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X-efficiency, Scale Economies, Technological Progress and Competition: A Case of Banking Sector in Pakistan

Abdul Qayyum
Associate Professor
Pakistan Institute of Development Economics, Islamabad

and

Sajawal Khan
Research Associate
Pakistan Institute of Development Economics, Islamabad

PAKISTAN INSTITUTE OF DEVELOPMENT ECONOMICS
ISLAMABAD

Pakistan Institute of Development Economics
Islamabad, Pakistan

E-mail: publications@pide.org.pk
Website: http://www.pide.org.pk
Fax: +92-51-9210886

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ABSTRACT

This study aims at empirical investigation of the x-efficiency, scale economies, and technological progress of commercial banks operating in Pakistan using balance panel data for 29 banks. As banking sector efficiency is considered as a precondition for macroeconomic stability, monetary policy execution, and economic growth. We also make efficiency comparisons between the domestic and foreign banks and big banks. Our results indicate that the domestic banks operating in Pakistan are relatively less efficient than their foreign counterparts for the period 2000-05. The scale economies for small banks, especially foreign banks are higher. Our results suggest the existence of technological progress for all groups of banks for the year 2000 and onward. It was lowest for big banks in 2000 and highest for foreign banks in 2005. Again, technological progress is lower for domestic banks relative to foreign banks.

The results show also that the market share of big five banks are declining over the period but average interest spread shows fluctuations. The main conclusions that can be drawn from these results are that mergers are more likely to take place, especially in small banks. If the mergers do take place between small domestic banks and foreign banks, these will reduce cost due to scale economies as well as x-efficiency (because foreign banks are x-efficient relative to small domestic banks). Even if mergers do take place between small and big banks, cost will reduce without conferring any monopolistic power to these banks. This will also help in stability of the financial sector, which is an important concern of the State Bank of Pakistan (SBP). So the best policy option for SBP is to encourage mergers, while keeping a check on interest spread, so that the benefits from reduction in cost due to mergers are passed on to depositors and borrowers.

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1. INTRODUCTION

The financial sector plays an important role in the economic growth, and banking sector a part of financial sector facilitates the economic activities in capacity of intermediaries between lender and borrowers. That is why the researchers as well as the policy-makers have been concerned with the issue of banking sector efficiency. The banks transform their various inputs into multiple financial products, and the efficient way the banking sector transform these input into financial products may followed by macroeconomic stability [Ngalande (2003)]. It has also important role in effective execution of monetary policy [Hartman (2004)], furthermore, efficient allocation by banks play a central role in economic growth [Galbis (1977)].

There is a strong empirical support for positive link between financial intermediation and economic growth. A wide acceptance of this link also exists and financial development used as a determinant in growth model over the past several decades [Gurley and Shaw (1955) and Goldsmith (1969)]. The positive relationship could be either through factor accumulation or through increase in efficiency [Collins (2002)]. It is the efficiency which is more important because mere factor accumulation could not stimulate economic growth [Slutz (2001)]. The efficient financial intermediation mechanism allocates the credit to more productive sectors in optimal way. In addition, this efficient financial intermediation mechanism also promotes innovations, because of high return on investment, with positive implications for economic growth [Luccheti (2000)].

Economic efficiency can be decomposed into two basic components: technical efficiency and price efficiency (allocative efficiency). A firm is said to be technically more efficient than another firm if it can produce more output using a given amount of inputs as compared to another firm [Yotopulas and Lau (1973)]. While it is regarded as an allocatively efficient if profit maximisation implies that marginal cost of the firm will be equal to marginal revenue of the firm.

Efficiency is linked to more controversial issues like competition, economies of scale and regulation, with trade offs among these concepts. Efficiency and competition are closely linked together. In competitive banking system, banks must operate efficiently. The absence of such a competition results into higher prices by restricting output or collusion of the banks with one an other. The competition and efficiency depend upon the number of banks operating in the market, freedom of entry and exit, and ability of banks to

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achieve an appropriate size (economies of scale) for serving their customers. Smaller number of banks in the market could encourage the monopolisation and collusion, while sub-optimal size of bank may leads to inefficiency. Another trade off is between competition and stability of the banking sector. The competition among the banks results into banks failure because of high risk taking behaviour of banks. Matutes and Vive (2000) argue that banks pose too high deposits rate when social failure cost is high. Cordella and Yeyati (1998) find that competition in deposits rate encourages the banks to take risky investments. The competition induces also gambling between banks [Hellman, *et al.* (2000)]. It is here that regulation comes in. However, too much regulation either to curb such competition or monopolistic power is dangerous. So that regulation should be such that it keeps balance between these forces in conflicting directions.

Efficiency of banking sector becomes more important in the vent of liberalisation and globalisation of financial market. The liberalistion and globalisation of financial market pose new challenges as well as provide opportunities to banking industries in developing countries like Pakistan. Furthermore, the Basel Accord II, which is to be implemented next year, and Pakistanis is one of the signatory of this accord, may lead to merger of the banks.

Therefore is a dire need to probe into these issues which are essential for survival in this globalised and liberalised environment. There are only a few studies [Din, *et al.* (1996); Limi (2003); Akhter (2002) and Kiani (2005)] that attempted to investigate the relative technical efficiency for the banking sector of Pakistan. But no study investigating scale economies, and technological progress exists. This study is an attempt in this regard. The objective of this study is to measure the cost efficiency, scale economies, and technological progress of Pakistani commercial banks. The study will also investigate the impact of scale economies upon level of competition and efficiency of the banking sector in Pakistan, using Fourier-Flexible cost function. Panel data from 1998 to 2005 are used for analysis.

The organisation of the study is as follows. Section 2 reviews the existing empirical studies on the banking sector. Section 3 presents different approaches to measure the efficiency. Section 4 discusses the methodology of our model, sources of data, specification of inputs and output of the banking sector and construction of different variables. Section 5 gives the interpretation of the results on the cost structure of the banking sector. Finally, Section 6 consists of summary and concluding remarks.

2. REVIEW OF LITERATURE

There exists huge literature empirically estimating the efficiency, scale economies, and technological progress. Review of few studies is presented here.

Aly, *et al.* (1990) analysis on the nature of technical, scale and allocative efficiency of US banks, come up with the results that on average, the banks are scale efficient. However, the technical efficiency is negatively related to product diversity, and positively related to the extent of urbanisation. Yuergert (1993) used cross section data of 805 companies for the year 1989 and the translog cost function in estimation. His results show that there was a substantial amount of X-inefficiency in the industry, but the difference across firm's size was insignificant. Zardkoohi and Kolari (1994) analysd empirical estimates of scale and scope economies for 615 branch offices representing 43 saving banks in Finland for the year 1988. Their result suggested that there are economies of scale for individual branch offices. Favero and Papi (1995) analysd efficiency of the Italian banking sector. They used both parametric and non-parametric methods to make a comparison between these two approaches on a sample of 174 Italian banks for the year 1991 and found that the Italian banking industry features high variability in all the cost and profitability indicators. Chang, *et al.* (1998) conducted a comparative analysis of productive efficiency of foreign-owned multi-national banks and US-owned multinational banks operating in the US for the years 1984–1989. Their results indicate that average inefficiency score of the US multi-national banks was significantly lower than the average inefficiency score posted by the foreign owned multi-national banks. Altunbas, *et al.* (1999) estimated the impact of technical change on the costs of European banks using the stochastic cost frontier. The data set of 3779 banks, based in 15 European countries, for the year 1989 to 1996 was used. The results suggest that the annual rate of total cost reduction, attributable to technical change, to be very strongly correlated with the bank size. Chen (2001), using data from 1988-97, found banks' X-efficiency had substantially increased in Taiwan's deregulated banking market. Hassan and Marton (2003) concluded that bank reforms in Hungary improved X-efficiency scores between 1993 and 1998. Hao *et al.* (2001), using data from 1985-1995, reported that financial reforms in Korea had little or no significant effect on banks' X-efficiency. Isik and Hassan (2002) found that following liberalisation (1988–1996), Turkish banks' X-efficiency worsened over time, as did Hardy and Patti (2001), when they computed the X-efficiency of all Pakistani banks during a period of deregulation, 1993-1998. There are only few studies measuring banks efficiency for Pakistan banking sector. Din, *et al.* (1996) examined the scale and scope efficiency of the Agriculture Development Bank of Pakistan. Their result showed that the bank's production technology exhibits both overall and product-specific economies of scale. Hardy and Emilia (2001) estimated profit, cost, and revenue function to measure the efficiency of Pakistani banks. Their results suggest that much of the benefits of reform were passed on to consumers of the banks output and those supplying the banks with inputs. Both public and private banks made progress in improving cost efficiency and that private banks seemed

more successful in expanding their revenue base and in this way regaining profit in Pakistan. Limi (2003) examined the changes in technical efficiency of Pakistani banking industry after the structural reform started in 1990s. His result show that the impact of the structural adjustment programmes varies among banks. Some banks are found to have improved their technical efficiency during the reform period, while the efficiency improvement of other banks was ambiguous. Kiani (2005) investigated empirically the technical efficiency of commercial banks operating in Pakistan and made efficiency comparisons between the domestic and foreign banks. Her results indicate that the domestic banks operating in Pakistan are relatively less efficient than their foreign counterparts.

3. APPROACHES

Different approaches have been used to measure the cost efficiency for banking industry. Earlier, financial ratios were used to measure the banks performance. The problem with this approach is that it relies heavily on the bench mark ratios, which could be misleading as changes in these ratios may be as a result of a change in either numerator or denominator values rather than to changes in the overall ratio [Demirgüç-Kurt and Huizinga (1998)]. These ratios make no distinction among X-efficiency, scale efficiency and scope efficiency as source of bank performance [Akhavein, Berger, and Humphrey (1997)] Furthermore these ratios do not capture the long term performance [Sherman and Gold (1985); Sathye (2001)]. Farrell (1957) introduces the basic framework for measuring inefficiency, which is defined as "deviation of actual from optimum behaviour." The frontier establishes the optimum benchmark against which deviations are calculated. The two widely used concepts in this frontier approach are cost and profit efficiencies i.e. how far the firm's cost/profit is from the most efficient firm which produces same output. This technique to measure efficiency can further be divided in parametric and non-parametric approaches. The parametric approach includes Stochastic Frontier Analysis (SFA), the Free Disposal Hull, Thick Frontier, and Distribution Free Approach (DFA). While non-parametric approach is Data Envelop Analysis (DEA). All of these approaches have their own merits and demerits. The SFA was developed independently Aigner, *et al.* (1977). The primary advantage of this approach is to separate the random noise from inefficiency components. The main criticism on this approach is that the distributional assumptions to be used are overly restrictive in estimation using a single year's data [Allen and Rai (1996)]. However, this assumption can be avoided by using panel data. The Distribution Free Approach (DFA) developed by Schmidt and Sickles (1984) uses panel data with assumption of constant inefficiency over time. The main advantage of non-parametric i.e. DEA is that it permits analysis of small size. The disadvantage of this approach is that it measure efficiency in relative term.

4. METHODOLOGY AND DATA

4.1. Methodology and Estimation Procedure

This study uses panel data and assumes that inefficiency varies across the observations and over the time, therefore use of DFA approach is appropriate though the SFA and DFA provide the efficiencies estimates that are consistent to each other [Berger and Mester (1997)] the latter is more appropriate in the case of balance panel data, because it allow the estimation of standard models of fixed and random effects without any assumption about the distribution of the inefficiency term [Adongo, *et al.* (2005)]. DFA specifies a functional form for the best practice frontier that estimates alternative X-efficiency for each bank. This estimate is then used to determine the difference between its average residual and the average residual of the best practice bank on the frontier, which gives a single alternative cost/profit X-efficiency measure for each bank. DFA gives a better indication of a bank's longer-term performance than any of the other methods, which rely on a bank's performance under a single set of circumstances [Berger and Humphrey (1997)]. DFA uses less arbitrary assumptions than SFA to disentangle inefficiencies from random error.

4.2. Functional Form

Due difference in degrees of dispersion of "Nonparametric" and "Parametric" techniques, these rank the same banks differently [Adong, *et al.* (2005)]. To avoid this problem, one way is to add more flexibility to the parametric approaches while introducing a degree of random error into the nonparametric approaches. Fourier-flexible function (FFF) has been adopted for the parametric approaches in this context. It is a global approximation that adds orthogonal, Fourier, trigonometric (sine and cosine) terms to a standard translog function [Berger and Humphrey (1993)]. This provides more freedom to the data in choosing the shapes for the best practice frontier, by increasing the flexibility and allowing for many inflection points that help fit the frontier to the data wherever it is most needed [Adongo, *et al.* (2005)].

The cost function is defined by Aigner, *et al.* (1977) and Meeusen and Broeck (1977) as:

$$C_i = f(p_k, y_{i,,}\varepsilon_i) \qquad i = 1,\ldots, n \qquad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (1)$$

Where C represents total costs, y_i represents various products or services produced; p_k represents the prices of inputs used, and ε represents a random disturbance term which can be further decomposed as

$$\varepsilon_i = u_i + v_i \qquad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (2)$$

Where u_i represent endogenous factor and v_i refers to exogenous one. With assumption of seperability of u_i and v_i multiplicatively from rest of cost function, we can write the Equation (1) in log form as under:

$$\ln C_i = f(p_k, y_i) + ln\ u_i + ln\, v_i \quad \ldots \qquad \ldots \qquad \ldots \qquad \ldots \qquad (3)$$

The relative efficiency of the firm is measured as the ratio, $\lambda = \frac{\sigma_u}{\sigma_v}$ [Jondrow, *et al.* (1982)]. If the inefficiency has dominance over the random factor then the value of λ will be higher. The u_i can be formulated as:

$$u = [\sigma\lambda/(1+\lambda^2)][-\phi(\varepsilon_i\lambda/\sigma)/\Phi(\varepsilon_i\lambda/\sigma) + (\varepsilon_i\lambda/\sigma)]_i \quad \ldots \qquad \ldots \qquad (4)$$

Where $\sigma = (\sigma_u + \sigma_v)^2$, ϕ standard normal density functions, and Φ is cumulative normal density function.

In Equation (2), The error component u_i ($u_i \geq 0$), which represents efficiency, is assumed to be distributed independently of v_i. The term v, represents random term.

We assume that the banks use inputs, $x = (x_1, x_2, ..., x_n)$, available at fixed prices, $p = (p_1, p_2, ..., p_n)$, to produce the output y.

To the end we specify banks as multi-product and multi-input firms and estimate Fourier-flexible cost function as under:

$$\ln C = \alpha_0 + \sum_i \alpha_i \ln Y_i + \sum_k \beta_k \ln p_k + \theta_1 t + \sum_k \tau_{kt} t \ln p_k + \sum_i \phi_{it} t \ln Y_i +$$

$$\frac{1}{2}\sum_i \sum_j \alpha_{ij} \ln Y_i \ln Y_j + \frac{1}{2}\sum_k \sum_h \beta_{kh} \ln p_k \ln p_h + \sum_i \sum_k \delta_{ik} \ln Y_i \ln p_k +$$

$$\frac{1}{2}\theta_2 t^2 + \sum_i [\eta_i \cos(z_{it} + \lambda_i \sin z_{it})]_i +$$

$$\sum_i \sum_j [\eta_{ij} \cos(z_{it} + z_{jt}) + \lambda_{ij} \sin(z_{it} + z_{jt})] + \varepsilon_i \quad \ldots \qquad \ldots \qquad (5)$$

where, C = total cost, Y_i = ith output, p_k = kth input price,[1] z_i =adjusted value of $ln\ y_i^2$ it is used to reduce the approximation problem near the end point [see Berger, *et al.* (1997) for more detail] ε_i = disturbance term. For a cost function to

[1]We assume little variation in input prices across the banks and hence exclude from the Fourier terms.

[2]The formula for *Zi* is $0.2\ \pi - \mu.alny$, where $\mu=(0.9.2\pi - 0.1.2\pi)/(b-a)$ and (a,b) is range $LogY_i$.

be well behaved, it must be homogeneous of degree 1 in prices for each level of output. It implies the following restrictions on the cost function.

$$\sum_k \beta_k = 1 \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (6)$$

$$\sum_k \beta_{kh} = \sum_h \beta_{hk} = \sum_i \delta_{ik} = \sum_i \phi_{it} = 0 \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (7)$$

The symmetry on the cross-price effect implies $\alpha_{ij} = \alpha_{ji}$ and $\beta_{kh} = \beta_{hk}$

(i) *X-efficiency Measure*

In a competitive environment, a firm is considered as x-efficient if it systematically incurs lower cost relative to other firms. Several techniques have been proposed for estimating x-efficiency. Our study utilises the Berger (1993) distribution free method. This approach collapses the x-efficiency and random error component into a single variable. As shown by Berger, the residual of the Equation (5) can be transformed so that the minimum is zero, that is

$$\hat{\varepsilon}_{ti} = \min(\hat{e}_{ti}) - \hat{e}_{ti} \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (8)$$

By taking the exponential of Equation (8), the resulting efficiency measure

$$x_{efi} = \exp(\hat{\varepsilon}_{ti}) \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (9)$$

is normalised to fall between zero and one.

(ii) *Economies of Scale and Technological Progress*

Overall scale economies measure the relative change in a firm's total cost for a given proportional change on all outputs. Economies of scale can be estimated as follow:

$$\hat{\rho} = scale = \sum_i \frac{\partial(\ln C(p, y, t))}{\partial \ln y_i}$$

$$= \sum_i [\alpha_i + \sum_k \alpha_{ik} \ln y_{kt} + \sum_j \delta_{ij} \ln p_{jt} + \phi_i t] + \mu_i \sum_i [-\eta_i \sin(z_{it}) + \lambda_i \cos(z_{it})]$$

$$+ 2\mu \sum_i \sum_k [-\eta_{ij} \sin(z_{it} + z_{kt}) + \lambda_{ik} \cos(z_{it} + z_{kt})] \quad \ldots \quad \ldots \quad (10)$$

Scale measures are estimated for each bank in the sample at its respective output level *y*1and *y*2. If $\hat{\rho}$ is less than one, then banks are operating below the optimal scale levels and can reduce costs by increasing output further. If $\hat{\rho}$ is

greater than one, then banks should reduce their output level to achieve optimal input combinations.

The technological progress is the other factor that influences the cost in addition to input prices and output levels. To capture the impact of technological progress, we include the linear and quadratic time trend in the cost function specification and allow them to interact with other exogenous variables. The effect of technological changes on aggregate cost can be calculated as follows:

$$\hat{T} = \frac{\partial \ln C(p, y, t)}{\partial t} = \theta_1 + \theta_2 t + \sum_i \phi_i y_{it} + \sum \theta_k p_{jt} \qquad \ldots \qquad \ldots \quad (11)$$

The negative value of $\hat{T}$ implies that technological progress exists. The first two terms on right hand side of Equation (11) represents the pure technological change, while third term is associated with scale augmenting technological change.

4.3. Data and Variable Construction

We use three basic inputs for the banking sector, which are labour, capital, borrowed funds. We take two outputs, measured as loans and advances and investment. The outputs are defined as

Y_1 = Loans and Advances, and Y_2 = Investment. The input Prices are defined as p_1= total admin cost / total deposits, p_2 = total interest paid / total deposits, p_3 = occupancy cost / total deposits. The cost of capital is assumed to be numeraire.

Our sample includes 29 banks, eighteen domestic banks and eleven foreign banks, the period covered is from 1998-2005.[3] For the purpose of estimation, we use balanced panel data. The required time series data was obtained from the State Bank of Pakistan's various issues of annual Banking Statistics of Pakistan.

5. EMPIRICAL RESULTS

In this section we present the results on the x-efficiency, scales economies, and technological progress those are estimated using Equations (9), (10), and (11) respectively. The implication of these results, shown in Table 1, is discussed based on average values obtained for 29 commercial banks in the sample for eight time periods, though the results for individual banks are reported in the index. We divide the banks into three group i.e. domestic, foreign, and big banks to make a comparison among them. The efficiency was lowest in 2004 and highest in 1999 for all groups. The average efficiency score is higher for domestic banks than the average efficiency score for all banks till

[3]The banks included in this study are given in Appendix B.

Table 1

Efficiency, Scale Economies, and Technological Progress of Banks

	Efficiency				Scale Economies				Technical Progress			
Years	All Banks	Domes-tic Banks	Foreign Banks	Big Banks	All Banks	Domes-tic Banks	Foreign Banks	Big Banks	All Banks	Domes-tic Banks	Foreign Banks	Big Banks
1998	0.87	0.89	0.84	0.88	0.18	0.08	0.22	0.07	0.07	0.08	0.06	0.10
1999	0.89	0.90	0.88	0.90	0.18	0.16	0.23	0.06	0.01	0.02	–0.004	0.04
2000	0.87	0.87	0.87	0.86	0.18	0.15	0.23	0.06	–0.05	–0.04	–0.06	–0.02
2001	0.88	0.87	0.89	0.85	0.17	0.14	0.21	0.05	–0.10	–0.09	–0.12	–0.07
2002	0.89	0.88	0.91	0.89	0.16	0.13	0.22	0.04	–0.15	–0.14	–0.17	–0.12
2003	0.86	0.85	0.86	0.86	0.17	0.12	0.25	0.04	–0.18	–0.17	–0.20	–0.15
2004	0.63	0.63	0.65	0.63	0.16	0.10	0.24	0.02	–0.24	–0.23	–0.25	–0.19
2005	0.74	0.74	0.78	0.76	0.14	0.08	0.23	0.01	–0.32	–0.31	–0.34	–0.28

the year 2000; however is higher for foreign banks for the latter periods. While it is almost same for five big banks.[4]

We find the evidence on economies of scale for all groups of banks for each period. Scale economies are lowest in year 2005 with the exception of foreign banks and highest in year 1999 almost for all groups. These are lowest for big banks for all periods; it is higher for foreign banks, and for domestic banks it is also lower than the average scale economies for all banks. This shows that scale economies of small banks, especially for foreign banks are higher.

As for technological progress, which indicates the possible contribution of technical advances in reducing average costs, our results suggest the existence of technological progress for all groups of banks for the year 2000 and on ward. It was lowest for big bank in 2000 and highest for foreign banks in 2005. Again technological progress is lower for domestic banks relative to foreign banks.

Based on results discussed above we infer the existence of cost inefficiency, scale economies, and technological progress for all group of banks. Given the difference in the nature of management practices of Pakistani and foreign banks, we specify Fourier-Flexible cost function to characterise the efficient frontier for commercial banks in Pakistan. This specification allows the data a large degree of flexibility in choosing the global shape of the cost frontier and avoids the problem associated with local approximations such as, Trans-log cost function.

As results suggest that the scale economies of small banks, especially for foreign banks are higher. More over the requirement of Basel accord is that Capital Adequacy ratio must be 8 percent of the risk weighted Assets. There two approaches for calculating risk weighted average, namely standard approach and internal rating approach. The second approach is more beneficial for banks but requires higher fixed cost investment in equipments, employees expertise, and

[4]The five big banks, namely Allied Bank, National Bank of Pakistan, Muslim Commercial Bank, Habib Bank, and United Bank. The banks with market share greater than average are categorised as big banks.

development of software etc. therefore, given high fixed cost, only larger banks go for internal rating approach. In addition to these, state bank of Pakistan has asked the banks to raise their capital gradually to 6 billions by 2009. All these suggest that the mergers of the banks are more likely to take place.

Therefore, we need to analyse whether merger of the banks would result into monopolistic behaviour. For this we see whether higher concentration ratio has any impact on the interest rate spread. In Table 2, we see that market share of big five banks shows a declining trend but average interest rate spread shows much dispersed picture.[5] The spread shows fluctuations, it increases up to 2001, then declines and is high in 2005. The average spread for the foreigner bank is larger as compared to domestic banks. But the average spread for big banks (which are domestically owned) is significantly high relative to all domestic banks. However, it is nearly half of the foreign banks (which are relatively small). This shows a lack of competition in the banking sectors. It is not due to monopolistic behaviour but may be due to risk perceptions as well as lack of information.

Table 2

Concentration Ratio and Average Interest Rate Spread

Years	Concentration Ratio	Interest Rate Spread			
		All Banks	Domestic Banks	Foreign Banks	Big Banks
1998	0.72	2.60	0.13	8.39	4.59
1999	0.73	9.71	0.49	10.31	5.58
2000	0.72	11.75	0.59	12.93	5.76
2001	0.69	12.91	0.65	13.52	6.86
2002	0.61	9.38	0.47	8.93	5.92
2003	0.58	7.30	0.36	6.03	4.50
2004	0.56	6.94	0.35	5.87	4.09
2005	0.58	9.15	0.46	7.81	6.25

The difference in the spread, between big and small domestic banks, is mainly due to following reasons;

- Access to low cost funds as big banks have larger number of branches are even represented rural areas.
- Low risk perception as the big banks were previously owned by public sector (National Bank of Pakistan is still in public sector).
- Overhang from past continues as the bank-customer relations continue from past (even some less literate people may not know about the privatisation of these banks).

[5]The five big banks, namely Allied Bank, National Bank of Pakistan, Muslim Commercial Bank, Habib Bank, and United Bank Constitute on average above than 60 percent of market share.

The difference in the spread, between foreign and small domestic banks may be because these are performing different functions.

6. SUMMARY AND CONCLUSION

This study aims at investigating empirically the x-efficiency, scale economies, and technological progress of commercial banks operating in Pakistan. We also make comparisons between the domestic, foreign banks, and big banks using data for 29 banks from 1998 to 2005 operating in Pakistan.

Our results indicate that the domestic banks operating in Pakistan are relatively less efficient than their foreign counterparts since the year 2000. The average efficiency score is lower for domestic banks than the average efficiency score for all banks for periods 2000-05; it is higher for foreign banks, and almost close to average for big banks except 2000-01. This implies that smaller domestic banks are less efficient during this period. The scale economies exist for all groups of banks for each period. The economies of scale for big banks are lower than the average economies of scale for all banks; it is higher for foreign banks, and lower for domestic banks. This shows that scale economies for small banks, especially foreign banks are higher. Our results suggest the existence of technological progress for all groups of banks for the year 2000 and on ward. It was lowest for big bank in 2000 and highest for foreign banks in 2005. Again technological progress is lower for domestic banks relative to foreign banks.

Results also show that market share of big five banks is declining over the period but average interest rate spread shows fluctuations. This negates any relationship between the two. The average spread for the foreigner bank is larger as compared to domestic banks. But the average spread for big banks (which are domestically owned) is significantly high relative to all domestic banks. However, it is nearly half of the spread for foreign banks (which are small banks). This shows a lack of competition in the banking sectors. The main conclusions that can be drawn from these results are that mergers are more likely to take place especially in small banks. If the mergers do take place between small domestic banks and foreign banks, these will reduce cost due scale economies as well as x-efficiency (because foreign banks are x-efficient relative to small domestic banks). Even if mergers do take place between small and big banks, cost will reduce with out conferring any monopolistic power to these banks. This will also help in stability of the financial sector, which is one of the concerns of State Bank of Pakistan (SBP). So the best policy option for SBP is to encourage mergers, while keeping a check on interest spread, so that the benefits from reduction in cost due to mergers are passed on to depositors and borrowers.

Appendix A

	Economy of Scale							
	1998	1999	2000	2001	2002	2003	2004	2005
ABL	0.11	0.09	0.11	0.117	0.103	0.114	0.091	0.051
Askari	0.16	0.155	0.144	0.13	0.11	0.104	0.087	0.062
Al-Habib	0.17	0.166	0.158	0.151	0.125	0.123	0.106	0.091
Bol Bank	0.24	0.255	0.238	0.234	0.228	0.214	0.203	0.184
First Wom	0.291	0.289	0.276	0.244	0.236	0.229	0.228	0.215
HBL	0.034	0.028	0.02	0.024	0.006	–0.003	–0.017	–0.032
Alfalah	0.183	0.169	0.157	0.139	0.115	0.094	0.06	0.029
Metropolitan	0.175	0.174	0.171	0.152	0.13	0.111	0.104	0.092
MCB	0.082	0.087	0.075	0.074	0.064	0.043	0.038	0.015
NBP	0.026	0.026	0.021	0.009	0.008	–0.002	–0.022	0.002
Prime	0.203	0.203	0.199	0.191	0.175	0.163	0.154	0.133
Soneri	0.178	0.171	0.17	0.165	0.154	0.141	0.128	0.108
UBL	0.096	0.085	0.083	0.076	0.068	0.061	0.038	0.005
Faysal	0.166	0.175	0.204	0.13	0.139	0.13	0.102	0.076
BOP	0.19	0.196	0.197	0.196	0.187	0.155	0.113	0.075
Union	0.184	0.189	0.174	0.179	0.137	0.129	0.123	0.087
Khyber	0.179	0.177	0.178	0.167	0.17	0.176	0.168	0.158
PICIC	0.21	0.21	0.208	0.186	0.149	0.136	0.127	0.115
Al-Baraka	0.239	0.234	0.238	0.222	0.22	0.209	0.203	0.219
ABN Amro	0.155	0.161	0.163	0.132	0.135	0.143	0.137	0.128
Am Expres	0.21	0.233	0.207	0.207	0.204	0.238	0.249	0.276
Oman	0.282	0.272	0.277	0.263	0.267	0.323	0.336	0.276
Tokyo	0.214	0.216	0.221	0.237	0.359	0.386	0.274	0.239
Citi Bank	0.136	0.145	0.156	0.141	0.14	0.156	0.166	0.124
Deutsche	0.239	0.25	0.262	0.279	0.272	0.352	0.338	0.292
HabibZurich	0.176	0.183	0.17	0.162	0.143	0.14	0.13	0.125
Hon Kong	0.207	0.216	0.236	0.211	0.223	0.229	0.223	0.207
Rupali	0.36	0.414	0.385	0.34	0.416	0.488	0.56	0.575
Stan. Char.	0.155	0.168	0.166	0.14	0.104	0.12	0.11	0.099

Continued—

Appendix A—(*Continued*)

	Technological Progress							
	1998	1999	2000	2001	2002	2003	2004	2005
ABL	0.099	0.035	–0.026	–0.082	–0.125	–0.145	–0.188	–0.274
Askari	0.081	0.018	–0.034	–0.092	–0.142	–0.174	–0.221	–0.313
Al-Habib	0.073	0.014	–0.043	–0.098	–0.144	–0.18	–0.227	–0.307
Bol Bank	0.074	0.021	–0.039	–0.107	–0.151	–0.173	–0.235	–0.315
First Wom	0.075	0.017	–0.031	–0.094	–0.15	–0.183	–0.23	–0.309
HBL	0.101	0.042	–0.016	–0.074	–0.115	–0.149	–0.202	–0.279
Alfalah	0.071	0.017	–0.042	–0.098	–0.144	–0.178	–0.227	–0.304
Metropolitan	0.078	0.019	–0.046	–0.1	–0.148	–0.189	–0.243	–0.316
MCB	0.096	0.04	–0.013	–0.07	–0.117	–0.147	–0.201	–0.271
NBP	0.103	0.045	–0.016	–0.071	–0.119	–0.152	–0.209	–0.3
Prime	0.069	0.009	–0.047	–0.097	–0.155	–0.19	–0.244	–0.318
Soneri	0.077	0.016	–0.05	–0.106	–0.156	–0.186	–0.236	–0.321
UBL	0.108	0.046	–0.014	–0.072	–0.119	–0.143	–0.195	–0.289
Faysal	0.071	0	–0.073	–0.116	–0.165	–0.189	–0.237	–0.32
BOP	0.078	0.014	–0.035	–0.091	–0.14	–0.163	–0.221	–0.309
Union	0.07	0.008	–0.043	–0.11	–0.147	–0.194	–0.246	–0.319
Khyber	0.075	0.007	–0.057	–0.108	–0.16	–0.201	–0.249	–0.333
PICIC	0.065	–0.003	–0.062	–0.105	–0.15	–0.194	–0.242	–0.319
Al-Baraka	0.053	–0.005	–0.068	–0.129	–0.182	–0.209	–0.263	–0.356
ABN Amro	0.065	0.003	–0.059	–0.108	–0.15	–0.172	–0.22	–0.316
Am Expres	0.056	–0.018	–0.067	–0.128	–0.178	–0.209	–0.258	–0.337
Oman	0.041	–0.014	–0.081	–0.129	–0.194	–0.25	–0.299	–0.348
Tokyo	0.094	0.018	–0.051	–0.12	–0.18	–0.19	–0.248	–0.369
Citi Bank	0.081	0.019	–0.049	–0.108	–0.154	–0.196	–0.25	–0.317
Deutsche	0.05	–0.002	–0.062	–0.147	–0.174	–0.213	–0.262	–0.363
HabibZurich	0.066	–0.001	–0.056	–0.111	–0.157	–0.205	–0.255	–0.335
Hon Kong	0.058	–0.012	–0.06	–0.119	–0.177	–0.199	–0.25	–0.344
Rupali	0.032	–0.039	–0.073	–0.157	–0.202	–0.21	–0.282	–0.377
Stan. Char.	0.074	0.004	–0.052	–0.114	–0.135	–0.16	–0.208	–0.295

Appendix B

Banks Included in the Study

Serial No.	Domestic Banks	Forien Banks	Big Banks
1	Allied bank	Al-Baraka Bank	Allied Bank
2	Askari Bank	Abn Amro Bank	
	Habib Bank		
3	Bank Al-Habib	American Express	Muslim Commercial Bank
4	Bolan Bank	Omnan International Bank	National Bank of Pakistan
5	First Women Bank	Bank of Tokyo	United Bank
6	Habib Bank	Citi Bank	
7	Bank Al-Falah	Deutsche Bank	
8	Metropolitan Bank	Habib Zurich	
9	Muslim Commercial Bank	Hong Kong Bank	
10	National Bank of Pakistan	Rupali Bank	
11	Prime Commercial Bank	Stand Charted Bank	
12	Sonery Bank		
13	Union Bank		
14	United Bank		
15	Faysal Bank		
16	Bank of Punjab		
17	Bank of Khyber		
18	PICIC Commercial Bank		

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