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ARE COMMERCIAL BANKS REALLY MORE EFFICIENT THAN AGRICULTURAL DEVELOPMENT BANKS? EVIDENCE FROM BANGLADESH

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Abstract

Previous studies have argued that commercial banks are more efficient in making and recovering loans than are development banks. Few studies, however, directly compare the efficiency of the two types of banks operating in the same market area. This study in Bangladesh made such a comparison. A normalized profit function was estimated based on the data collected from rural bank branches for the years 1987 and 1988. The results showed that the nationalized commercial bank branches were relative price efficient with respect to wages, while the development bank branches were relative price efficient with respect to deposit interest rates. The development bank branches were relative technical efficient with respect to loans made, while there was no technical efficiency differences between the two bank types with respect to deposits. These results suggest that the issue of relative bank efficiency is unique to each country and cannot be easily generalized.

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In many developing countries, both agricultural development banks and commercial banks are used to disburse subsidized funds to agriculture. But policy makers, donor agencies and academicians are usually more concerned with the performance of development banks than with commercial banks because of the high social costs of subsidies associated with development bank operations and their frequent failures during the 1980s (McKean). It is often assumed that commercial banks have different objectives and standards than development banks and, therefore, are more efficient. But are commercial banks really more efficient than development banks in rural financial markets in developing countries? The answer to this question has policy implications for efforts to improve the performance of rural financial markets. But there have been few studies that carefully test the relative efficiency of rural commercial and development banks. As a result, the suggestion that commercial banks are more efficient may be an exaggeration and a policy to expand them at the expense of development banks may not necessarily lead to a more efficient performance of rural financial markets.

It is frequently argued in the rural finance literature that development banks are not efficient because of (a) high default rates (Von Pischke); (b) financial indiscipline due to political intervention in their operations (Blair; Kane; Von Pischke); and (c) imperfect

information and high costs of supervision (Bourne and Graham; Cuevas and Graham; Graham and Bourne). Some research has provided empirical evidence suggesting that commercial banks perform better than development banks in some countries (e.g., Cuevas and Graham; Graham and Bourne). This evidence is rather questionable, however, because most studies have failed to directly compare commercial and development banks operating in the same market area, and have not explicitly recognized the differences in lending behavior and loan portfolios between the two bank types. The share of rural loans to total loans is often much smaller in commercial banks than in development banks. As a result, the findings of these studies may be misleading and may not be generalizable beyond the specific countries for which they were conducted. Strong policy conclusions can only be generated by analyzing rural bank data that compares different types of banks operating in the same or very similar market areas.

This study is unique because it analyzes rural bank data from commercial and development bank branches in Bangladesh to directly test the relative economic efficiency of the two types of banks. The data used in the study refer to 1987 and 1988 when the country was heavily involved in targeted rural loan programs through both types of banks.

THE BANGLADESH RURAL FINANCIAL SYSTEM

There have been several structural changes in the Bangladesh banking system since 1971. All banks, except foreign banks, were nationalized in March, 1972, and six commercial banks were created out of 12 nationalized commercial banks (NCBs). In addition, there are three development banks - one for industrial development and two for agricultural

development. Agricultural development banks have been operating in rural areas since 1962. Following the policy of bank privatization adopted by the government in 1981, there are now 14 privately-owned banks in Bangladesh. But except for the two denationalized private banks, the newly created private banks have no branchs in rural areas. Therefore, the rural financial market essentially consists of the nationalized commercial and agricultural development bank branches.

Prior to 1977, rural bank branches constituted about 45 percent of all bank branches operating in the country. During the period 1978-81, the banks were required to open two new branches in rural areas for every new urban branch opened under a "two-for-one" branching policy designed to effectively disburse 1,000 million taka in special agricultural credit. Following suspension of this policy in 1981, the growth rate in new rural branches declined. Because of these policies, rural branches constituted 68 percent of the total bank branches by 1988.

Commercial banks generally consider rural lending to be a risky business. But as a result of the branching policy during the 1978-81 period, the NCBs were forced to open branches in rural areas in order to gain licenses to open the more attractive urban branches they desired. Currently, about 70 percent of the NCB and 91 percent of the agricultural development bank branches are defined as rural. But only 24 percent of the total NCB loan portfolio is rural and their share of total rural lending is only 34 percent (Bangladesh Bank). Because of their experience in rural lending over three decades, there are reasons to believe that the development banks may be more efficient in rural lending than the commercial

banks. If true, this would make the Bangladesh experience somewhat different than that found in some other developing countries.

ANALYZING ECONOMIC EFFICIENCY

A bank is economically efficient if it operates with both technical and price efficiency (Richard and Villanueva). Lau and Yotopoulos argue that technical efficiency accounts for differences in output level given a set of production inputs, and price efficiency accounts for a differential degree of profit maximization by equating the marginal value product of each factor to its price. Consider the production function of two banks:

$$Q_1 = A_1F(X_1)$$

$$Q_2 = A_2F(X_2)$$

where Q is output, A is a technical efficiency parameter, X is a vector of inputs employed, and F refers to the production function. Subscripts 1 and 2 refer to banks 1 and 2.

A bank is said to be more technically efficient than another if it produces a larger output from the same set of inputs. If $A_1 > A_2$, then bank 1 is more technically efficient than bank 2. A bank is price efficient if it maximizes profit, i.e., equates the marginal value product of each factor to its price. It is possible for a bank to be technically efficient but not price efficient. This could be the case in Bangladesh where rural bank branches are largely those of public sector banks, and where interest rates are determined by the Bangladesh Bank (central bank) and are uniform across all banks.

The usual marginal condition of profit maximization does not hold for banks that are price inefficient and that pursue diverse goals other than profit maximization. In this

situation, the marginal conditions as provided by Lau, and Lau and Yotopoulos are given by

$$P(A^j \partial Q^j / \partial X^j) = \kappa^j_i r^j_i$$

where, i,j,r,κ, respectively, refer to input type, bank type, input price, and a constant parameter to distinguish between profit maximizing and non-profit maximizing firms. If $\kappa = 1$, then the bank is a profit maximizer. If $\kappa \neq 1$, then the bank is not a profit maximizer and equates marginal revenue with a constant κ times the price of inputs. Lau argues that this revised marginal productivity rule is consistent with over-or-under valuation of the opportunity costs of resources, and the satisficing behavior of a firm.

BEHAVIOR OF RURAL BANK BRANCHES IN BANGLADESH

The rural bank branches make two general types of loans - refinanciable target loans, $L\tau$, and non-target commercial loans, $L\eta\tau$. The target loans are associated with government sponsored loan programs while non-target loans are made using each bank's own lending criteria. There is diversity in target loans in terms of types and interest rates: 20 types of target loans are offered at seven different interest rates. Most are agriculturally related and carry a 16 percent interest rate. Not all types of target loans are made by all bank branches, however, because of differences in enterprises found in different market areas (Khalily). The local branch managers select target loan borrowers based on their creditworthiness and in accordance with the terms and conditions set by the Bangladesh Bank. The selection of non-target loan borrowers, however, follows individual bank policies since these are commercial loans usually made out of deposits or borrowings from urban branches. Interest

rates on non-target loans vary between 16 and 20 percent. Interest rates on both target and non-target loans are set by the Central Bank and are uniform across bank branches. Rural branches, in addition to making target and non-target loans, provide risk-free loans to their head offices, L_h, which represent residual loanable funds after making target and non-target loans. The rural branches can also borrow from their head offices, B_h, when the amount of deposits mobilized (D) is insufficient to meet the demand for target and non-target loans. Interest rates on L_h and B_h are lower than the rate paid on savings deposits and are set by the head offices.

Given the fact that the government uses target loan programs and intervenes in rural loan allocation and recovery to achieve political objectives (Blair; Khaled; Khalily and Meyer), the probability of default for target loans, $\theta\tau$, is expected to be greater than the probability of default for non-target commercial loans, $\theta\eta\tau$. Generally, most target loan borrowers repay loans. Honest borrowers may not be able to repay loans on time because of production fluctuations or unforseen contingencies, but it is expected that they will eventually repay their loans. Meyer and Srinivasan, using data for short term loans for the period 1979-84 from 89 rural bank branches, showed that about 70 percent of the loan principal was recovered within five years after the due date. Borrowers under the political protection of their sponsors, however, can escape repayment or repay at a slower rate. Khaled showed that elected chairmen and members of rural local government units, who are the most powerful persons in terms of rural power structure, often did not repay their loans but no legal action was taken against them. Not only did they default on their own loans, they were also instrumental in supporting their clients to not repay their loans.

Therefore, losses incurred on target loans are essentially due to political intervention and are exogenous to the rural bank branches. On the other hand, political intervention in non-target loan allocation and recovery is much less, so the loss rate is much lower.

It is expected that rural bank branch managers consider effective interest rates, adjusted for loan loss, when allocating financial resources. The loss adjusted target loan interest rate is defined as ρ_{τ} and the loss adjusted non-target rate as $\rho_{\eta\tau}$. Interest rates on loans to and from head offices are the same and may be expressed as a single price of netput (L_h-B_h). The interest rate on netput for the NCB branches is 12.5 percent, while it is 10.5 percent for the development bank branches. About 65 percent of the NCB rural branches are net lenders to their head offices, but about 85 percent of the agricultural development bank branches are net borrowers from their head offices (Khalily). This implies that the development bank branches generally make more loans than they mobilize in deposits while the NCB rural branches essentially mobilize deposits for transfer to their head offices. As a result, the loan portfolios of the NCB branches are relatively less risky than those for the development bank branches since lending to the head office is risk free.

The Bangladesh Bank refinances the banks for target loans made at interest rates that are lower than the interest rates the banks pay on deposits. Therefore, the banks receive an interest subsidy if they rediscount target loans with the central bank. The rediscounting interest rates vary between commercial and development banks and are dependent upon the percentage of the disbursed target loans that each bank chooses to refinance. For example, the NCBs can refinance 50 to 60 percent of their disbursed target loans at an interest rate of 8.5 percent, while the development banks can refinance a

maximum of 80 percent of their disbursed loans at the same interest rate. The development banks refinance most of their loans and, therefore, receive a large subsidy. They are more oriented towards making loans than in mobilizing deposits. The interest subsidies obtained from refinanced loans are retained by the head office rather than passed on to individual branches.

The management task of rural bank branch managers involves allocating loanable funds among different loan types considering local market opportunities and the differences in loss-adjusted lending interest rates in each market. Khalily showed that there is substitution between government sponsored target loans and commercial loans (made from own deposits and/or borrowings from the head office) in response to differences in loss-adjusted lending rates. This finding is consistent with the expectation that even though they operate in a tightly regulated environment the rural branch managers respond to variations in lending interest rates as they allocate their loanable funds.

Rural branches use two major inputs - deposits and labor - in loan production. If the amount of deposits mobilized by rural branches is insufficient to meet loan demand, the branches can borrow from their head offices. The interest rates paid on different types of deposits, r_d, are set by the Bangladesh Bank, and the wages (W) of branch employees are also set by the government. Branch managers can vary the cost of their deposits and their total wage bill by varying their mix of deposits and types of employees (officers versus staff). Therefore, the bank branch managers can behave as cost minimizers by changing the mix of deposits and labor, and by increasing labor productivity.

THE EMPIRICAL MODEL

A normalized profit function is used to test the relative economic efficiency of NCB and development bank branches so that the function can (a) differentiate between profit maximizing and satisficing firms, and (b) avoid simultaneous bias between quantity and price (Lau; Lau and Yotopoulos). Argument (a) is the major consideration in using the normalized profit function since the nationalized rural banks may have diverse goals set for them by the government. Consequently, the banks may not be profit maximizers. Since there is one-to-one correspondence between the production function and the normalized profit function, duality can be applied to indirect normalized profit to derive supply and factor demand functions.

The empirical model is a quadratic normalized profit function for two major reasons: first, the quadratic function has the advantage of flexibility having both linear and quadratic terms with an arbitrary number of inputs; and second, the negative profits of some rural branches have restricted the use of other functional forms like the Cobb-Douglas and translog. The empirical model is developed following the standard neo-classical framework. In addition to prices of inputs and outputs, differences in profits may be explained by institutional characteristics and management ability (Aron; Clark; Hannan; Lucas; Mullineaux; Oi; Rhoades; Short). Lau argues that differences in technical efficiency may be due to differences in environmental and management characteristics. As a result, a bank dummy variable, the management ability of branch managers represented by their years of banking experience and schooling, and a set of control variables - age of bank, regional per-

capita income, fixed assets, total deposits and loans - are included in the model to account for differences in bank behavior, their characteristics and the environment.

The empirical quadratic normalized profit function, derived in general form, is specified as the actual normalized profit function in terms of behavioral characteristics. By dividing the indirect profit function by ρ_h, the price of loans to head office (L_h), the normalized profit function is expressed in general form as

$$\Pi_a^* = \sum_{i=1}^{2} \rho_i^n L_i^* + (L_h - B_h)^* - \sum_{m=1}^{3} r_m^n X_m^* \qquad (1)$$

$i = \tau, \eta\tau$; $m = D, B_h$, and N

where, X_m refers to the variable inputs - deposits(D), borrowings from head office (B_h) and labor (N). ρ_i^n and r_m^n are, respectively, normalized prices of outputs (target and non-target loans) and inputs (deposits, borrowings from head office and labor). The asterick represents optimum level. ρ_i^n is defined as

$$\rho_i^n = (1/\rho_h)[(1-\theta_i)\rho_i]$$

Note that ρ_i^n is the normalized effective price of loans adjusted for interest rate loss only, not adjusted for principal loan losses, because the provisions for loan losses are not made at the rural branch level, and the arbitrary selection of a provision rate may distort the empirical results.

Since the objective is to test the relative economic efficiency of rural bank branches within the framework of profit maximization, the actual normalized profit function is

developed to incorporate the satisficing behavioral parameter. Let the behavioral normalized profit function ($\prod_b^n$) be defined as

$$\Pi_b^n = \sum_{i=1}^{2} \rho_i^n L_i^* + (L_h - B_h)^* - \sum_{m=1}^{3} \kappa_m r_m^n X_m^* \tag{2}$$

where, $\kappa_m r_m^n$ refers to the effective normalized prices of variable inputs. Applying duality to eq. (2), the supply and factor demand functions are derived

$$(\partial \Pi_b^n / \partial \rho_i^n) = L_i^n \tag{3}$$

$$(1/\kappa_m)(\partial \Pi_b^n / \partial r_m^n) = -X_m^* \tag{4}$$

From (2),

$$(L_h - B_h)^* = \Pi_b^n - \sum_{i=1}^{2} \rho_i^n L_i^* + \sum_{m=1}^{3} \kappa_m r_m^n X_m^* \tag{5}$$

Substituting (5) into (1), the actual normalized profit function is derived as follows:

$$\Pi_a^n = \sum_{i=1}^{2} \rho_i^n L_i^* + \Pi_b^n - \sum_{i=1}^{2} \rho_i^n L_i^* + \sum_{m=1}^{3} \kappa_m r_m^n X_m^* - \sum_{m=1}^{3} r_m^n X_m^*$$

$$= \Pi_b^n - \sum_{m=1}^{3} (1-\kappa_m) r_m^n X_m^* \tag{6}$$

Equation (6) can be rewritten substituting eqs. (4) and (5) as

$$\Pi_a^n = \Pi_b^n + \sum_{m=1}^{3} (1-\kappa_m) r_m^n \frac{1}{\kappa_m} \frac{\partial \Pi_b^n}{\partial r_m^n} \tag{7}$$

Note that if $\kappa_m = 1$, then the behavioral normalized profit reduces to the actual normalized profit function. That is, rural bank branches are profit maximizers and price efficient.

The behavioral quadratic normalized profit function is expressed so that the partial derivatives in (7) can be substituted as follows:

$$\begin{aligned}
\Pi_b^n = {} & \alpha_0 + \sum_{i=1}^{2} \alpha_i \rho_i^n + \frac{1}{2} \sum_{m=1}^{2} \sum_{j=1}^{2} \alpha_{ij} \rho_i^n \rho_j^n \\
& + \sum_{m=1}^{3} \alpha_m \kappa_m r_m^n + \frac{1}{2} \sum_{m=1}^{3} \sum_{v=1}^{3} \alpha_{mv} \kappa_m r_m^n \kappa_v r_m^n \\
& + \sum_{i=1}^{2} \sum_{m=1}^{3} \alpha_{im} \rho_i^n \kappa_m r_m^n + \sum_{s=1}^{6} \alpha_s Z_s \\
& + \frac{1}{2} \sum_{s=1}^{6} \sum_{u=1}^{6} \alpha_{su} Z_s Z_u + \sum_{i=1}^{2} \sum_{s=1}^{6} \alpha_{is} \rho_i^n Z_s + \sum_{m=1}^{3} \sum_{s=1}^{6} \alpha_{ms} \kappa_m r_m Z_s
\end{aligned} \tag{8}$$

where Z is a vector of fixed inputs and control variables.

Fixed inputs include fixed assets. The control variables encompass the age of the bank branch, regional per-capita income, management ability as defined by years of schooling and years of banking experience of the branch manager, and type of rural bank - NCB versus development bank.

Differentiating (8) with respect to prices of inputs and outputs, gives

$$\frac{\partial \Pi_b{}^n}{\partial \rho_i{}^n} = \alpha_i + \sum_{j=1}^{2} \alpha_{ij} \rho_j{}^n + \sum_{m=1}^{3} \alpha_{im} \kappa_m r_m{}^n + \sum_{s=1}^{6} \alpha_{is} Z_s \tag{9}$$

$$\frac{\partial \Pi_b{}^n}{\partial r_m{}^n} = \alpha_m + \sum_{v=1}^{6} \alpha_{mv} \kappa_v r_v{}^n + \sum_{i=1}^{2} \alpha_{im} \rho_i{}^n + \sum_{s=1}^{6} \alpha_{ms} Z_s \tag{10}$$

Substituting (9) into (4), the behavioral demand function is derived as

$$\frac{\partial \Pi_b{}^n}{\partial r_m{}^n} = -\frac{1}{\kappa_m}\left[\alpha_m + \sum_{v=1}^{3} \alpha_{mv} \kappa_v r_m{}^n + \sum_{i=1}^{2} \alpha_{im} \rho_i{}^n + \sum_{s=1}^{6} \alpha_{ms} Z_s\right] \tag{11}$$

By substituting (9) and (10) into (7), the actual normalized profit function is derived incorporating the behavioral parameters as follows:

$$\Pi_a{}^n = \Pi_b{}^n + \sum_{m=1}^{3} \frac{(1-\kappa_m)}{\kappa_m} r_m{}^n (\alpha_m + \sum_{v=1}^{3} \alpha_{mv} \kappa_v r_v{}^n$$

$$+ \sum_{i=1}^{2} \alpha_{mi} \rho_i{}^n + \sum_{s=1}^{6} \alpha_{ms} Z_s \tag{12}$$

Note that if $\kappa_m = 1$, then $\Pi_a{}^n = \Pi_b{}^n$. The actual normalized profit, substituting equation 8 into eq. (11), is finally derived as

$$\Pi_a^n = \alpha_0 + \sum_{i=1}^{2} \alpha_i \rho_i^n + \frac{1}{2}\sum_{i=1}^{2}\sum_{j=1}^{2} \alpha_{ij} \rho_i^n \rho_j^n + \sum_{m=1}^{3} \alpha_m \kappa_m r_m^n$$

$$+ \frac{1}{2}\sum_{m=1}^{3}\sum_{v=1}^{3} \alpha_{mv} \kappa_m r_m^n \kappa_v r_v^n + \sum_{i=1}^{2}\sum_{m=1}^{3} \alpha_{im} \rho_i^n \kappa_m r_m^n$$

$$+ \sum_{s=1}^{6} \alpha_{zs} Z_s + \frac{1}{2}\sum_{s=1}^{6}\sum_{u=1}^{6} \alpha_{su} Z_s Z_u + \sum_{i=1}^{2} \alpha_{is} \rho_i^n Z_s$$

$$+ \sum_{m=1}^{3} \alpha_{ms} \kappa_m r_m^n Z_s + \sum_{m=1}^{3} \frac{(1-\kappa_m)}{\kappa_m} r_m^n$$

$$(\alpha_m + \sum_{v=1}^{3} \alpha_{mv} \kappa_v r_m^n + \sum_{i=1}^{2} \alpha_{mi} \rho_i^n + \sum_{s=1}^{6} \alpha_{ms} Z_s) \qquad (13)$$

Equation (13) is the estimating actual normalized profit function. The system of estimating equations consists of the actual normalized profit function (13), two supply equations (9) and two factor demand equations (11). There is no adding up problem in the quadratic function.

The parameters in equations (9), (11) and (13) were estimated using the Maximum Likelihood Estimator on pooled data from 84 randomly selected rural bank branches for 1987 and 1988. Because of the large number of parameters and the limited number of observations, the symmetry condition was imposed. The data for 1987 and 1988 were collected directly from the branches through a structured questionnaire. The prices of loans were defined as loss-adjusted interest rates, $(1-\theta_i)\rho_i^n$, where i=target and non-target loans; ρ^n is the normalized nominal interest rate; and θ_i refers to degree of interest loss varying

between 0 and 1 for loan type i. θ_i was determined based on the classification of overdue rural loans by the Bangladesh Bank. It classifies overdue loans into substandard (no payment received in three years), doubtful (no payment received in five years) and bad (no payment received in five years and some other unique circumstances such as death of borrowers). The central bank requires that zero, 50 percent and 100 percent provisions are made, respectively, for substandard, doubtful and bad loans during the year the classification is made. If there are no doubtful or bad overdue loans, then there is no interest loss. Thus, θ_i is the ratio of doubtful and bad overdue loans to total overdue loans. Wages and deposit interest rates were defined as weighted annual average wages and interest rates. Bank type was introduced as a dummy variable: 1 for NCBs and 0 otherwise. Reported profits were adjusted for interest loss. The price and profit variables were normalized by the interest of netput. About 38 percent of the rural branches were unprofitable based on reported profits, and this proportion increased to 46 percent when profits were adjusted for interest loss only. When profits were adjusted for both interest and principal losses, then 67 percentage of the rural bank branches were unprofitable. These results show the impact of loan recovery problems on rural bank profits.

ANALYSIS OF THE RESULTS

The definition of the variables used in the study is reported in Table 1 and the parameter estimates are presented in Table 2. The empirical results are consistent with expectations, and most of the variables are statistically significant. Economic efficiency was tested both in absolute and in relative terms. The Wald chi-square test rejected the null

hypothesis of absolute price efficiency with respect to labor and deposits (Kw=1, Kd=1). The estimated coefficient of 3.29 being greater than 1 for Kw implies that the marginal cost of labor is less than marginal revenue. The estimated coefficient of 0.20 (less than 1) for Kd suggests that the marginal cost of deposits is higher than their marginal revenue. In other words, these results imply that labor is underutilized and deposits are costly.

The relative price efficiency with respect to the inputs of labor and deposits was also tested to evaluate the marginal technical substitution between the two inputs. To equate the marginal rate of technical substitution with the factor price ratio, Kw must be equal to Kd. The Wald chi-square test rejected the null hypothesis implying that the branches are not operating on the profit maximizing input expansion path.

The relative price efficiency with respect to inputs by bank type was tested by evaluating the parameters A39 and A49. If A39 and A49 are insignificant, then there is no relative price efficiency. The sign of A39 is positive , while A49 is negative. The Wald chi-square test rejected the null hypothesis that A39=0 and A49=0. This result suggests that the NCB branches are relative price efficient with respect to wages, while the development bank branches are relative price efficient with respect to deposit interest rates.

The relative output price differences for the NCB and development bank branches were tested by evaluating the interaction parameters of target and non-target interest rates with respect to the bank dummy variables (A19 and A29). The Wald chi-square test rejected the null hypothesis that A19=0, but could not reject A29=0. Since the coefficient of A19 is negative and significant, the development bank branches have a higher average effective

price in target loans than the commercial bank branches. In addition, there is no significant difference in effective non-target interest rates between commercial and development banks.

The relative technical efficiency by bank was examined by evaluating the parameters A9, ALB and ADB. The partial differentiation of profit with respect to the bank type variable, evaluating at the geometric means, showed that the NCB branches are not relative price efficient compared to the development bank branches. This result is further supported when relative technical efficiency is evaluated in terms of deposits and loans.

The relative technical efficiency of banks in terms of loans and deposits is examined by evaluating the parameters ALB and ADB. The parameter ALB is negative and significant. The Wald chi-square test rejected the null hypothesis that ALB=0 suggesting that the development bank branches are relative technical efficient with respect to loans made. On the other hand, the insignificant coefficient for the parameter ADB suggests that there is no significant difference in technical efficiency with respect to deposits.

SUMMARY AND POLICY IMPLICATIONS

The empirical results of the profit function are consistent with expectations. The rural banks in Bangladesh are neither profit maximizers nor absolute price efficient. However, development banks are relative price efficient in deposits, while the NCBs are relative price efficient in wages. The rural branches are not price efficient because of the constraints imposed by the central bank, and because of government interventions in rural loan allocation and recovery. However, neither the NCB nor the development banks differ in the effective average price of non-target loans but the development banks have a higher

average effective target loan interest rates. These results suggest that development bank branches are more efficient in making target loans because, by definition of effective interest rates, their target loan loss is lower than the NCBs. This results is also supported by the fact that development banks are relatively more technical efficient in making loans. No bank is technical efficient in deposit mobilization.

These findings are different from the previous studies cited that argued that commercial banks are more efficient than development banks. This study is an improvement over previous studies because it directly compared the rural branches of commercial and development banks that compete within the same market areas. It is possible, of course, that at the aggregate level the NCBs may be relatively more efficient than development banks since a larger portion of their loan portfolio is urban, while the development banks are generally restricted to rural operations.

A major issue is how the efficiency of both commercial and development banks can be increased so that the performance of rural financial markets can be improved and the central bank subsidies reduced. There are two plausible alternatives: first, liberalize the territorial restrictions for development banks so they can open urban branches and directly compete with the NCBs for urban deposits and investments. By expanding their volume, they can also reap the benefits of their relative price and technical efficiency in rural financial markets. Alternatively, commercial banks that can cross subsidize their rural operations with profits from urban branches may be encouraged to increase their rural loan portfolio. This will reduce the demand for central bank subsidies for rural lending, and will force the urban bank customers to pay for the inefficiency of rural operations. But since the development

banks are relatively more technical and price efficient in rural areas, the first option is expected to be more effective because: (a) it will also encourage the NCBs to improve their efficiency; and (b) the amount of central bank subsidy will decline since development banks will be able to increasingly finance rural lending with urban deposits.

The results of this study suggest that although agricultural development banks generally have had a bad experience in developing countries, it is not universally true that they are less efficient than commercial banks in rural lending. These results from Bangladesh show that both types of banks have serious problems in making and recovering rural loans, but the development banks have some advantages compared to commercial banks. This may stem from their longer experience in making loans and the fact that the NCBs tend to concentrate more of their efforts in mobilizing rural deposits for use in urban lending. Unlike the situation in some other countries, the situation in Bangladesh does not imply closing down development banks and encouraging commercial banks to expand their rural lending operations but to stimulate improvements in efficiency for both types of banks.

Table 1

Parameters and Variables in the Profit Function

Parameter	Variable	Definition
A1	TLRATE	Target Loan Interest Rate
A2	NTLRATE	Non-Target Loan Interest Rate
A3	WAGE	Average Wage Per Employee
A4	DEPRATE	Average Weighted Deposit Interest Rate
A5	AGE	Age of Rural Bank
A6	EDU	Education of Bank Manager
A7	EXP	Experience Level of Bank Manager
A8	GDP	Regional Per-Capital Income
A9	BANK	Dummy Variable: 1 for NCB, 0 otherwise
AF	FXAST	Fixed Assets
AD	DEPOSITS	Total Deposits
AL	LOANS	Total Loans
ALB	LONBANK	Interaction of Loans and Bank Type
ADB	DEBANK	Interaction of Deposits and Bank Type
A11	TLRATE2	Quadratic Term of Tlrate
A12	TLNTL	Interaction of Tlrate and Ntlrate
A13	TLWAGE	Interaction of Tlrate and Wage
A14	TLDEP	Interaction of Tlrate and Deprate
A16	TLEDU	Interaction of Tlrate and Education
A17	ELEXP	Interaction of Tlrate and Experience
A18	TLGDP	Interaction of Tlrate and GDP
A19	TLBANK	Interaction of Tlrate and Bank Type
A22	NTLRATE2	Quadratic Term of Ntlrate
A23	NTLWAGE	Interaction of Ntlrate and Wage
A24	NTLDEP	Interaction of Ntlrate and Deprate
A26	NTLEDU	Interaction of Ntlrate and Education
A27	NTLEXP	Interaction of Ntlrate and Experience
A28	NTLGDP	Interaction of Ntlrate and GDP
A29	NTLBANK	Interaction of Ntlrate and Bank Type
A33	WAGE2	Quadratic Term of Wage
A34	WAGEDEP	Interaction of Wage and Deprate
A36	WAGEEDU	Interaction of Wage and Education
A37	WAGEEXP	Interaction of Wage and Experience
A39	WAGEBANK	Interaction of Wage and Bank Type
A44	DEPRATE2	Quadratic Term of Deprate
A46	DEPEDU	Interaction of Deprate and Education
A47	DEPEXP	Interaction of Deprate and Experience
A48	DEPGDP	Interaction of Deprate and GDP
A49	DEPBANK	Interaction of Deprate and Bank Type
A55	AGE2	Quadratic Term of Age
A66	EDU2	Quadratic Term of Education
A67	EDUEXP	Interaction of Education and Experience
A77	EXP2	Quadratic Term of Experience
A88	GDP2	Quadratic Term of GDP

Table 2

Parameter Estimates of the Normalized Profit Function

Parameter	Coefficient	T-ratio	Parameter	Coefficient	T-ratio
A0	-1.44	-1.81*	A23	-6.58	-4.11*
A1	2.38	11.08*	A24	-53.60	-3.24*
A2	0.78	2.75*	A26	2.10	1.45**
A3	-3.73	-5.24*	A27	-4.53	-2.73*
Kw	3.29	6.37*	A28	8.81	0.76
A4	-0.19	-2.67*	A29	-0.02	-0.05
Kd	0.20	7.17*	A33	0.78	1.11***
A5	2.71	1.12***	A34	40.94	5.72*
A6	-2.05	-0.29	A36	-1.50	-3.11*
A7	8.21	1.18***	A37	-0.33	-1.94*
A8	-78.74	-4.37*	A39	1.95	2.81*
A9	1.96	2.52*	A44	-1,070.20	-3.05*
AF	-0.38	-1.85*	A46	-8.28	-5.22*
AD	-0.04	-1.21***	A47	4.51	2.41*
AL	0.16	20.42*	A48	64.33	2.46*
A11	288.94	6.99*	A49	-0.12	-1.57**
A12	-28.94	-1.43**	A55	-0.07	-0.98
A13	3.27	1.08***	A66	0.18	0.56
A14	-15.84	-0.52	A77	-0.14	-1.66*
A16	-10.14	-3.17*	A67	0.15	0.62
A17	-1.01	-0.56	A88	5.00	1.76
A18	24.43	2.28*	ADB	0.01	0.42
A19	-1.25	-5.05*	ALB	-0.09	-8.42
A22	81.29	3.26			

Note: * Significant at 5 percent level.
** Significant at 10 percent level.
*** Significant at 15 percent level.

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