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

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Abstract

This paper presents an analysis of the relative economic efficiency of rural commercial and development banks in Bangladesh using a normalized profit function. Contrary to the experiences of other developing countries, the development banks are relatively more technical and price efficient in producing loans than commercial banks.

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In many developing countries, both agricultural development banks and commercial banks are used to disburse cheap funds to agriculture. But policymakers, donor agencies and academicians are usually more concerned with the performance of development banks than with commercial banks because of the high social cost of subsidies associated with development bank operations. Are commercial banks really more efficient than development banks in rural financial markets? The answer to this question has policy implications for improving the performance of rural financial markets. But there have been few studies to carefully test the relative efficiency of rural commercial and development banks. As a result, the suggestion that commercial banks are more efficient may be a mis-representation and their expansion may not lead to the efficient performance of rural financial markets.

It is frequently argued in the rural finance literature that development banks are not efficent because of (a) high default rates (Von Pischke); (b) financial indiscipline due to political intervention of the government (Blair; Kane; Von Pischke); and (c) imperfect information and high costs of supervision (Bourne and Graham; Cuevas and Graham; Graham and Bourne). Some researchers have provided empirical evidence suggesting that commercial banks perform better than development banks (e.g., Cuevas and Graham;

Graham and Bourne). But this evidence is rather questionable because most studies have failed to directly compare commercial and development banks 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 for commercial banks than development banks. As a result, the findings of these studies may be misleading. Strong policy conclusions can only be generated by using rural bank data that compares banks operating in the same market.

This study is unique because it uses rural bank data from commercial and development bank branches in Bangladesh to directly test the relative economic efficiency of the two branch types.

THE BANGLADESH RURAL BANKING SYSTEM

Since independence in 1971, there have been several structural changes in the Bangladesh banking system. All commercial banks, except foreign banks, were nationalized in March, 1972. Six banks were created out of the twelve nationalized commercial banks (NCBs). In addition, there are three development banks - one for industrial development and the other two for agricultural development. Agricultural development banks have been operating in rural areas since 1962.

Beginning in 1977, commercial banks were induced to disburse more rural loans. During the 1978-81 period, all banks were required to open two rural branches for every new urban branch authorized under a "two-for-one" branching policy. Currently about 67 and 91 percent of the NCB and development bank branches, respectively, are rural. But only 24 percent of the total NCB loan portfolio is rural, and the NCBs share of total rural

lending is only 34 percent (Bangladesh Bank). Because of their specialization and long experience in rural lending, there are reasons to believe that development banks may be more efficient than commercial banks, contrary to the experience found in some other developing countries.

ECONOMIC EFFICIENCY

A bank is economically efficient if it operates with botn technical and price efficiency (Richard and Villanueva). Consider the production function of two banks:

$$Q_1 = A_1F(X_1); \quad Q_2 = A_2F(X_2)$$

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 technical 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 technical 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 technical efficient but not price efficient.

The usual marginal condition of profit maximization does not hold for banks that are price inefficient and pursue diverse goals other than maximizing profits. In this situation, the marginal conditions are given by -

$$P(A^j\partial Q^j/\partial X^j) = \kappa^j_i r^j_i \qquad (1)$$

where, i, j,r,κ refer to input type, bank type, input price, and a constant parameter to distinguish between profit maximizing and non-profit maximizing banks, respectively. If $\kappa = 1$ then the bank is profit maximizer and 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. This may be the case with the nationalized banking sector in Bangladesh when banks pursue the objectives set by the government. Lau, and Lau and Yotopoulos argued that the revised marginal condition is consistent with over-or-under valuation of the opportunity costs of the resources, and the satisficing behavior of a firm.

THE EMPIRICAL MODEL

A normalized profit function is used to test the relative economic efficiency of commercial and development bank branches in Bangladesh so that the function can differentiate between profit maximizing and satisficing firms, and can avoid simultaneous bias between quantity and price (Lau; Lau and Yotopoulos). The empirical model is developed following the 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).

The rural bank branches make two types of loans - refinanciable target loans (government sponsored loan programs), L_τ and non-target commercial loans, $L_{\pi\tau}$. In addition, they can lend to (L_h) and borrow from (B_h) their head office. Interest rates on target and non-target loans are set by the Central Bank and are uniform across branches, but interest rates on loans to or from the head office are set by the head office.

Target loan terms and conditions of disbursement and recovery are set by the Central Bank. Risks for target loans are higher than for non-target loans because of government intervention in target loan allocation and recovery to achieve political objectives (Blair; Kane; Khalily and Meyer). As a result, some portion of interest and principal may never

be recovered. It is assumed that branch managers consider effective interest rates (adjusted for loan losses) in allocating financial resources. The loss adjusted target loan interest rate is defined as ρ_{τ} and the loss adjusted non-target loan interest rate as $\rho_{\eta\tau}$. Loans to the head office are risk free. In Bangladesh, interest rates on loans to and from the head office are the same, and they are expressed as a single price of netput, $(L_h\text{-}B_h)$.

Target loans are largely refinanced by the Central Bank at interest rates lower than the interest rates paid on deposits. In other words, banks receive an interest subsidy for making target loans if they rediscount them with the Central Bank. The development banks refinance most of their loans and, therefore, receive a large subsidy from the Central Bank. They are more oriented towards making loans than mobilizing deposits. The interest subsidies obtained from refinanced loans are retained by the head office rather than passed on to individual branches. Our study showed that about 65 percent of the NCB branches are net lenders to their head office, and about 85 percent of the development bank branches are net borrowers from their head office. This implies that development bank branches generally make more loans than they mobilize in deposits while the NCB branches essentially mobilize deposits to transfer to their head offices.

Rural branches use two major inputs - deposits and labor - in loan production. If rural deposits mobilized by branches are insufficient to meet loan demands, branches can borrow from their head office at interest rates lower than the refinance rates. Interest rates on deposits of different types are set by the Central Bank, and the wages of branch employees are set by the government. Branches vary in the cost of deposits and labor by varying their mix of deposits and employees (officers and staff).

Given the above framework and following Lau, and Lau and Yotopoulos, the normalized profit function for testing absolute and relative efficiency is specified as follows[1]:

$$\begin{aligned}\Pi_a &= \alpha_0+\sum_{i=1}^{2}\alpha_i\rho_i+\frac{1}{2}\sum_{i=1}^{2}\sum_{j=1}^{2}\alpha_{ij}\rho_i\rho_j+\sum_{m=1}^{2}\alpha_m\kappa_m r_m \\ &+\frac{1}{2}\sum_{m=1}^{2}\sum_{v=1}^{2}\alpha_{mv}\kappa_m r_m\kappa_v r_v+\sum_{i=1}^{2}\sum_{m=1}^{2}\alpha_{im}\rho_i\kappa_m r_m+\sum_{s=1}^{5}\alpha_s Z_s \\ &+\frac{1}{2}\sum_{s=1}^{5}\sum_{u=1}^{5}\alpha_{su}Z_s Z_u+\sum_{i=1}^{2}\alpha_{is}\rho_i Z_s+\sum_{m=1}^{2}\alpha_{ms}\kappa_m r_m Z_s \\ &+\sum_{m=1}^{2}\frac{(1-\kappa_m)}{\kappa_m}r_m(\alpha_m+\sum_{v=1}^{2}\alpha_{mv}\kappa_v r_v+\sum_{i=1}^{2}\alpha_{mi}\rho_i+\sum_{s=1}^{5}\alpha_{ms}Z_s)\end{aligned} \tag{2}$$

where i= target, non-target loans; m= deposits, labor, and Z is a vector of fixed inputs and control variables. The fixed inputs include fixed assets, and the control variables represent age of branch, regional per-capita income, total deposits and loans, and branch managers' management ability measured by years of schooling and banking experience levels. By duality, loan supply (eq.3) and factor demand functions (eq.4) are specified as follows -

$$L_i = \alpha_i+\sum_{j=1}^{2}\alpha_{ij}\rho_j+\sum_{m=1}^{2}\alpha_{im}\kappa_m r_m+\sum_{s=1}^{5}\alpha_{is}Z_s \tag{3}$$

$$X_m = -\frac{1}{\kappa_m}\left[\alpha_m+\sum_{v=1}^{2}\alpha_{mv}\kappa_v r_m+\sum_{i=1}^{2}\alpha_{im}\rho_i+\sum_{s=1}^{5}\alpha_{ms}Z_s\right] \tag{4}$$

where X refers to the inputs of deposits and labor.

The parameters in eqs. (2) thru (4) were estimated as a system using the Maximum Likelihood Estimator on pooled data from 84 randomly selected rural banks for 1987 and 1988. Because of the large number of parameters and limited number of observations, the

[1] Details of the model are available from the authors on request.

symmetry condition was imposed. Data for 1987 and 1988 were collected directly from the branches through a structured questionnaire. Prices of loans were defined as interest loss adjusted interest rates, $(1-\theta_i)\rho^n_i$, where i=target and non-target loans; ρ^n is the nominal interest rate; and θ_i refers to degree of interest loss which varies between 0 and 1. θ_i was determined based on the classification of overdue rural loans by the Central Bank. It classifies overdue loans into substandard (no payment received in three years), doubtful (no payment received in 5 years), and bad (no payment received within 5 years of due date, and some other unique circumstances such as death of borrowers). The Central Bank requires that no, 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, there 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 rate of netput. About 38 percent of the rural branches based on reported profits were unprofitable, and this proportion increased to 46 percent when profits were adjusted for interest loss. Interest rates on netput for the NCB branches were 12.5 percent, and 9.5 percent for the development bank branches.

ANALYSIS OF THE RESULTS

The parameter estimates along with the definition of variables are reported in Table 1. The results are consistent with expectations, and most of the variables are statistically

significant. Economic efficiency was tested both in absolute and 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, labor is underutilized and deposits are costly.

The relative price efficiency with respect to the inputs, 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 this 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 was tested by evaluating the parameters A_{39} and A_{49}. If A_{39} and A_{49} are insignificant, then there is no relative price efficiency. The sign of A_{39} is positive, while A_{49} is negative. The Wald chi-square test rejected the null hypothesis that $A_{39}=0$ and $A_{49}=0$. This result suggests that NCBs are relative price efficient with respect to wages, while development banks are relative price efficient with respect to deposit interest rates.

The relative output price differences for the commercial and development banks were tested by evaluating the interaction parameters of target and non-target interest rates with the bank dummy variables (A_{19} and A_{29}). The Wald chi-square test rejected the null hypothesis that $A_{19}=0$, but could not reject $A_{29}=0$. Since the coefficient of A_{19} is negative and significant, the development banks have a higher average effective price in target loans

than NCBs. 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 A_9, A_{lb} and A_{db}. 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 technical efficient compared to development banks. This result is supported further 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 A_{lb} and A_{db}. The parameter, A_{lb}, is negative and significant. The Wald chi-square test rejected the null hypothesis that $A_{lb}=0$ suggesting that development banks are relative technical efficient with respect to loans made. On the other hand, the insignificant coefficient for parameter, A_{db}, 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. Rural banks in Bangladesh are neither profit maximizers nor absolute price efficient. However, development banks are relative price efficient in deposits, while NCBs are relative price efficient in wages. The rural branches are not price efficient because of the constraints imposed by the government. However, neither commercial nor development banks differ in the effective average price of non-target loans but the development banks have higher average effective target loan interest rates. These results suggest that development bank branches are more efficient in making target loans because, by the definition of effective

interest rates, their target loan loss is lower than commercial banks. This result 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 previous studies 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. It is possible, however, that at the aggregate level commercial banks may be relatively more efficient than development banks since a large portion of their total 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 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 commercial banks 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 be more effective because: (a) it will also force commercial banks to improve their efficiency, and (b) the amount of subsidy from the Central Bank will decline

since development banks will be able to increasingly finance rural lending with urban deposits.

Table 1
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	6.27*	A28	8.87	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*			
			R-Square = 0.99		

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

Parameters and Variables in 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 DEPOSIT INTEREST RATE
A5	AGE	AGEOF RURAL BANK
A6	EDU	EDUCATION OF BANK MANAGER
A7	EXP	EXPERIENCE LEVEL OF BANK MANAGER
A8	GDP	PER CAPITA AGRICULTURAL GDP AT UPAZILLA LEVEL
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 EDU
A17	TLEXP	INTERACTION OF TLRATE AND EXP
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 EDU
A27	NTLEXP	INTERACTION OF NTLRATE AND EXP
A28	NTLGDP	INTERACTION OF NTLRATE AND GDP
A29	NTLBANK	INTERACTION OF NTLRATE AND BANK
A34	WAGEDEP	INTERACTION OF WAGE AND DEPRATE
A36	WAGEEDU	INTERACTION OF WAGE AND EDU
A37	WAGEEXP	INTERACTION OF WAGE AND EXP
A39	WAGEBANK	INTERACTION OF WAGE AND BANK
A44	DEPRATE2	QUADRATIC TERM OF DEPRATE
A46	DEPEDU	INTERACTION OF DEPRATE AND EDU
A47	DEPEXP	INTERACTION OF DEPRATE AND EXP
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 EDU
A77	EXP2	QUADRATIC TERM OF EXP
A67	EDUEXP	INTERACTION OF EDU AND EXP
A88	GDP2	QUADRATIC TERM OF GDP

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