found to dominate scale inefficiencies in banking studies (Berger *et al.*, 1994) [1]. In a fairly comprehensive and detailed study based on a Fourier-flexible cost function using data from 760 branches of a large US commercial bank, Berger *et al.* (1997) found that there were about twice as many branches as would optimize costs and that X-inefficiencies were quite large (over 20%). They also suggested that it would be difficult for banks to achieve any major saving in branch cost through merger and acquisition, particularly through the creation of inter-state branching networks. Their study considers both the intermediation approach (with outputs as various deposits) and the production approach (with output as various numbers of accounts of deposits and credit). In this conceptualization, the bank as a whole makes the asset and liability decisions while branches primarily operate to raise the funds by producing services for depositors. Because branch managers have little control over interest expenses, revenues, or number of transactions required per dollar of deposit, and largely focus on operating expenses, this would argue for using the production approach rather than the intermediation approach for studies of branch efficiency.

In a recent econometric study, Bartel (2000) examined how and why the human resource management environment is likely to affect the branch level performance. She found that human resource management environment does affect the branch performance after controlling for the characteristics of the market, employees and unobserved branch specific and manager specific attributes. This underscores the potentially significant impact of differences in the local work culture across regions where the branches are located on branch-level efficiency.

Most of the studies of bank branches that allow the presence of X-inefficiency use the mathematical programming techniques (either Data Envelopment Analysis (DEA) or Free Disposal Hull (FDH) analysis e.g., Sherman and Gold, 1985; Oral and Yolalan, 1990; Vassiglou and Giokas, 1990; Pastor, 1993; Sherman and Ladino, 1995; Tulkens and Malnero, 1994; Athanassopoulos, 1997; Lovell and Pastor, 1997; Schaffnit *et al.*,

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[1] In general, X-inefficiency at financial institutions accounts for a considerable portion of the total costs and is a much greater source of performance problems than either scale or product mix inefficiencies, and has a

1997). A majority of these studies used data from small numbers of branches and most of the branches were found to have very high efficiency scores. While this finding may reflect very tight managerial control at the bank level over branch operations, this could, just as well, reflect a problem that arises in programming models when the number of observations is small relative to the number of outputs and inputs plus any environmental variables specified. Like Zardkoohi and Kolari (1994) and Berger *et al.* (1997), we use data on the branches of a single bank and estimate labor cost inefficiency of the individual branches. By considering the branches of a single bank we eliminate the effects of heterogeneity in management and operational style across banks. Efficiency estimates are more directly comparable across branches of a single bank and hence lead to better interpretations. Presence of little cost-inefficiencies among the branches would suggest that the bank as a whole generally controls costs at its individual branches and keeps their inefficiency at an approximately constant level. However, because the benchmark technology from which the efficiency scores are obtained has been constructed without making use of the data from the branches of other banks, the specific bank under review could, on the whole, still be quite inefficient relative to other banks. When there is evidence of a considerable measure of labor-inefficiency at the branches, it would be reasonable to conclude that the bank fails to control branch-level costs and that most of its branches were not on or near the efficient frontier. In this case, one may conclude that the bank as a whole was not on the 'true' efficient frontier.

III. An Overview of the Work Culture and Banking in Select Metro Regions

Since deregulation in 1992, Indian banks have responded reasonably well to the challenges of globalization and deregulation of markets by restructuring, improving their products and services, and seeking alternative markets for them. Amenities of modern banking, like ATMs, credit cards, and internet banking have moved banking to points of convenience for customers in metro cities. Most of the commercial banks have some type of Fair Lending Practices Code (FLPC), which seeks to achieve synchronization of best practices while dealing with customers. Also, it aims at providing valuable inputs to customers and facilitates effective interaction of customers with the banks. In any typical

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strong empirical association with higher probabilities of failures [Bauer *et al.* (1998)].

bank in India, there are three categories of employees: officers, clerks and subordinates. While officers have the higher responsibility of management, supervision, administration, etc. of the branch, clerks and subordinates act as the support staff. Officers are, in general, likely to get inter-state transfers, while clerks and subordinates continue to work in the same area. As a result, the work-culture/ethics, socio-economic environment, and the strength and militancy of political unions in each metro-city affect the day to day operations at the branches. For example, as per the labor bureau report of the government of India, the average time lost in 2000 due to industrial disputes was highest at 10.57 million man-days in West Bengal, while the same for Tamil Nadu and Maharashtra was at 2.59 million man-days and 1.75 million man-days, respectively.

The cities of Mumbai, Delhi, Kolkata, and Chennai are, respectively, the state capitals of the states of Maharashtra, Delhi, West Bengal and Tamil Nadu. These are the four largest metropolitan cities in the nation located respectively in the western, northern, eastern and southern part of India. Table 1 below provides a summary picture of the overall banking landscape in the four cities.

Table 1: Selected banking indicators in the 4 metro regions

Indicators	Mumbai	Delhi	Kolkata	Chennai	Total
No. of branches	1479	1459	1006	792	4736
Share in all India (%)					
(i) Office	2.2	2.2	1.5	1.2	7.1
(ii) Deposits	16.6	11.9	3.4	2.8	34.7
(iii) Credit	25.2	12.5	4.2	5.6	47.5
Population per office	11067	8767	13138	8112	10304
Deposits per office (in Rs. million)	17048	12369	5133	5422	11132
Credit per office (in Rs. million)	15183	7656	3699	6246	8930
Per capita deposits (in Rs. thousand)	154	141	39	67	108
Per capita credit (in Rs. thousand)	137	87	28	77	87

Source: Quarterly Handout, Reserve Bank of India, March 2003.

Mumbai, being the financial capital of the country is more cosmopolitan, and presents a much better work culture and business environment. On account of the professional attitude of the workers coupled with greater economic opportunities, Mumbai is the ever busy metro city in India, despite political rivalries among various trade unions. The base level workers (clerks and sub-ordinates) mostly belong to the local community comprising primarily Maharshtrian and Gujarati people who are known to be more hard working than other communities in India. The economy of Mumbai city is

much stronger than those of the other cities in India. Mumbai has around 1,480 commercial bank branches; in 2003 it alone generated about 17% of India's bank deposits and disbursed more than one-quarter of bank credit of the whole nation (Table 1). Thus, average employee productivity of Mumbai banks is expected to be higher.

Delhi is the capital of India, and being the center of political power the city is constantly under scrutiny of the national and international media. Its work culture is highly influenced by the people of neighboring Uttar Pradesh and Haryana, and Punjab, where the Green Revolution in agriculture was launched. In terms of financial infrastructure, Delhi compares well with Mumbai. However, its credit disbursement is 50% lower than that of Mumbai (Table 1). This clearly shows low level of industrial opportunity and financing undertaken by banks.

Kolkata is quite unequivocally a Bengali city. The influence of Bengali culture is evident in every aspect. However, since there are a large number of people from other communities too, the Calcuttan is quite sophisticated, not provincial, in approach. The economic opportunities in Kolkata may have declined, but the intellectual and cultural level of the population as a whole is relatively higher than anywhere else in India even today. The work culture of Kolkata usually gets criticized (Banerjee, *et al.*, 2002). Rivalry among unions and political parties further aggravates the problem. The state has been ruled by a coalition of leftist parties dominated by the Communist Party of India (Marxist) (CPM) and under the full protection of the state government, the labor unions affiliated to the CPM virtually dictate terms at all labor-management negotiations. While things are changing for the better overall, traces of the old-gentry-landlord-culture still remain, in spite of the communist influence. It is called the "*bhadra lok* (gentle man)" culture. All this is well reflected in the day to day working of commercial banks also. The Confederation of Indian Industry report in 1999 commented about the operations of banks in Kolkata that "there is a total lack of work culture, excessive manpower, un-remunerative branches and a piling of non-performing assets (NPAs). The trade unions opposed the banks' IPO as it was a divestment of the government's stake." A long wait in the line for even minor service at the bank is quite common. Employees often do not show up at the counter even fifteen minutes after the commencement of business hours.

In the recent past, the state government initiated efforts to restore 'work culture' in public offices. Indeed, out of three public sector banks designated as weak by the Reserve Bank of India in 1999, two were based at Kolkata. Kolkata has more than 1,000 commercial bank branches. However, it has only 3.4% bank deposits base of the entire nation and absorbs only 4.2% of total bank credit.

Compared to the typical lifestyle to Mumbai or Delhi, Chennai is on the conservative side but this is changing. Chennai's position as the pioneering industrial centre of South India and its ability to meet the demands of the new economy have helped it emerge as one of the fast-developing cities in the country. Well developed infrastructures, excellent corporate culture, skilled (and affordable) manpower and cordial industrial relations make it a highly desirable location for banking, insurance, information technology, and related service industries. In a Nasscom-McKinsey study (2002), Chennai is rated as the best possible location for software investments in India. Along side the public sector banks, foreign banks are equally visible all around the city. The work culture in Chennai is regarded as one of the best in the country. Its economic opportunities, as expressed by the typical banking indicators, are clearly better than that of Kolkata.

In the overall perspective, it is clear that each of the four metro cities has its unique work culture and has recorded diverse banking developments. It is, therefore, expected that labor use efficiency of bank branches of these regions would also differ. In this context, the issue and methodology of measurement of labor use efficiency against a benchmark technology is explained in the following section.

IV. The Nonparametric Methodology

Unlike in econometric applications where one specifies some explicit form of the production, cost, or profit function to represent the benchmark technology for efficiency measurement, in the nonparametric alternative, one makes a number of fairly general assumptions about the technology but leaves the functional form unspecified. Typically, it is assumed that the production possibility set is convex and both inputs and outputs are freely disposable.

Consider an industry producing m outputs from n inputs. An input-output bundle *(x, y)* is considered feasible when the output bundle *y* can be produced from the input bundle *x*. The technology faced by the firms in the industry can be described by the production possibility set

$$T = \{(x, y): y \text{ can be produced from } x\}. \tag{1}$$

In the single output case, one can conceptualize the production function

$$f(x) = \max y: (x, y) \in T. \tag{2}$$

In the multiple output case, the frontier of the production possibility set is the production correspondence

$$F(x, y) = 1. \tag{3}$$

The method of Data Envelopment Analysis introduced by Charnes, Cooper, and Rhodes (CCR)(1978) and further extended to non-constant returns technologies by Banker, Charnes, and Cooper (BCC)(1984) provides a way to construct the production possibility set from an observed data set of input-output bundles.

Suppose that *(x^j, y^j)* is the input-output bundle observed for firm *j* *(j = 1,2,..., N)*. Clearly, these input-output bundles are all feasible. Then the smallest production possibility set satisfying the assumptions of convexity and free disposability that includes these observed bundles is

$$S = \{(x, y): x \geq \sum_{j=1}^{N} \lambda_j x^j; y \leq \sum_{j=1}^{N} \lambda_j y^j; \sum_{j=1}^{N} \lambda_j = 1; \lambda_j \geq 0; (j = 1,2,..., N)\}. \tag{4}$$

The set *S* is also known as the free disposal convex hull of the observed input-output bundles. One can obtain various measures of efficiency of a firm using the set *S* as the reference technology. In the following paragraphs we describe how the efficiency of a firm can be measured under alternative assumptions about what its choice variables are.

An alternative and equivalent characterization of the production technology is possible in terms of a family of input requirement sets. For any specific output bundle y^0 the input requirement set consists of all input bundles *x* that can produce y^0 and can be specified as

$$V(y^0) = \{x: (x, y^0) \in T\}. \tag{5}$$

If the output-bundle of the firm is treated as an assigned task, efficiency lies in producing the target output bundle y^0 at the minimum cost.

Suppose that the firm faced the input price vector w. Then its actual cost is $C^0 = w'x^0$.
Then, the minimum cost of producing the target output is

$$C(w, y^0) = \min w'x : x \in V(y^0). \qquad (6)$$

Here all inputs are treated as choice variables, we have implicitly assumed that the firm can vary all of the inputs to achieve efficiency. This clearly corresponds to a long run analysis. It is often the case that one or more input is quasi-fixed and only the other inputs are subject to variation at the discretion of the firm. One needs to modify the relevant efficiency measure in order to take explicit account of the quasi-fixed inputs.

Suppose that the input vector x can be partitioned as $x = \{v, K\}$, where v is an n_1 element vector of variable inputs, while K is an n_2 element vector of quasi-fixed inputs. We may define the conditional input requirement set for output y^0 given the quasi-fixed input K^0 is

$$V(y^0 | K^0) = \{v : (v, K^0) \in V(y^0) \}. \qquad (7)$$

Next consider cost efficiency in the short run. Suppose that the input price vectors are q and r for the variable and fixed inputs, respectively. The actual variable cost of the firm is $VC^0 = q'v^0$ while its fixed cost is $FC^0 = r'K^0$. Note that the fixed cost is a constant in the short run and plays no role in its cost-minimization. Hence, the appropriate criterion of efficiency in this context is variable cost minimization. The minimum variable cost of the firm is

$$VC(q, y, K^0) = \min q'v : (v, K^0) \in V(y^0). \qquad (8)$$

The DEA model for variable cost minimization is

$$VC^* = \min q'v \qquad (9)$$

s.t. $$\sum_{j=1}^{N} \lambda_j y^j \geq y^0;$$

$$\sum_{j=1}^{N} \lambda_j v^j \leq v;$$

$$\sum_{j=1}^{N} \lambda_j K^j \leq K^0;$$

$$\sum_{j=1}^{N} \lambda_j = 1;$$

$$\lambda_j \geq 0; (j = 1, 2, ..., N).$$

The variable cost efficiency of the firm is measured as

$$\gamma_v = \frac{VC(q, K^0, y^0)}{VC^0}. \tag{10}$$

Apart from measuring efficiency the optimal solution of (10) above also provides the cost-minimizing quantity of the individual variable inputs which may be compared with the corresponding actual quantities to determine to what extent a firm is over- or under-using the different inputs.

V. Selection of Sample Branches and Definition of Inputs and Outputs

The bank selected for this study is a major public sector bank that is over a century old and has a nation-wide network of branches[2]. It accounts for a significant share of the total banking business in all the four metro cities, viz. Mumbai, Delhi, Kolkata and Chennai. This bank gave the leadership in development banking by meeting the growing and diversified financial needs of the planned economy of India and is one of the best performing public sector banks in India. In recent years, the bank has adopted and effectively pursued an IT policy aimed at achieving better efficiency in operations, meeting customer needs and market expectations, and staying ahead of the competition. Most of its branches in the metro areas are fully computerized[3]. It has established a "Helpline" service equipped with toll-free telephone lines, fax, and e-mail at local head offices for providing quick and complete information on bank's products and services, and to enable the customers to have their grievances redressed through electronic media in addition to normal channel of complaints received by mail. Our primary data set consists of all the branches in the four major metro areas of the selected bank. However, the final data are based on 222 bank branches as on March 31, 2003 (and 191 as on March 31, 2002) as per the selection criteria adopted here (discussed below).

In the context of Indian banking, a complicating factor is that banks identify selected branches as deposit-oriented (which disburse very little credit) and some others as advance/credit-oriented (which do not accept public deposits). The surplus deposit mobilized by a deposit-oriented branch is transferred to the head office account and the branch is remunerated through a transfer pricing mechanism. The opposite is true for

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[2] Due to the proprietary nature and confidentiality of the branch-data, the name of the bank is not disclosed.
[3] In order to provide better customer service, recently business hours were extended in a majority of its computerized branches in the country.

advance-oriented branches. Besides, there are branches that only offer specialized services like international business or credit to small-scale industries. Because the designation of a branch as deposit- or credit-oriented is mainly a policy decision, we have taken this characteristic as exogenously determined. We classified the branches of the four metro-regions into three groups as having credit-deposit ratios (i) less than 10% (deposit-oriented branches), (ii) between 10% and 60%, and (iii) more than 60% (credit-oriented branches)[4]. To remove the influence of these specialized branches on the benchmark technology constructed from the data, we only include branches with credit-deposit ratios no less than 10% at the lower end and no more than 60% at the upper end. In a practical sense, these branches performed the business of financial intermediation as against the specialized branches. In this study, we have explicitly assumed branches as intermediaries as against producers of deposits and loan accounts. Thus, instead of the production approach, we take the intermediation approach and use the *values* of deposits and credit as outputs. Additionally, branches produce valuable services like safe deposit and other custodial services and different payment services that generate revenues in the form of fees for the bank. Accordingly, we include non-interest income generated at a branch as another output. We include the numbers of different categories of employees (officers, clerks, and support staff (like security and janitorial employees) as separate inputs. In addition, the (physical) capital input is measured by the amount of overhead expenses.

Branch-level income-expenditure data are obtained from the records of the selected bank. The data on category-wise number of employees, deposits and credit are culled out from the control returns submitted by banks under Basic Statistical Return System, RBI. Average remuneration of each category of employees has been estimated from Form-A2 return submitted by all scheduled commercial banks to RBI.

The DEA Models

The performance of each branch in our sample is measured against two different frontiers: one based on branches from all the four regions in the sample and the other based only on branches from the metro region where it is located. The first can be

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[4] Indeed there were very few branches with credit-deposit ratio of more than 60 per cent.

regarded as the national or *grand* frontier and the other as the regional or metro frontier.

The relevant DEA model for metro region r with N_r branches in the sample is:

$$VC_r = \min \ w_1 L_1 + w_2 L_2 + w_3 L_3 \tag{11}$$

s.t.
$$\sum_{j=1}^{N_r} \lambda_j y_k^j \geq y_k^0; (k = \text{deposit, credit, non-interest income});$$

$$\sum_{j=1}^{N_r} \lambda_j L_i^j \leq L_i; \ \ (i = 1, 2, 3);$$

$$\sum_{j=1}^{N_r} \lambda_j K^j \leq K^0; \ \ (\text{overhead expenses});$$

$$\sum_{j=1}^{N_r} \lambda_j = 1;$$

$$\lambda_j \geq 0; (j = 1,2,...,N_r); L_1, L_2, L_3 \in \{0,1,2,...\}.$$

A comparison of the actual quantity of labor input L_i^0 with the corresponding optimal quantity L_i^* reveals whether a branch is using too little or too much of that particular kind of labor[5]. For the labor input i define the ratio

$$\alpha_i = \frac{L_i^0}{L_i^*}. \tag{12}$$

A value of α_i greater (less) than unity implies over (under) use of that input.

For a branch facing labor input price (vector) w using the labor input bundle L^0 and overheads K^0 to produce output y^0, a measure of its within-metro labor use efficiency is

$$\gamma = \frac{VC_r(w, K^0, y^0)}{w' L^0.}. \tag{13}$$

For the overall or grand efficiency of the branch we solve the following LP problem including all the N branches from all the regions in our sample:

$$VC_G = \min \ w_1 L_1 + w_2 L_2 + w_3 L_3 \tag{14}$$

s.t.
$$\sum_{j=1}^{N} \lambda_j y_k^j \geq y_k^0; (k = \text{deposit, credit, non-interest income});$$

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[5] Another important consideration in the present application is that like their actual quantities, the optimal levels of the individual labor inputs must take integer values.

$$\sum_{j=1}^{N} \lambda_j L_i^j \leq L_i; \quad (i = 1, 2, 3);$$

$$\sum_{j=1}^{N} \lambda_j K^j \leq K^0; \quad \text{(overhead expenses)};$$

$$\sum_{j=1}^{N} \lambda_j = 1;$$

$$\lambda_j \geq 0; (j = 1, 2, ..., N); L_1, L_2, L_3 \in \{0, 1, 2, ...\}.$$

The grand efficiency of the branch can be measured as

$$\delta = \frac{VC_G}{w'L^0}. \tag{15}$$

Note that a point-wise measure of the labor-use efficiency of region r relative to the grand frontier evaluated at the input-output data of branch j is

$$\beta_{j}^{r} = \frac{VC_G(w, K^j, y^j)}{VC_r(w, K^j, y^j)} \leq 1. \tag{16}$$

There will, of course, be N_r measures of the regional efficiency – one for each branch in the region. An overall measure of labor-use efficiency of the region r is

$$\beta^r = (\prod_{j=1}^{N_r} \beta_j^r)^{1/N_r}. \tag{17}$$

For the branch j in region r, γ_j^r is a measure of its performance relative to other branches within the same region. For any region, β^r is a measure of its performance compared to all regions in the nation.

VI. Results

Labor cost efficiency score of each branch within each metro city was estimated for the years 2002 and 2003 separately based on their individual frontier and also based on the grand frontier comprising all the observations taken together. As discussed earlier, the role of each metro city in defining the overall efficiency is captured by an overall measure of the distance of individual frontier to the grand frontier and is called as *area efficiency*. Area efficiency broadly reflects impact of the social, economic and cultural factors in a particular area on the labor efficiency of a branch. While achievement of high overall efficiency becomes a target at corporate level, the issues relating to area

efficiency call for actions at local/regional controlling offices. Table 2 presents the year-wise average distribution of within metro, overall and area efficiency scores. The number of branches in the regions of Kolkata and Chennai were relatively higher in the sample used. Average labor efficiency of all four metro centers based on their respective within-metro frontiers in 2002 stood around 77%. The implied level of average cost-inefficiency of around 23% at the branch level compares well with the similar findings by Berger *et al.* (1997). Although there was some variation in the distribution of efficiency in the two years covered in our study, the difference does not appear to be significant. Even when judged against the within-metro frontiers, significant degrees of labor inefficiency on average are found for each region. For Delhi it was the highest, followed by Kolkata in 2003. However, except for Kolkata and Chennai, average labor efficiencies seem to have improved in other two cities in 2003. This was most pronounced in the case of Mumbai. By contrast, Kolkata showed a sharp drop in efficiency. This finding of substantial labor cost-inefficiency at the branch level in each metro city signals the presence of substantial inefficiency at the bank level. Thus, even on the basis of data from a single bank, we can conclude that this bank has significant inefficiency relative to a 'true' best-practice bank frontier which includes only branches that are on the branch frontier. The bank as a whole is inefficient because most of its branches do not perform near the levels of its own best practice offices. The observed dispersion of efficiency, as measured by its standard deviation, of these branches was found to be relatively high. While the branches in Kolkata recorded low dispersion, those in Delhi witnessed higher variability. Higher dispersion in labor efficiency also suggests that the bank is not able to control fully the performance of its branches.

Table 2: Mean efficiency of branches across regions: 2002 and 2003

Region/Year	No. of Branches		Labor Efficiency				Area Efficiency	
			Based on individual frontier		Based on grand frontier			
	2002	2003	2002	2003	2002	2003	2002	2003
Mumbai	32	39	78.23	82.35	49.30	62.87	64.48	77.08
Delhi	33	46	66.09	72.17	64.37	59.64	96.21	87.50
Kolkata	72	81	79.09	74.35	47.29	54.63	57.46	69.94
Chennai	54	56	80.63	78.01	65.73	71.79	84.10	91.99
All	191	222	77.14	76.23	55.79	61.44	72.14	84.94

Estimates of labor cost efficiencies based on the grand frontier were lower as expected. Except for Chennai, the cost inefficiencies are substantial for all the other cities. Kolkata registered inefficiency of more than 50% in 2002. This suggests that the branches which were efficient within each metro region may not necessarily be efficient at all India level. Delhi recorded the highest level of area efficiency (when averaged over the two years). This is particularly interesting in light of the fact that both the within-metro and the grand efficiency scores were higher in Chennai than in Delhi. However, the Delhi frontier appears to be closer than the Chennai frontier to the grand frontier. This clearly highlights the role of area efficiency. At the other end, low level of area efficiency of Kolkata clearly demonstrates the detrimental effects of poor work culture on the performance of branches. In other words, low level of area efficiency is reflected by high level of operating costs as compared to their outputs. In addition, these may indicate that the bank's management is not able to control fully the costs at its branch offices through its policies and procedures, incentives, and supervision. Rather, the quality and effectiveness of local management appears to be more important in determining the performance of branches.

Within the metro regions, less than one-fourth of the branches were found to be cost efficient and in the aggregate scenario, only about 7%-8% branches were cost efficient (Table 3). It is also interesting to note that these proportions are quite stable across years despite the increase in the number of branches in 2003. None of the branches in Mumbai made it to the grand frontier in 2003. That is, the bank failed to create any model branch in Mumbai.

Table 3: Frequency Distribution of Efficient Branches: 2002 and 2003

Region/Year	Based on individual frontier				Based on grand frontier			
	Number		Proportion		Number		Proportion	
	2002	2003	2002	2003	2002	2003	2002	2003
Mumbai	5	12	15.63	30.77	2	0	6.25	0.00
Delhi	7	13	21.21	28.26	5	4	15.15	8.70
Kolkata	15	13	20.83	16.05	3	8	4.17	9.88
Chennai	16	14	29.63	25.00	4	5	7.41	8.93
All	43	52	22.51	23.42	14	17	7.33	7.66

Around 70% of the operating expenditure of public sector banks in India goes towards paying salaries and perquisites to employees. These costs account for more than 25% of the total expenses. Table 4 presents class-wise average (percentage) reduction in employee cost for 2002 and 2003. It is clear from the table that a substantial portion of total cost stems from inefficiency. Potential for cost reduction is evident for all classes of employees in every region. In other words, there is excess staff over the optimally required levels at each metro city and the current level of output could be produced by a much smaller workforce. The major reduction in labor cost is feasible in the case of the clerical and subordinate category. In value terms, substantial gain is feasible for the clerical category because in this particular bank there are roughly 1.7 clerks and 1 subordinate staff for each officer.

There are three different lines of action before the bank that would eliminate labor inefficiency:

(i)   the bank may open new branches, deploy these surplus staff, increase the volume of output, and thereby generate more revenue,

(ii)   the bank may deploy these staff suitably in the existing branches and encourage them to produce more output by means of some sort of incentives, promotional benefits, etc., and

(iii)   the bank may downsize its employment through a voluntary retirement scheme (VRS) and close down inefficient branches.

In fact, part of the inefficiency observed at the bank level may be explained by uneconomically large branch size, and the total cost of producing the bank's observed output bundle could be reduced by operating fewer branches, each producing a bigger output bundle than what a typical branch is producing at present. The extent of interregional variation in potential cost saving provides some interesting insights. As shown in Table 4 below, possible reduction in the payment to officers is the lowest in Kolkata in both years (only 8.03% in 2002 and 11.71% in 2003). By contrast, the extent of proportionate reduction in clerical employee costs would be around four times as much. In general, the high degree of labor inefficiency in all the four metro regions can be traced primarily to the presence of surplus staff in the clerical and subordinate categories.

Table 4: Percentage Reduction in Employee Cost

Year	2002				2003			
	Mumbai	Delhi	Kolkata	Chennai	Mumbai	Delhi	Kolkata	Chennai
Officers	21.99	22.82	8.03	14.33	13.21	38.76	11.71	21.14
Clerks	35.33	39.57	34.22	18.37	33.77	56.20	44.65	24.60
Subordinates	47.35	36.28	19.19	24.02	26.74	27.54	18.66	36.73
Total	33.10	33.46	24.66	17.76	26.56	46.19	30.28	24.90

As noted earlier, employees in the clerical and subordinate staff categories are transferred within a region but not across. Thus, the problem of surplus labor in these categories has to be resolved by the regional management and little can be done to address this from the corporate level. This again emphasizes the importance of local managers in determining the performance of a branch.

Table 5: Mean characteristics of the best performing branches based on individual frontier

Year/Indicators	2002				2003			
	Mumbai	Delhi	Mumbai	Delhi	Mumbai	Delhi	Mumbai	Delhi
No. of branches	5	7	15	16	12	13	13	14
Proportion of officers	21.81	23.72	19.11	22.88	23.51	25.42	18.45	19.95
Proportion of clerks	35.59	34.58	36.54	32.67	32.08	24.50	38.60	35.06
Proportion of subordinates	13.78	15.52	16.74	10.78	12.88	8.70	19.13	13.31
Credit –Deposit ratio (%)	24.40	28.53	18.86	19.80	20.14	19.93	20.97	23.50
Labor productivity*	11190	18544	10604	10059	13843	8058	13183	11849
Per employee overheads*	44.50	54.30	50.83	44.34	61.21	36.51	43.58	57.22
Per employee non-interest income*	143.68	194.30	121.43	104.17	45.10	69.28	139.03	230.35

*: in thousands of Rupees.

Table 6: Mean characteristics of the poor (labor efficiency less than 60%) performing branches based on individual frontier

Year/Indicators	2002				2003			
	Mumbai	Delhi	Kolkata	Chennai	Mumbai	Delhi	Kolkata	Chennai
No. of branches	8	16	11	11	6	17	19	15
Proportion of officers	17.04	19.90	13.69	21.07	14.72	24.35	16.11	19.93
Proportion of clerks	45.69	34.72	51.17	34.27	50.01	33.89	45.31	35.27
Proportion of subordinates	17.20	13.85	20.71	11.11	17.06	9.99	17.74	13.83
Credit –Deposit Ratio (%)	15.90	19.07	17.09	19.29	16.12	14.84	14.66	20.92
Labor productivity*	7732	6559	5663	4329	8759	5324	6414	5319
Per employee overheads*	62.33	36.83	37.91	31.89	62.66	39.11	36.63	36.97
Per employee non-interest income*	60.95	40.94	48.70	52.76	50.11	35.28	40.86	43.94
Labor efficiency	51.85	45.42	52.20	54.42	55.78	48.07	52.49	48.70

*: in thousands of Rupees.

Tables 5 and 6 present the summary measures of various aspects of the operations of the efficiency of the best (based on individual frontier) and the poor

performing branches (i.e., those with efficiency lower than 60%) from the different regions. Comparison of the efficient and poor performing branches does help one to identify the coordinates along which the two categories of branches differ significantly. The major findings with regard to empirical correlates with the presence of surplus labor as presented in Tables 5 and 6 may be summarized as follows: (a) Irrespective of location (across regions), efficient branches always have a higher proportion of officers among its employees. By contrast, poor performing branches have significantly higher proportion of clerks. This suggests that the quality of human capital plays an important role in the overall performance of a branch; (b) Although the credit off-take depends primarily on the state of the regional economy, efficient branches recorded higher credit-deposit ratio between the two groups within a given region. Thus, deposit mobilization vis-à-vis credit deployment does play a major role in determining branch performance; (c) Branches with low labor cost efficiencies need not necessarily had higher per employee overhead (administrative) cost. It may be noted in this context that labor productivity (defined by the total of deposits and credit divided by the total number of employee) was uniformly lower at the inefficient branches. Given that bank output is to a large extent demand determined and higher productivity can be attained primarily through a reduction in the number of employees. (d) In terms of non-interest income (a proxy index of service quality), efficient branches recorded a much better performance as compared to the inefficient branches.

Next we examine the relationship between the size of a branch and its labor utilization efficiency[6]. Here, we have classified branches in terms of their total business (deposits *plus* credit) and grouped into three categories. Mean characteristics of these classes for each metro city are presented in Table 7. The results indicate the following: (a) at the branch level, the labor cost efficiency has a mixed relationship with size. While the medium size branches recorded high cost inefficiency, small and big branches recorded significantly low inefficiency. In other words, the size and cost efficiency at branch level is found be U-shaped; (b) there exist significant differences in the composition of the personnel across branches of different sizes. This is especially true in

respect of the proportion of officers. For example, the small size branches in Mumbai have a higher proportion of officers than the large branches. A more rational policy towards the allocation of human resources directly related to the business needs of a branch would improve efficiency. Towards this objective, while the bank at the corporate level has a definite role, regional managements need to look into the proportionate distribution of human resources tailored to the volume of business; (c) labor productivity is lowest in the smallest category and it would be possible to exploit scale economies through consolidation of inefficient/unproductive branches where feasible.

Table 7: Size and Labor Efficiency

Year/Indicators	2002				2003			
	Mumbai	Delhi	Kolkata	Chennai	Mumbai	Delhi	Kolkata	Chennai
Small size (business less than Rs.50 crore)								
No. of branches	7	21	52	36	8	28	56	34
Proportion of officers	21.60	20.45	16.45	21.05	20.27	23.53	16.59	20.56
Proportion of clerks	26.42	29.07	36.34	27.75	29.93	29.32	35.60	26.96
Proportion of subordinates	12.03	11.82	11.09	8.51	13.64	7.86	11.48	9.31
Credit –Deposit Ratio (%)	15.75	20.32	17.36	20.58	15.75	17.94	17.62	22.75
Labor productivity*	5444	5487	3555	4625	5717	4964	3941	4840
Per employee overheads*	63.51	32.50	22.76	26.97	51.34	32.33	23.70	33.49
Per employee non-interest income*	38.92	48.13	25.15	35.87	33.52	39.08	25.72	89.57
Labor efficiency	84.22	65.86	79.43	79.52	83.72	78.00	74.95	76.34
Medium size (business between Rs.50 crore and Rs.100 crore)								
No. of branches	14	9	15	9	13	18	15	13
Proportion of officers	15.92	23.56	17.01	16.01	20.75	26.45	18.03	17.99
Proportion of clerks	46.14	38.16	46.99	39.87	38.28	29.64	44.21	37.32
Proportion of subordinates	15.63	10.81	17.22	12.73	13.28	11.69	16.86	12.72
Credit –Deposit Ratio (%)	17.30	20.25	17.27	17.83	18.90	17.12	15.59	21.42
Labor productivity*	9629	9323	8368	8563	9699	9279	8788	9535
Per employee overheads*	65.79	44.27	40.63	39.11	58.60	47.01	47.63	43.01
Per employee non-interest income*	55.16	134.11	57.07	76.35	44.73	50.57	49.71	56.61
Labor efficiency	70.59	58.88	76.81	77.69	82.60	68.42	65.73	71.49
Large size (business greater than Rs.100 crore)								
No. of branches	11	3	5	9	18		10	9
Proportion of officers	17.57	27.46	16.75	19.71	18.75		18.97	21.75
Proportion of clerks	50.77	43.39	62.98	52.47	48.15		53.64	47.53
Proportion of subordinates	16.74	22.65	35.95	17.41	17.05		29.48	19.25
Credit –Deposit Ratio (%)	18.72	15.13	13.78	20.08	20.46		22.89	21.23
Labor productivity*	16288	40910	25511	19331	18268		21690	21719
Per employee overheads*	63.05	93.48	126.98	73.17	70.80		71.31	84.93
Per employee non-interest	105.98	158.19	286.44	181.01	81.75		197.78	176.78

[6] The relation between size and efficiency has been studied extensively in the bank efficiency literature. In general, the findings are mixed. However, no such attempt so far has been made in the context of branch efficiency.

income*								
Labor efficiency	84.15	89.37	82.37	93.52	81.56		83.93	93.78

*: in thousands of Rupees.

We may now highlight the significant findings of this study:

- Even within any one region there exists considerable measure of labor use inefficiency and the inefficient branches can accomplish considerable saving in their personnel expenditure by following other branches within the same city as their role models.

- A nation-wide comparison shows an even greater degree of inefficiency and underscores the detrimental effects of a poorer work culture at the region where the branch is located.

- From the regional and the national measures of the levels of efficiency of individual branches in a given region, we can construct a summery measure of the overall *area efficiency* of a region. Not surprisingly, Kolkata scored the least in this respect. Mumbai, the capital city of the politically turbulent state of Maharashtra had the second lowest score.

- The single most important determinant of labor cost inefficiency is the proportion of subordinate staff (especially the clerical staff) in a branch.

VII. Conclusion

This paper analyzes labor use efficiency at the branch level using data from four major metropolitan regions of India for the branches of a large public sector bank with thousands of branches across the country. For each branch we obtain two different measures of efficiency: one based on data from only the region where it is located and the other on the data from all the four regions. The first provides the amount of savings in the personnel expenses at the branch level and the optimal manpower profile that would make it possible. This, it may be noted, is saving that would be feasible even when operating within the constraints imposed by the regional work culture. This is the target that the regional management could set from the branch and make the branch management accountable if it fails to meet this objective. At the same time, comparison of the two different measures of efficiency brings out the effect of regional factors that would restrain a branch from attaining the level of efficiency that would be possible if it

could use branches from any region (rather than from its own region) as role models. These are area-wide factors over which individual branches would have limited control. In fact, the overall *area* efficiency of a region identifies how far the metro region as a whole lags behind the nation in terms of efficiency. This is clearly a matter for which the regional management of the bank would be accountable to the corporate management.

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