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Corporate Governance Changes in Pakistan's Banking Sector: Is There a Performance Effect?

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1. Introduction

While an increasing number of emerging economies are engaged in corporate governance changes in their banking sectors, the performance effects of such changes are not that well understood. Corporate governance changes are defined as those occurring due to changes in bank ownership; they include privatization and restructuring of government owned banks, and shifting of ownership on account of mergers and acquisitions (M&As).¹ Combined, these corporate governance changes are reshaping the structure of the banking industry in these countries. The policy makers must weigh the performance effects of these governance changes to assess if they are best to improve the efficiency of financial institutions. Even though many studies have focused on corporate governance issues in the non-financial sectors, a few studies examine the corporate governance issues in the banking sector [Wright et al., (2002), Kini et al. (2004), Berger et al. (2005)]. Given the importance of banking industry to an economy, corporate governance of banks is an equally important issue as in other sectors.

The principal agent model (agency theory) and public choice theory provide the necessary theoretical underpinning to explain why these ownership forms produce different efficiency outcomes [Shleifer and Vishny (1997), Fama and Jensen (1983), Altunbas (2001)]. Under this approach, separation of ownership from management control makes managers freer to enjoy discretion and act in own interest rather than in the interest of owners and debt holders thus giving them much fewer incentives to be efficient.² While separation of ownership from control persists in all forms of bank governance, albeit in varying degrees, government owned banks experience much lower environmental pressures due to which they operate less efficiently. By contrast, the managers of private and foreign banks are much more accountable to owners for high performance and value maximization of banks.

Much of the empirical research in emerging economies, however, continues to rely on the static effects of corporate governance on long-term efficiency of banks [see, for example, Bhattacharya et al. (1997) for India, Isik and Hassan (2002) for Turkey, Jemric and Vujcic (2002) for Croatia, Havrylchyk (2006) for Poland; Patti and Hardy (2005) for Pakistan; Ataullah et al. (2004) for India and Pakistan]. These studies find, in general, that foreign and domestic banks show superior performance while state-owned banks have unfavorable effects on banking efficiency.³ Because the static models are

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¹M&As related ownership change may involve shift from private to private banks, private to foreign banks, foreign to private banks, and foreign to foreign banks.

²Information asymmetries are more commonly observed in the banking sector where the quality of loans is difficult to observe and where bad and non-performing loans can be hidden for long periods [Levine (2003)].

³A survey of recent literature by Lensink et al. (2007) corroborates these results with their finding that foreign banks in developing and transition economies post higher cost or profit efficiency than domestically owned banks.

not designed to capture the dynamic adjustments, the earlier studies may be providing poor approximations to the resulting adjustment path.

Privatization is considered as the driving force to reduce the agency cost problems by promoting efficiency gains to the firms, but mixed results are found on the effects of privatization on bank performance in different countries [Beck et al. (2005), Clarke et al. (2005), Nakane and Weintraub (2005)]. Even as some studies have addressed dynamic adjustments to predict the effects of privatization in developing countries [Nakane and Weintraub (2005), Beck et al. (2005)]⁴, only few studies have adequately considered the static effects of corporate governance changes [Bonin et al. (2005), Williams and Nguyen (2005)]. Moreover, the empirical research on the dynamic effects of M&As continues to rely on US or European banking data [see among others, Vander Vennet (1996), Akhavein et al. (1997), Rhoades (1998), Hughes et al. (1999), Amel et al. (2004)]. Yet we still have a rather limited understanding of how M&As end up affecting static and dynamic performance of banks in developing countries.

While the static and dynamic considerations are undoubtedly important in evaluating the impact of corporate governance changes, it is important to account for all governance change effects in the same model. This framework has been used by Berger et al. (2005) to jointly investigate the static, selection and dynamic effects of foreign, domestic private and state ownership on the performance of banks in Argentina in the 1990s. Even though this argument has been well understood, no or very little empirical research has been done in developing countries to assess the performance affects of all corporate governance changes in the same model [Williams and Nguyen (2005)].

This paper distinguishes itself from previous research by focusing specifically on the role of the static and dynamic corporate governance changes on the performance of banks in a developing country setting. The performance of banks is measured by Farrell's (1957) well-established concept of technical inefficiency, sometimes epitomized by the concept of X-inefficiency [Leibenstein (1966)]. The work of Berger et al. (2005) most closely compares to the present application, although unlike their two-step procedure we take the approach of simultaneous estimation of the stochastic frontier and technical inefficiency effects.⁵ The particular case we consider is the performance effects of ownership changes in Pakistan. As shown below, Pakistan's banking industry has undergone remarkable transformation on account of privatization and restructuring of state-owned banks and M&As of foreign and domestic private banks since 1991. While the analysis in this paper is restricted to only one country, the scope of financial

⁴These studies show that when banks adjust and adapt to the new conditions their performance generally improves over time.

⁵In the case of performance effects of ownership change, some earlier studies using parametric approach have applied a two stage procedure. In the first stage, the stochastic frontier model is estimated and technical inefficiency effects are obtained while in the second stage, technical inefficiency effects are regressed on explanatory variables to find out its determinants. That the two stage approach is inconsistent, empirical models, such as those by Kumbhakar et al. (1991), Reifschneider and Stevenson (1991), Battese and Coelli (1993), and Huang and Liu (1994), all propose models for simultaneous estimation of the stochastic frontier and technical efficiency effects.

reforms in Pakistan in the 1990s and 2000s matches that of many other developing countries with prevalence of government-owned, domestic private and foreign banks. The financial reforms in Pakistan are quite representative of the structural change other developing countries may be compelled to carry out in order to liberalize their banking sectors to cope with the challenges of globalization. The focus of our research on Pakistan is further motivated by the availability of a rich and detailed fifteen-year unbalanced panel data of 46 Pakistani banks from 1991 to 2005.

To evaluate the effects of corporate governance change, we estimate cost efficiency of each bank in our sample from the best practice frontier using panel data methods in which inefficiency terms are a linear function of a set of governance change variables [Battese and Coelli (1995)]. To allow for the static, selection and dynamic effects of corporate governance change we therefore follow the suggestion of Berger et al. (2005) and include all the relevant types of bank ownership changes in the same model.

The results of this paper indicate that the static and dynamic corporate governance changes lead to different short-term and long-term efficiency trends, which assure that the short-term efficiency gains (losses) do not preclude the possibility of a reversal in the long-term trends. In particular, we find that privatization and government restructuring of state-owned banks lead to substantial short-term efficiency losses, but their performance generally improves over time when these banks adjust and adapt to the new competitive environment. Similarly, efficiency gains associated with M&As overwhelm the increasing pre-governance change X-inefficiency levels. Our results also predict that the banks selected for corporate governance changes are expected to hold on to the X-inefficiency gains even in the near future. The paper thus enriches the line of studies in the corporate governance literature that could help policy makers engage in an informed decision-making to improve the efficiency of financial institutions.

Section 2 describes financial reforms and corporate governance changes in Pakistan. Section 3 outlines the empirical model while Section 4 describes the data and data sources. Section 5 describes the estimation results, explains the effects of corporate governance on X-inefficiency of banks and presents the results of the sensitivity analysis. Concluding comments are in Section 6.

2. Financial Reforms and Corporate Governance Changes in Pakistan

Over the past 15 years Pakistan's banking sector has undergone a remarkable transformation. Privatization and restructuring of state-owned banks and mergers and acquisitions of private and foreign banks have substantially changed the governance of the banking organizations. This structural change is generally attributed to financial liberalization, deregulation and advances in information technology.

Before 1991, the banking sector of Pakistan mainly served as a tool to implement the government's development strategy. To this end, all domestic commercial banks had been nationalized in 1972, and five state-owned commercial banks had been set up after merger of these nationalized banks. These banks were used by the government

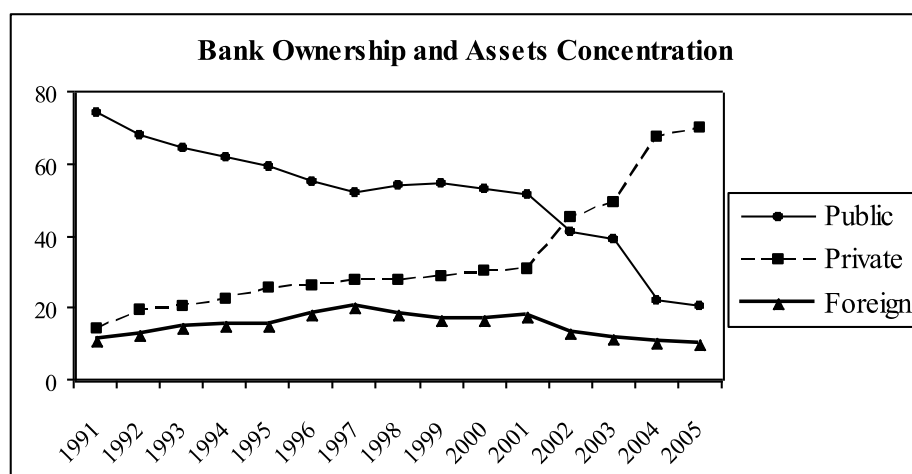
to direct bank credit to some preferred sectors of the economy.⁶ Foreign banks were allowed to operate in this period, but they could not grow and extend operations due to regulatory restrictions on the number of bank branches. This resulted in five state-owned banks dominating the scene holding more than 90% share in banking assets in 1990; the rest of the share was held by 16 foreign banks. While the system of nationalized banks first proved effective at fostering more equal use of bank credit across the priority sectors, it later became clear that the banking system as operated under state control created economic inefficiencies. For instance, higher default rates of state-owned banks led to swelling of non-performing loans in the Pakistani context to which Patti and Hardy (2005) and Ataullah et al. (2004) continue to draw our attention.

This realization of economic inefficiencies under state regulation and controls motivated reforms introduced by Pakistan's government through its central bank, i.e., the State Bank of Pakistan. Through the 1990s and 2000s, the State Bank of Pakistan has embarked on ambitious financial sector reforms characterized by liberalization, prudential regulations and institutional strengthening of the banking industry. The primary justification underlying these reforms has been the potential to reduce any systematic sources of inefficiency in the banking sector. These regulatory reforms have resulted in corporate governance changes, which can be studied at three distinct levels.

Firstly, as part of liberalization and reforms, ten new private banks were granted permission to operate in August 1991, of which eight banks started operations in the later-half of 1992; the other two banks started operations in 1993. Similarly, three new foreign banks were granted permission in 1992 and two provincial government banks were scheduled in September 1994. In 1995 controls on opening of new bank branches by private and foreign banks were also removed. The privatization of state-owned banks started in 1991 with the sale of 26% shares of MCB to the private sector; 50% shares of MCB were divested to general public in 1992 and 1993, respectively, and finally, the remaining 24% shares were sold in 2001-02. Similarly, 26% shares and control of ABL was handed-over to its management under the employee stock ownership. In 2002, a large state-owned bank, UBL, was privatized to a consortium consisting of Abu Dhabi Group and Bestway Group. More recently, HBL, which was one of the largest commercial banks in Pakistan, was also privatized. Mass privatization of state-owned banks led to a gradual decline in the share of state-owned banks in banking assets from 74.5% in 1991 to only 20.4% in 2005. This is illustrated in Figure 1, which also shows that the share of private banks has increased from 15% in 1991 to 70% in 2005 while the share of foreign banks has fell after 2002 before reaching at its peak level in 1997.

⁶How state-owned firms in developing countries are used to finance politically motivated projects, engage too many employees and open too many offices support the public choice theory of the government and has been succinctly described by Jones (1985) and Li and Xu (2004).

Secondly, state-owned banks have passed through phases of restructuring and downsizing. Funded by a \$300 million loan from the World Bank, state-owned banks were subjected to restructuring and downsizing in 1997, apparently to cut financial intermediation cost and to enhance rate of return on deposits. Under this initiative five state-owned banks namely HBL, UBL, NBP, MCB and ABL, launched their respective employee separation schemes and eventually 21,996 bank employees were released under voluntary golden shake-hand schemes from these banks between July 1997 and December 1999. To further rationalize the cost structure of these banks some 814 loss making branches of these state-owned banks were closed down between 1997 and 2000. Another 1,122 branches of these banks closed down their banking operations between 2001 and 2003. Some state-owned banks also suffered



from severe liquidity problems due to over spending, directed lending and political influence that led to fragility and vulnerability of these banks. For instance, UBL continuously demonstrated a shortfall in its liquidity position, which was well below the statutory requirements. Moreover, there was an alarming increase in the bank's administrative expenditures due to over-staffing, managerial inefficiency and waste. Similarly, HBL starved for additional liquidity in 1999; this much needed support was provided by the government in the form of major injections to improve their balance sheets while attempting to maintain their financial sustainability.

Finally, since 2000, the governance of banks in Pakistan has also been influenced by merger and acquisitions leading to consolidation of some private and foreign banks. Policy changes by SBP have also encouraged merger and acquisition of small and struggling private and foreign banks by their financially superior counterparts. As a result, a total of 12 M&As have occurred between 2000 and 2005, out of which 9 acquisitions were such where foreign banks were merged or acquired mostly by domestic private banks.

Largely for the reasons mentioned above, the governance structure of the Pakistani banking industry has dramatically changed over the last 15 or so years. As indicated in Table 1, the number of private banks has increased from 13 in 1993, 16 in 1997, 14 in 2000, 18 in 2003 to 20 in 2005; the corresponding number of foreign banks has been 17, 18, 19, 14 and 11; and the number of state-owned banks has been 7, 6, 6, 5 and 4. This decrease in the number of state-owned banks has been associated with large expansion in the share of private and foreign banks' branch network rising from 4.6% in 1993 to over 73% in 2005.

Table 1. A comparison of bank numbers and branches

Year	All Banks		State-owned		Private		Foreign	
	Banks	Branches	Banks	Branches	Banks	Branches	Banks	Branches
1991	21					0		
1993	36	7397	7	7058	13	284	17	55
1997	40	7828	6	5241	16	2510	18	77
2000	39	7367	6	4864	14	2425	19	78
2003	37	4946	5	1491	18	3390	14	65
2004	36	5600	4	1528	20	3975	12	77
2005	35	5867	4	1575	20	4,189	11	103

Source: State Bank of Pakistan, Various Reports

By contrast, the share of state-owned banks in total branch network has fallen from 95% in 1993 to only 27% in 2005. While this relative decline in importance of state-owned banks has undoubtedly reduced their share in assets and deposits, it probably has also increased healthy competition between the banks to provide better financial services to customers with significantly improved infrastructure.

3. The Econometric Model

We use the cost representation of the stochastic frontier model developed by Battese and Coelli (1995) for the unbalanced panel data that allows time-varying bank effects. The model may be written as

$$\ln C_{it} = C(y_{it}, w_{it}; \beta) + v_{it} + u_{it} \quad (1)$$

where subscript i indexes a sample bank ($i = 1, \dots, N$), and t indexes time period ($t = 1, \dots, T$)⁷; C_{it} is the observed total cost of production for the i th sample bank in the i th time period; y_{it} is a vector of bank outputs; w_{it} is a vector of input prices of known functions of cost and other explanatory variables linked with the i th bank at the t th time period; $C(y_{it}, w_{it}; \beta)$ is the assumed functional form, i.e., the translog; and β is a vector

⁷All the banks in our data are not observed for all T time periods in this model.

of unknown parameters to be estimated. As usual in frontier literature, the stochastic composite error term in (1) is decomposed into v_{it} and u_{it} . v_{it} s represent the stochastic random error component that capture the effects of exogenous shocks to the cost function due to factors beyond the control of the bank and are assumed to be iid $N(0, \sigma_v^2)$. Moreover, are independently distributed of the u_{it} s.

The technical inefficiency term, u_{it} s, are non-negative random variables capturing firm- and time-specific cost inefficiency effects reflecting the extent to which the cost of the i th bank at t th time period exceeds the minimum cost defined by the frontier. A higher value for u indicates an increase in technical inefficiency. When u equals zero the bank is perfectly technically efficient because it is on the cost frontier. It is further assumed that the u_{it} s are independently distributed, such that u_{it} is obtained by truncation at zero, that is u_{it} , dist. $N(0, \sigma_u^2)$, where $\mu_{it} = \delta' z_{it}$, z_{it} is a vector of observable explanatory variables linked with technical inefficiency of banks overtime, and δ is a vector of unknown coefficients. In effect, the technical inefficiency, u_{it} , for each bank in (1) could be replaced by a linear function of explanatory variables reflecting firm- and time-specific characteristics specified by

$$u_{it} = \delta' z_{it} + \varepsilon_{it} \quad (2)$$

where δ is a vector of unknown bank and time-specific parameter estimates associated with technical inefficiency of banks and ε_{it} is an unobservable random variable that is obtained by truncation of the normal distribution with mean zero and variance, σ_ε^2 . The point of truncation occurs at $-\delta' z_{it}$ or $\varepsilon_{it} \geq -\delta' z_{it}$.

Several studies have applied a two stage procedure whereby the first stage involves specification and estimation of the stochastic frontier and technical inefficiency effects. In the second stage, the technical inefficiency effects are regressed on various bank characteristics or explanatory variables by the Ordinary Least Squares or the Tobit maximum likelihood procedures to find out factors that contribute in technical inefficiency. However, these second stage estimations usually assume that technical inefficiency effects in the first stage of estimation are independently distributed. Battese and Coelli (1993) have noted that the two stage technique is inconsistent because the estimation in the first stage assumes that the composed error term including technical inefficiency effects is identically distributed. Nevertheless the use of inefficiency estimates in the second-stage implies that they are not identically distributed. Kumbhakar et al. (1991), Reifschneider and Stevenson (1991), and Huang and Liu (1994) have proposed models for simultaneous estimation of the stochastic frontier and the technical inefficiency effects for cross-sectional data while Battese and Coelli (1993, 1995) have extended this approach to the panel data models. In this paper we (1993, 1995) have extended this approach to the panel data models. In this paper we implement Battese and Coelli (1993, 1995) technical inefficiency effects model for the unbalanced panel data. The functional form employed in the empirical analysis is the stochastic frontier translog

cost for the panel data written as

$$\begin{aligned} \ln C_{it} = & \alpha_0 + \sum_{r=1}^3 \beta_r \ln w_{rit} + \sum_{m=1}^2 \alpha_m \ln y_{mit} + \sum_{r=1}^3 \sum_{s=1}^3 \beta_{rs} \ln w_{rit} \ln w_{sit} + \frac{1}{2} \sum_{m=1}^2 \sum_{n=1}^2 \alpha_{mn} \ln y_{mit} \ln y_{nit} \\ & + \sum_{r=1}^3 \sum_{m=1}^2 \gamma_{rm} \ln w_{rit} \ln y_{mit} + \phi_{\tau} \tau_{it} + v_{it} + u_{it} \end{aligned} \quad (3)$$

where the technical inefficiency effects, u_{it} , are assumed to be defined by a linear function of explanatory variables reflecting bank- and time-specific characteristics given by

$$u_{it} = \delta_0 + \sum_{j=1}^{11} \delta_j z_{jit} + \delta_{12} \ln(A_{it}) + \delta_{13} \tau_{it} + \varepsilon_{it} \quad (4)$$

where subscripts r, s denote factor prices; m, n denote outputs; t refer to the bank and the time period, respectively, C_{it} is the total cost; and τ is a time trend variable for the year of the observation for each bank accounting for the effects of disembodied technological progress in the stochastic frontier model and time-varying inefficiency effects in the inefficiency model.

Since the objective of this paper is to examine the effects of bank governance on bank performance, we first introduce different types of bank governance variables that are relevant in Pakistan as determinants of u_{it} . Empirical studies on bank governance and performance do not examine the static and dynamic effects of governance together in the same model. Berger et al. (2005) highlight the importance of including “indicators of all the relevant governance effects in the same model” and argue that the inefficiency model may be “misspecified” and might give biased and misleading results if any of the bank governance effects are excluded from the model. Following Berger et al. (2005) we also incorporate in (4) all the relevant effects of different types of governance in Pakistan, e.g., state-ownership, private domestic ownership and foreign ownership of banks.

While earlier findings suggest that foreign and private banks in Pakistan are more efficient than state-owned banks [Patti and Hardy (2005), Burki and Niazi (2006)], the fact remains that all new foreign and private banks are typically small in size. Moreover, some large foreign and state-owned banks are also very efficient. Therefore, it would be interesting to see how technical inefficiency of banks varies by asset size and the ownership status. Lagged assets variable ($\ln A_{t-1}$) is used to capture the effects of scale of operations on banking inefficiency. Moreover, a time variable, τ , is included in the inefficiency model specifying that banking inefficiency may change linearly with respect to time according to the sign of the parameter δ_{13} .

The stochastic frontier model (3) along with the model for the bank specific time-varying technical inefficiency effects (4) is estimated simultaneously by the maximum likelihood where the likelihood function is given in Battese and Coelli (1993). The

parameter estimates of the translog cost frontier are obtained by imposing the symmetry conditions on the cross-price and cross-output effects and homogeneity of degree one in input prices given y and t .

The mean technical inefficiency associated with the cost for the i th bank at the t th time period is given by $TE_{it} = [\exp(u_{it}) | v_i + u_i] = \exp(\delta z_{it} + \varepsilon_{it})$. The conditional expectation for the mean technical inefficiency is given by

$$TE_{it} = E[\exp(u_{it}) | v_i + u_i] = \exp\{\mu_* + 0.5\sigma_*^2\} \frac{\{\Phi[(\mu_*/\sigma_*) + \sigma_*]\}}{\{\Phi(\mu_*/\sigma_*)\}}, \quad (5)$$

where $\mu_* = (1-\gamma)z_{it}\delta + \gamma(v_i + u_i)$ and $\sigma_*^2 = \gamma(1-\gamma)\sigma^2$.

4. Data Description

This paper uses a fifteen-year unbalanced panel data of 46 Pakistani banks from 1991–2005 for a total of 490 observations. Most previous studies on banking efficiency in Pakistan have employed data obtained from *Banking Statistics of Pakistan* published by the State Bank of Pakistan. These studies have cited inappropriate aggregation of assets, liabilities, costs and revenues and lack of data on the number of bank employees as major problems in this data [Saeed (2002), Patti and Hardy (2005)]. The balance sheet data and income statement data are taken from the Annual Reports of state-owned, private and foreign banks that operated during this period. This data is unique in terms of details and coverage.

Due to the entry of several new banks in early and mid-1990s and merger and acquisition of banks after 1998, the number of observations varies overtime. As a result, we collect data of 23 banks in 1991; 36 banks in 1992 to 1994; 38 banks in 1995; 39 banks in 1996, 1999 and 2000; 40 banks in 1997 and 1998; 35 banks in 2001; 34 banks in 2002 and 2003; and 33 banks in 2005.

A long standing debate in the banking literature on the definition and physical measurement of bank inputs and outputs has failed to produce a consensus on how best to measure them [Sealey and Lindley (1977)]. However, researchers generally adopt either the production or the intermediation approach. The former approach takes the view that banks are producers of loans and deposit account services by using labor and capital as key inputs while the later approach takes the view that banks are intermediaries of financial services. Under the intermediation approach banks collect purchased funds and convert them into loans, advances, investments and other assets whereas total costs are defined to include interest costs along with other operating costs. Like several other studies on banking efficiency⁸ including those dealing with multi-period efficiency, this paper adopts the intermediation approach because interest costs account for more than 70% of the total costs in Pakistani banks. We use two outputs: (a) loans and advances; and (b) investments; and construct three prices of factors: (a) price of labor; (b) price of deposits; and price of operating cost. These variables are defined in Table 2 whereas Table 3 provides summary statistics.

⁸See for instance, Berger and Mester (1997), Mukherjee et al. (2001), Isik and Hassan (2002), Patti and Hardy (2005), and Havrylychuk (2006) among others.

Table 2. Definition and descriptive statistics of the variables

Variable name	Definition
Cost function:	
Total cost (C)	Wage bill including directors fee + depreciation on and repair to bank's property + operating cost + interest paid on deposits and borrowing + operating cost
Investments(y_i)	The amount of investment made by the bank consisting of government securities, treasury bills, shares fully paid-up, debentures, bonds and other investments, like NIT and gold.
Loans & advances (y_2)	The value of loans and advances, which include loans, cash credits, overdrafts and bills discounted and purchased.
Price of labor(w_1)	Total expenditure on employees' salary including directors' fees divided by the total number of employees.
Price of financial capital(w_2)	Total interest paid on deposits and borrowing divided by total deposits
Price of operating cost (w_3)	Total operating cost divided by total assets
Time trend (τ)	A simple time trend variable indicating the year of observation involved
Inefficiency equation:	
<i>Static governance variables:</i>	
Private bank with no-governance change (z_0)	Dummy equals 1 for all periods for a private bank if it underwent no governance change over the 1991–2005 interval and equals 0 for all periods otherwise.
Foreign bank with no-governance change (z_1)	Dummy equals 1 for all periods for a foreign owned bank if it underwent no governance change over the 1991–2005 interval and equals 0 for all periods otherwise
State-owned banks with no-governance change (z_2)	Dummy equals 1 for all periods for a state-owned bank if it underwent no governance change over the 1991–2005 interval and equals 0 for all periods otherwise.
<i>Banks chosen for governance change:</i>	
Chosen for privatization (z_3)	Dummy equals 1 for all periods for a bank that was selected for privatization over the 1991–2005 interval and equals 0 for all periods otherwise. (Note: If a bank was privatized after restructuring, it is set to equal 1 because privatization is considered a dominant event)
Chosen for restructuring (z_4)	Dummy equals 1 for all periods for a bank that was selected for government restructuring (e.g., downsizing, capital/equity injection, etc.) over the 1991 – 2005 interval and equals 0 for all periods otherwise. (Note: If a bank was privatized after restructuring, it is set to equal 0 because privatization is considered a dominant event)
Chosen for M & A (z_5)	Dummy equals 1 for all periods for a bank that was selected for domestic or foreign acquisition or merger over the 1991–2005 interval and equals 0 for all periods otherwise.

Variables measuring SR effects of governance change:

Experienced privatization (z_6)	Dummy equals 1 for all periods following privatization of a bank starting in the next year after privatization, equals 0 for the year of the privatization and prior to the privatization. Banks that did not undergo privatization are set to equal 0 for all periods.
Experienced restructuring (z_7)	Dummy equals 1 for all periods following restructuring of a bank starting in the next year after restructuring, equals 0 for the year of restructuring and prior to the restructuring. Banks that did not undergo restructuring are set to equal 0 for all periods.
Experienced M & A (z_8)	Dummy equals 1 for all periods following merger or acquisition of a bank starting in the next year after M&A, equals 0 for the year of M & A and prior to M & A. Banks that did not undergo M&A are set to equal 0 for all periods.

Dynamic Governance Variables measuring LR effects of governance change:

Years after privatization (z_9)	Number of years since privatization of the bank took place. Set to equal 0 for the year of and the years prior to privation and starts with 1 for the first year after privation, 2 for the second year and so on. Banks that did not undergo privatization are set to equal 0 for all periods.
Years after restructuring (z_{10})	Number of years since restructuring of the bank took place. Set to equal 0 for the year of and the years prior to restructuring, and starts with 1 for the first year after restructuring, 2 for the second year and so on. Banks that did not undergo restructuring are set to equal 0 for all periods.
Years after M&A (z_{11})	Number of years since M&A of the bank took place. Set to equal 0 for the year of and the years prior to M&A, and starts with 1 for the first year after M&A, 2 for the second year and so on. Banks that did not undergo M&A are set to equal 0 for all periods.

Other control variables:

Log lagged assets ($\ln A_{t-1}$)	Natural log of bank assets after taking one year lag for each bank in constant 1999-00 Pak rupees
Time trend (τ)	A simple time trend variable indicating the year of observation involved

Table 3. Summary statistics of the variables employed in the cost function and inefficiency model
(in Pak rupees)

Variable	Mean	Std. Dev	Minimum	Maximum
Total cost (C)	2.95×10^9	5.40×10^9	1.91×10^7	3.63×10^{10}
Investments (y_1)	1.21×10^{10}	2.40×10^{10}	16343	1.66×10^{11}
Loans & advances (y_2)	2.07×10^{10}	3.92×10^{10}	3577888	3.17×10^{11}
Price of labor (w_1)	388649	302286	102160	2198541
Price of financial capital (w_2)	0.006738	0.009904	0.001188	0.1219 2
Price of operating cost (w_3)	0.091176	0.082175	0.000328	0.88786
Private bank with no-governance change (z_0)	0.26866	0.44368	0	1
Foreign bank with no-governance change (z_1)	0.26767	0.4432 2	0	1
State-owned banks with no-governance change (z_2)	0.11777	0.32268	0	1
Chosen for privatization (z_3)	0.11349	0.31753	0	1
Chosen for restructuring (z_4)	0.11349	0.31753	0	1
Chosen for M & A (z_5)	0.11349	0.31753	0	1
Experienced privatization (z_6)	0.006424	0.079978	0	1
Experienced restructuring (z_7)	0.029979	0.17071	0	1
Experienced M & A (z_8)	0.036403	0.18749	0	1
Years after privatization (z_9)	0.27409	1.51736	0	14
Years after restructuring (z_{10})	0.18415	0.85186	0	6
Years after M&A (z_{11})	0.077088	0.48414	0	5
Log lagged assets ($\ln A_{t-1}$)	23.2917	1.57819	19.51499	26.87995
Time trend (τ)	7.66809	3.83947	1	14
No. of observations	490	--	--	--

5. Estimation Results

The maximum likelihood estimates of the parameters of the translog cost function and the inefficiency model are estimated simultaneously using the procedure in computer program (FRONTIER 4.1 [Coelli (1996)]). Hypothesis testing regarding functional forms and specifications is conducted on the basis of generalized likelihood ratio tests,⁹ which have approximately a χ^2 distribution, except cases where the null hypothesis also involves the restrictions of $\gamma = 0$. In such cases, the asymptotic of the likelihood ratio test statistic is a mixed - χ^2 distribution and therefore the appropriate critical values are drawn from Kodde and Palm (1986). Table 4 reports the results of the hypothesis tests regarding functional forms and model specifications with generalized likelihood ratio tests.

5.1 Cost Frontier Results

The theoretical restrictions for symmetry and linear homogeneity in input prices were imposed *a priori* on the translog cost frontier. The null hypothesis that the correct functional form for the cost function is Cobb-Douglas is rejected in favor of the translog at the 1% level of significance (Table 5). We do not restrict the cost frontier to be Hicks neutral *a priori*. However, the generalized likelihood ratio test in Table 5 indicates that the model in (3) and (4) is best specified by Hicks-neutral technological change.¹⁰ These results indicate that despite technological change in the banking sector of Pakistan, the shares of labor, financial capital and operating costs remain unchanged over the entire sample.

The estimated parameters of the Hicks-neutral translog cost frontier, constrained to satisfy symmetry and homogeneity in prices, are presented in Table 5 together with their asymptotic *t*-values while the correlates of X-inefficiency are reported in Table 6. Column (1) represents the full model, which simultaneously includes all the static and dynamic governance variables on the three attributes of corporate governance considered in this paper. As can be seen from Table 5, most of the estimated parameters in the translog cost frontier are statistically significant at least at the 95% confidence level. Monotonicity in factor prices also holds since all estimated factor shares are positive both at their mean values and at each observation. The signs of all first order parameters are positive as expected and statistically significant, which indicate that the banking costs in our sample increase with increasing factor prices and outputs. The curvature conditions for the estimated factor demand are satisfied at the point of

⁹The generalized likelihood-ratio test is defined by $LR = -2 \{ \ln[LH_0 / LH_1] \} = -2 \{ \ln[L(H_0)] - \ln[L(H_1)] \}$ where $L(H_0)$ and $L(H_1)$ denote the values of the likelihood function under the null and alternative hypothesis, respectively [Coelli et al. (1998)]. Under the null-hypothesis the test statistic has approximately chi-square distribution with parameters equal to difference between the parameters involved in the null and alternative hypothesis.

¹⁰The hypothesis that square-terms of time trend variable, τ^2 , in the translog and inefficiency equations are jointly zero cannot be rejected at the 1% level of significance.

Table 4. Model specification tests

Null Hypothesis	Critical value ($\alpha = 0.01$)	Test statistics	Decision
H_0 : Cobb-Douglas vs. translog cost	23.21	352.3	Reject H_0
H_0 : Technical change is Hicks neutral	15.08	2.00	Fail to reject H_0
$H_0 : \gamma = \delta_0 = \dots = \delta_{13} = 0$	28.48 ^a	46.03	Reject H_0
$H_0 : \delta_1 = \dots = \delta_{13} = 0$	27.67	36.68	Reject H_0

^a Critical values are taken from Table 1 of Kodde and Palm (1986) using 1% level of significance.

approximation as indicated by the negatively sloped factor demands. The estimated measure of returns to scale ($1/\sum \alpha_m$) at the point of approximation is 0.965 and is statistically significant, which indicates that a proportionate increase in the use of all inputs brings about a proportionate growth in banking output. Statistically insignificant parameter estimate for τ indicates that these banks did not experience annual rate of increase in banking costs.

5.2 Effects of Corporate Governance on X-inefficiency of Banks

Our primary interest in this paper is with the differential impact of corporate governance on X-inefficiency. To begin we note in Table 5 that the estimate for γ in the full model (column 1) is 0.861 with t -value of 28.63, which indicates that most of the residual variation in our model is on account of inefficiency effects. Generalized likelihood ratio tests reported in Table 4 on the full model also confirm these results where the hypothesis that technical inefficiency effects are absent ($\gamma = \delta_0 = \dots = \delta_{13} = 0$) is rejected at the 1% level of significance indicating that most of the banks in the sample are operating above the cost frontier. If the parameter γ equals zero, then it implies that the variance of u_{it} equals zero and the model reduces to a mean response function. In other words, the traditional average cost representation of banking technology is not adequate because a major portion of cost variability among the banks in the sample is explained by the existing differences in the degree of technical inefficiency. Further, the null hypothesis, $H_0 : \delta_1 = \dots = \delta_{13} = 0$, entails that all the explanatory variables in the inefficiency model are jointly zero is also rejected (see Table 4). This result indicates that the linear explanatory variables reflecting the effects of bank-specific characteristics on cost inefficiency is significant even though the individual parameters of some variables may not be significant.

In general, banks in our sample exhibit overall mean cost efficiency (i.e., the arithmetic average of all banks for all periods) of 1.361 (Table 5, column 1) indicating that the cost of production exceeds the minimum level frontier on average by 36% because of X-inefficiency. These results are in line with the results reported in some previous studies conducted on the banking sectors [see among others, Iisk and Hassan (2002) for Turkey, Kwan (2006) for Hong Kong, and Patti and Hardy (2005) for Pakistan].

Table 5. ML parameter estimates of the translog stochastic cost frontier

Variable	Parameter	Full model	Privatization	Re-structuring	M & A	Excluding years after governance change
		(1)	(2)	(3)	(4)	(5)
Constant	α_0	0.449*** (13.83)	0.458*** (12.98)	0.459*** (12.88)	0.476*** (15.53)	0.479*** (14.14)
$\ln y_1$	α_1	0.485*** (14.91)	0.484*** (15.05)	0.486*** (15.05)	0.482*** (15.12)	0.487*** (15.58)
$\ln y_2$	α_2	0.551*** (16.74)	0.552*** (16.99)	0.555*** (17.00)	0.556*** (17.37)	0.550*** (17.14)
$\ln w_1$	β_1	0.066** (2.11)	0.059** (2.04)	0.061*** (1.99)	0.064** (2.03)	0.057** (1.93)
$\ln w_3$	β_3	0.262*** (8.67)	0.261*** (9.06)	0.268*** (8.99)	0.269*** (8.90)	0.270*** (9.41)
τ	ϕ_τ	0.004 (0.62)	0.003 (0.50)	0.005 (0.81)	0.002 (0.34)	0.002 (0.46)
$\ln y_1^2$	α_{11}	0.137*** (15.75)	0.136*** (15.57)	0.137*** (15.50)	0.136*** (15.51)	0.137*** (16.03)
$\ln y_2^2$	α_{22}	0.140*** (12.57)	0.139*** (12.45)	0.139*** (12.65)	0.141*** (12.90)	0.138*** (12.71)
$\ln y_1 \ln y_2$	α_{12}	-0.115*** (-12.41)	-0.113*** (-12.26)	-0.113*** (-12.20)	-0.114*** (-12.46)	-0.114*** (-12.37)
$\ln w_1^2$	β_{11}	0.020 (1.15)	0.021 (1.26)	0.023 (1.35)	0.014 (0.80)	0.020 (1.28)
$\ln w_3^2$	β_{33}	-0.008 (-0.34)	-0.003 (-0.10)	-0.008 (-0.33)	-0.016 (-0.70)	-0.007 (-0.30)
$\ln w_1 \ln w_3$	β_{13}	-0.052** (-2.50)	-0.055*** (-2.67)	-0.055*** (-2.66)	-0.045** (-2.21)	-0.052*** (-2.64)
$\ln w_1 \ln y_1$	γ_{11}	0.018 (1.36)	0.015 (1.08)	0.015 (1.12)	0.016 (1.17)	0.017 (1.28)
$\ln w_3 \ln y_1$	γ_{31}	0.003 (0.15)	0.006 (0.32)	0.005 (0.31)	0.005 (0.31)	0.004 (0.22)
$\ln w_1 \ln y_2$	γ_{12}	-0.074*** (-4.51)	-0.071*** (-4.53)	-0.071*** (-4.38)	-0.071*** (-4.37)	-0.074*** (-4.70)
$\ln w_3 \ln y_2$	γ_{32}	0.024 (1.55)	0.020 (1.28)	0.024 (1.51)	0.024 (1.51)	0.023 (1.52)
$\sigma^2 = \sigma_u^2 + \sigma_v^2$	--	0.402*** (6.06)	0.564*** (4.68)	0.473*** (4.56)	0.735*** (3.22)	0.599*** (4.33)
$\gamma = \sigma_u^2 / (\sigma_u^2 + \sigma_v^2)$	--	0.861*** (28.63)	0.899*** (38.57)	0.880*** (25.47)	0.918*** (32.70)	0.898*** (39.97)
Log-likelihood	--	-153.38	-157.61	-158.00	-154.18	-153.45
Mean efficiency	--	1.361	1.345	1.354	1.330	1.323
No. of observations	N	490	490	490	490	490

*, ** and *** indicate statistically significant at the 90 %, 95 % and 99 % confidence level, respectively

Table 6. ML estimates for parameters of the stochastic cost inefficiency models

		Full model	Privati- zation	Re- structuring	M & A	Excluding years after governance change
		(1)	(2)	(3)	(4)	(5)
Constant	δ_0	-2.523** (-2.09)	-1.346 (-1.22)	-2.903** (-2.16)	-3.959* (-1.89)	-2.68*** (-2.90)
Foreign bank with no- governance change	δ_1	0.673*** (3.00)	0.632*** (2.95)	0.442*** (2.58)	1.392** (2.46)	1.304*** (3.16)
State-owned banks with no- governance change	δ_2	0.953*** (3.26)	0.949*** (3.16)	0.798*** (2.84)	1.721** (2.52)	1.782*** (3.35)
Chosen for privatization	δ_3	0.395 (1.32)	0.274 (0.95)	--	--	0.938** (2.27)
Chosen for restructuring	δ_4	-0.403 (-1.39)	--	-0.568* (-1.78)	--	-1.011** (-2.54)
Chosen for M&A	δ_5	0.673*** (2.78)	--	--	1.380** (2.35)	1.259*** (3.06)
Experienced privatization	δ_6	3.826** (2.53)	1.860*** (2.67)	--	--	0.937 (1.35)
Experienced restructuring	δ_7	1.255 (1.58)	--	1.094 (1.52)	--	0.083 (0.09)
Experienced M&A	δ_8	-0.790 (-0.83)	--	--	-2.761* (-1.67)	-2.717* (-1.85)
Years after priva tization	δ_9	0.048 (0.59)	-0.256** (-2.21)	--	--	--
Years after restructuring	δ_{10}	-0.669** (-2.23)	--	-0.496* (-1.74)	--	--
Years after M &A	δ_{11}	-0.060 (-0.19)	--	--	-0.022 (-0.09)	--
Log lagged assets	δ_{12}	0.052 (1.15)	0.025 (0.56)	0.066 (1.39)	0.027 (0.60)	0.062 (1.30)
Time trend	δ_{13}	-0.057*** (-2.61)	-0.091*** (-3.57)	-0.097*** (-3.69)	-0.101*** (-3.13)	-0.089*** (-3.59)

We first turn to the results of the full model in Table 6. The time trend variable is significantly negative in all of the specifications. The estimated coefficient for τ ($\delta_{13} = -0.057$) implies that, holding other things as constant, inefficiency of banks continued to decrease at the rate of 5.7% per annum throughout the fifteen-year period.¹¹ These results indicate that on average Pakistani commercial banks moved closer to their efficient cost frontier during the study period. The estimated coefficient for lagged assets is positive, but no statistical significance could be attached. It implies that all else being equal, size of a bank is not significantly associated with its X-inefficiency index in our sample.

The coefficient for the static governance variables on Foreign Banks with No-Governance Change (δ_1) and State-owned Banks with No-Governance Change (δ_2) indicate the long-term effect of constant foreign and state-ownership of banks where private banks are the reference category.¹² The parameters δ_1 and δ_2 are large, positive and statistically significant at the 1% level, which indicate that, on average, foreign and state-owned banks are more inefficient than the private banks. Further, the difference in the estimated delta ($\delta_2 - \delta_1$) is 0.28 in the same direction predicting that state-owned banks in our sample are more inefficient than foreign-owned banks. This is not a surprising result given that an explosion of papers in the last few years argue that political influence of firms increase their lending from government-owned banks [see, among others, LaPorta et al. (2002), Dinc (2003), Brown and Dinc (2003), Sapientza (2004), Khwaja and Mian (2005), Faccio (2006)]. In this regard, Khwaja and Mian (2005) present a stark picture of political rent seeking by the politically connected firms in Pakistan through their influence primarily on state-owned banks.¹³

In the specific example of the differential impact of constant ownership on long-term performance of banks, our results are also consistent with the conclusions drawn by some other studies for Pakistani banks around the same period. For example, Patti and Hardy (2005) evaluating the impact of banking reforms in Pakistan find that the new private banks were more profit efficient than the foreign and state-owned banks over the 1993-1997 period. Similarly, Ataullah et al. (2004) provide evidence on banking efficiency for a period inside the sample used in this paper, 1991 to 1998, that in the earlier period (1992-1994) foreign banks in Pakistan were most efficient than private and government-owned banks, but private banks became much more efficient than foreign and government banks in the subsequent period.¹⁴

¹¹Estimates by Patti and Hardy (2005) also show improvement in cost efficiency of Pakistani banks during the reform period.

¹²For further explanation on this point, see also Berger et al. (2005).

¹³A recent report by the State Bank of Pakistan also attributes state-owned banks' weak performance to "political intervention, over-staffing, over-branching" and other inefficiencies leading "to the problems of large non-performing loans, high administrative expenses, huge losses and eroding capital base" [SBP (2003)].

¹⁴Williams and Nguyen (2005) conduct a similar analysis for five East Asian countries (e.g., Indonesia, Malaysia, Philline, Korea and Thailand) and find that foreign banks are more profit efficient than domestic state-owned banks.

Performance Effects of Governance Change Due to Privatization:

To evaluate the effects of privatization on bank performance we consider the impact of all the static and dynamic governance change variables on relative inefficiency of banks in our sample. First, we consider pre-governance change difference between banks that are to be privatized in relation to private banks not selected for governance change. An interesting result in Table 6 (full sample) is that state-owned banks selected for privatization are not the least efficient of the state-owned banks. The statistically insignificant coefficient for the variable on *Chosen for Privatization* ($\delta_3 = 0.395$, $t = 1.32$) reveals that technical inefficiency of the selected banks is statistically not different from the private banks not selected for governance.¹⁵ Given that private banks show superior performance and state-ownership has unfavorable effects on banking efficiency [e.g., Isik and Hassan (2006); Havrylchyk (2006), Patti and Hardy (2005); Ataullah et al. (2004); Lensink et al. (2007)] one might have expected far more severe outcome for the selected banks.¹⁶ There are two reasons for the relatively good performance of the selected state-owned banks. First, the sale and control of least performing banks cannot be easily shifted to the private sector; hence relatively better performing state-owned banks are the ones that go up for sale. Second, even the poorly performing state-owned banks undergo a preparatory and restructuring phase prior to their privatization.¹⁷

Motivated by this finding, we next examine the dynamic performance effects of corporate governance change on the privatized banks. This raises the possibility that the privatized banks may have experienced different efficiency trends in the short- to the long-term. Therefore, we estimate these effects separately by considering the parameters of the variables defined as *Experienced Privation* (δ_6) and *Years after Privatization* (δ_9). The parameter represents the short-term performance effects of privatization on a bank (starting in the next year after privatization) relative to performance of non-privatized banks. The parameter δ_9 distinguishes the long-term performance effects of corporate governance change as time passes from the short-term effects. Our estimates show that there is interesting variation across time in the performance of the privatized banks. Our main finding here is that privatization is linked with substantial short-term performance loss, but this performance deterioration was being reversed in the long-term.¹⁸

¹⁵Boubakri et al. (2005) also support the conclusion that on average banks chosen for privatization in developing countries post lower economic efficiency.

¹⁶Patti and Hardy (2005) show that the banks selected for privatization in Pakistan depicted the lowest cost and profit efficiency prior to privatization, but their sample includes only two banks that were privatized in 1991–1992.

¹⁷In some East Asian countries, banks selected for privatization were also better performing banks [Williams and Nguyen (2005)]. However Clarke and Cull (1999) have argued that the cost of restructuring of state-owned banks exceeds net cost of privatization. Their findings suggest that privatization improves performance and raises competition even in the presence of a weak regulatory framework.

¹⁸While Williams and Nguyen (2005) also do not find any short term efficiency gain in privatized banks in East Asian countries, they do corroborate the results that efficiency gain in such banks is time taking. By contrast, Otchere (2005) and Clarke et al. (2005) find negligible efficiency gains after divestiture of state-owned banks.

For example, the large and significantly positive parameter value ($\delta_6 = 3.83, t = 2.53$) implies that the privatized banks have experienced a major and significant increase in their X-inefficiency (or a major fall in cost efficiency) in the years after privatization as compared with their own performance over the entire 1991-2005 period ($\delta_3 = 0.395, t = 1.32$). Because the difference in estimated delta ($\delta_6 - \delta_3$) is 3.435 in the same direction, it suggests a major increase in the relative inefficiency (or a major decrease in efficiency). That the short-term efficiency loss to the privatized banks is being reversed in the long-term is illustrated by a much smaller and statistically positively insignificant delta coefficient ($\delta_3 = 0.395, t = 1.32$). Since the difference in estimated delta ($\delta_6 - \delta_3$) is in the opposite direction, we predict that if the current trend continues the efficiency gains to the privatized banks are likely to accrue even in the future. This improvement in performance appears even more remarkable if seen in relation to the difference in the estimated delta of moving in the opposite direction, representing post- and pre-privatization level performance, respectively. Similar conclusions were drawn by Williams and Nguyen (2005) for privatization of banks in East Asian countries. A priori expectation of improvement in efficiency of the privatized banks perhaps is also due to efficient management and recapitalization of these banks before their sale.

Performance Effects of Restructuring of State-owned Banks:

There is very little guidance in the literature on the question of the performance effects of government restructuring of state-owned banks through such measures as downsizing and equity injections, etc. Hence it is important to evaluate and capture the performance effects of restructuring of these banks, especially in the context of pre- and post-governance change scenarios [see, for example, Clarke et al. (2005), Baer and Nazmi (2005)]. Equivalent to variables in the governance change due to privatization discussed above, we consider the coefficients on *Chosen for Restructuring* (δ_4), *Experienced Restructuring* (δ_7) and *Years after Restructuring* (δ_{10}), representing pre- and post-governance change effects.

We begin by considering the pre-governance change differentials in performance of the banks selected for restructuring and note that performance of these banks is statistically not differentiable ($\delta_4 = -0.403, t = -1.39$) from the private banks that are not selected for governance change. In other words, these results tend to reveal that X-inefficiency performance of the selected banks generally corresponds to the performance of the private banks over the 1991-2005 periods, except for the years when they were subjected to government restructuring on account of temporary financial difficulties.

Turning to the more specific results we ask, how government restructuring have influenced the short-term and the long-term performance of these banks? Table 6 (full model) presents the results of these two scenarios. For example, the estimated coefficient on *Experienced Restructuring* ($\delta_7 = 1.255, t = 1.58$) is positive and large, but remains statistically insignificant thus giving the impression that technical inefficiency was increasing immediately after bank restructuring (i.e., in the short-term). The *Years after*

Restructuring coefficient is large, negative and statistically significant ($\delta_{10} = -0.669, t = -2.23$) suggesting that the cost inefficiency of the selected banks substantially declined throughout the period after the government restructuring of these banks. Somewhat contrasting conclusions were drawn by Williams and Nguyen (2005) for the restructured banks in East Asian countries because they could not find short run or long run improvement in efficiency in these banks.

These results seem to suggest that government restructuring brings about increase in X-inefficiency in the short-term; however, any short-term efficiency loss due to restructuring is, not only, reversed in the long-term, but also the gain in efficiency accrued in the long-term are substantial. In a dynamic setting, these results reveal that the long-term efficiency gain is likely to accrue even in the future if the current trend continues.

Effects of Governance Change due to M&A:

As described above, M&A activity has helped consolidation of some private and foreign banks in Pakistan in recent years. In this sub-section, we ask how this governance change affects performance of the selected banks. To characterize the efficiency effects due to M&As, we first consider the coefficient on *Chosen for M&A* (δ_5), which gives the pre-governance change performance picture of the banks selected for M&As.

The coefficient δ_5 is significantly positively correlated with X-inefficiency index ($\delta_5 = 0.673, t = 2.78$), indicating that banks selected for M&As are technically more inefficient than the private banks. This result corroborates the general hypothesis that poorly performing banks are more likely to go through governance changes, a finding consistent with the results of Crespi et al. (2004), who also find that pre-merger efficiency of merged or acquired banks is relatively low. The fact that banks selected for M&As are generally small domestic or foreign banks suggests that they were either uninformed about the state of the market or had very weak asset base due to which they could not withstand the onslaught of rising competition in the banking industry. For example, foreign banks selected for M&A were those who were in trouble after the freezing of the foreign currency accounts in 1998, leading to a sharp fall in their currency deposits and in turn contraction in their assets.¹⁹

Then to allow for the impact of dynamic governance change variables we consider the coefficients on *Experienced M&A* (δ_8) and *Years after M&A* (δ_{11}). The negative coefficient on *Experienced M&A* ($\delta_8 = -0.79, t = -0.83$) entails that following governance change a decrease in X-inefficiency overwhelms the increase in X-inefficiency witnessed in the pre-governance change era; although no statistical significance could be attached to these results. Continuing on this, the coefficient on

¹⁹Pakistan's nuclear detonation in May 1998 was followed by international economic sanctions forcing the government to freeze the foreign currency accounts in all Pakistani banks.

Years after M&A ($\delta_{11} = -0.06$, $t = -0.19$) further suggests that if the trend continues, this group of banks is expected to hold on to most of the improvement in X-inefficiency and not return to their previous levels of X-inefficiency for a long time. These results also provide some contrast to the effects of M&As on cost efficiency in other countries.²⁰

5.3 Sensitivity Analysis

When all the different types of governance change variables are not included in the same empirical model, we expect biased results to be produced owing to misspecification of the model (see also Berger et al. (2005)). Therefore, in order to differentiate the impact of model misspecification on governance change estimates, we test alternative empirical specifications to explore how robust the results are to these specifications and to show the likely bias that may arise from misspecification. We present four different scenarios in the sensitivity analysis where we test each type of governance change in a separate model (see Tables 5 and 6, columns 2 to 5). First, we consider all the static and dynamic governance change variables of privatization of state-owned banks, but exclude other attributes of corporate governance (Column 2). Second, we explore only the performance effects of state restructuring of government owned banks; allowing only the variables for restructuring by excluding privatization and M&A variables (column 3). Third, we allow for the M&A variables for static and dynamic governance of private/foreign banks by excluding other corporate governance attributes (column 4). Fourth, we consider all other attributes of corporate governance that were part of the full model (column 5), but exclude years after governance change variables.

Table 5 and Table 6, columns 2 to 5, present the results of the sensitivity analysis. Incorrectly omitting governance change variables from the empirical specification produces biased results. While the coefficients of most governance change variables are broadly similar across alternative specifications, there is at least one important instance where there is a sign change; there are five other occasions where the statistical significance of the estimated coefficient is different from the corresponding coefficient in the full model. The coefficient of the *Years after Privatization* variable (δ_9) is highly sensitive and takes an opposite but statistically significant sign in column (2) when other control variables are excluded from the empirical specification. These changes in the sign and statistical significance of the coefficients indicate that the governance change estimates are highly sensitive to the assumed empirical specification. Further, these results corroborate the general argument of Berger et al. (2005) that all the relevant governance change variables must be included in the same empirical model because the extent of this bias is nontrivial to be ignored in this literature.

6. Conclusions

We examined the role of the static and dynamic corporate governance changes on X-inefficiency of banks when the parameters of the stochastic frontier and technical

²⁰See Amel et al. (2004) for a review of the international evidence on mergers and acquisitions.

inefficiency effects are simultaneously estimated for an unbalanced panel data of Pakistani banks from 1991 to 2005. Our tests reveal that the traditional average cost representation of the banking technology is not adequate on our data because most of the cost variability is explained by the differences in technical inefficiency. That the costs of production exceed the minimum level frontier is also indicated by the mean cost inefficiency of 36%. From 1991 through 2005, on average, the X-inefficiency of banks has decreased at the rate of 5.7 per annum in this sample, which assures, in general, that these banks have moved closer to their efficient cost frontier. The perceived wisdom that private and foreign banks show superior performance than state-owned banks is also supported by the results of this paper.

Our findings indicate that the market dynamics play a key role in determining the direction and magnitude of the relative performance of banks due to governance change. As one would have expected, the performance effects due to corporate governance changes do not happen uniformly in this sample. That is, the static and dynamic corporate governance changes lead to different short-term and long-term efficiency trends. In other words, the short-term efficiency gains (losses) do not preclude the possibility of a reversal in the observed trend in the long-term.

In particular, the paper finds that privatization and government restructuring of state-owned banks lead to substantial short-term efficiency losses for the selected banks, but we observe a dramatic reversal in this trend in the long-term with large efficiency gains for these banks. A continuation of this trend, if ever meaningful, should mean that, *ceteris paribus*, more efficiency gains are likely to accrue to these banks in the near future.

We have also investigated whether M&A in a developing country setting might allow performance gains to the banks that are subject to this form of corporate governance change. We find that following M&A, the efficiency gains of the selected banks overwhelm the increasing pre-governance change inefficiency levels of these banks. Moreover, the results predict that the banks subjected to M&A are expected to hold on to the improvements in their X-inefficiency levels for a long time.

Finally, although disagreeing with Berger et al. (2005) on various points, the paper shares their premise that all the relevant governance change variables must be included in the same empirical model because the extent of this bias is nontrivial to be ignored in this literature. The paper thus enriches the line of studies in the corporate governance literature that could help policy makers in developing countries engage in an informed decision-making concerning whether these governance changes are best to improve the efficiency of financial institutions. Empirically, it would be useful to know more about how corporate governance changes affect performance of banks. This may be a line of enquiry for the future research.

References

- Akhavein, J.D., A.N. Berger, D.B. Humphrey (1997). The effects of bank mega mergers on efficiency and prices: Evidence from the profit function. *Review of Industrial Organization*, 12, 95–139.
- Altunbas, Y., E. Lynne, P. Molyneux (2001). Bank ownership and efficiency, *Journal of Money, Credit and Banking*, 33, 926–954.
- Amel, D., C. Barnes, F. Panetta, C. Salleo (2004). Consolidation and efficiency in the financial sector: a review of the international evidence. *Journal of Banking and Finance*, 28, 2493–2519.
- Ataullah, A., T. Cockerill, H. Le (2004). Financial liberalization and bank efficiency: A comparative analysis of India and Pakistan, *Applied Economics*, 36, 1915–1924.
- Baer, W., N. Nazmi (2000). Privatization and restructuring of banks in Brazil, *Quarterly Review of Economics and Finance*, 40, 3–24.
- Battese, G.E., T.J. Coelli (1993). A stochastic frontier production function incorporating a model for technical inefficiency effects, Working Papers in Econometrics and Applied Statistics No.69. Department of Econometrics, University of New England, Armidale.
- Battese, G. E., T.J. Coelli T. J. (1995). A model for technical inefficiency effects in a stochastic frontier production function for panel data, *Empirical Economics*, 20, 225–232.
- Beck, T., R. Cull, A. Jerome (2005). Bank privatization and performance: Empirical evidence from Nigeria. *Journal of Banking and Finance*, 29, 2355–2379.
- Berger, A.N. and L.J. Mester. (1997). Inside the black box: What explains differences in the efficiencies of financial institutions?" *Journal of Banking and Finance* 21, 895–947.
- Berger, A.N., G.R.G. Clarke, R. Cull, L. Klapper, G.F. Udell (2005). Corporate governance and bank performance: A joint analysis of static, selection, and dynamic effects of domestic, foreign and state ownership, *Journal of Banking and Finance*, 29, 2179–2221.
- Bhattacharya, A., Lovell, C.A.K. and Sahay, P. (1997). The impact of liberalization on the productive efficiency of Indian commercial banks, *European Journal of Operational Research*, 98, 332–345.
- Boubakri, N., J.-C. Cosset, O. Guedhami (2005). Post privatization corporate governance: The role of ownership structure and investor protection. *Journal of Financial Economics*, 76, 369–399.

- Brown, Craig O., I. Serdar Dinc (2005). The politics of bank failures: Evidence from emerging markets, *Quarterly Journal of Economics*, 120, 1413–1444.
- Burki, Abid A., G.S.K. Niazi (2006). Impact of Financial Reforms on Efficiency of State-owned, Private and Foreign Banks in Pakistan. CMER Working Paper No.06-49. Lahore: Lahore University of Management Sciences.
- Clarke, G.R.G., R. Cull (1999). Why privatize. The case of Argentina public Provincial banks. *World Transition*, 5, 305-322.
- Clarke, G. R.G., R. Cull, M.M. Shirley (2005). Bank privatization in developing countries: A summary of lessons and findings. *Journal of Banking and Finance*, 29, 1905-1930.
- Coeli, T.J. (1996). A Guide to FRONTIER version 4.1: A Computer Program for Stochastic Frontier Production and Cost Function Estimation. CEPA Working Paper 7. Centre for Efficiency and Productivity Analysis, University of New England, Armidale.
- Crespi, R., Miguel A. Garcia-Cestona, V. Salas (2004). Governance mechanisms in Spanish banks. Does ownership matter? *Journal of Banking & Finance*, 28, 2311–2330.
- Dinc, I. Serdar (2005). Politicians and Banks: Political Influences on Government-owned Banks in Emerging Markets. *Journal of Financial Economics*, 77, 453 – 479.
- Faccio, M. (2006). Politically connected firms, *American Economic Review*, 96(1), 369–386.
- Fama, E.F., M.G. Jensen (1983). Separation of ownership and control. *Journal of Law and Economics*, 26, 301–325.
- Farrell, Michael J. (1957). The measurement of productivity efficiency. *Journal of Royal Statistical Society Sec. A*. 120, 253–290.
- Havrylchyk, O. (2006). Efficiency of the Polish banking industry: Foreign versus domestic banks. *Journal of Banking & Finance*, 30, 1975–1996.
- Huang, C.J., J.-T. Liu (1994). Estimation of a non-neutral stochastic frontier production function, *Journal of Productivity Analysis*, 5, 171–180.
- Hughes, J.P., W.W. Lang, L.J. Mester, C. Moon (1999). The dollars and sense of bank consolidation, *Journal of Banking and Finance*, 23, 291–324.

- Isik, I., M.K. Hassan (2002). Technical, scale and allocative efficiencies of Turkish banking industry. *Journal of Banking and Finance* 26, 719–766.
- Jemric, I., B. Vujcic (2002). Efficiency of banks in Croatia: A DEA approach. *Comparative Economic Studies*, 44, 69–93.
- Jones, L.P. (1985). Public enterprises for whom. Perverse distributional consequences of public operational decisions. *Economic Development and Cultural Change*, 33, 333–347.
- Khwaja, Asim I., A. Mian (2005). Do lenders favor politically connected firms? Rent provision in an emerging financial market, *Quarterly Journal of Economics*, 120, 1371–1411.
- Kini, O., W. Kracaw, S. Mian (2004). The nature of discipline by corporate takeovers, *Journal of Finance*, 59, 1511–1552.
- Kumbhakar, S.C., S. Ghosh and J.T. McGuckin (1991). A generalized production frontier approach for estimating determinants of inefficiency in U.S. dairy farms. *Journal of Business and Economic Statistics*, 9, 279 – 286.
- Kwan, Simon H. (2006). The X-efficiency of commercial banks in Hong Kong, *Journal of Banking and Finance*, 30, 1127–1147.
- La Porta, R., F. Lopez-de-Silanes, and A. Shleifer (2002). Government ownership of banks, *Journal of Finance*, 57(1), 256–301.
- Leibenstein, H. (1966). Allocative efficiency vs. ‘X-efficiency. *American Economic Review*. 56, 392–415.
- Lensink, R., A. Meesters, I. Naaborg (2007). Bank efficiency and foreign ownership: Do good institutions matter? *Journal of Banking & Finance*, doi:10.1016/j.jbankfin.2007.06.001.
- Levine, R. (2003). The corporate governance of banks: A concise discussion of concepts and evidence. World Bank Policy Research Working Paper No.3404.
- Li, W., L.C. Xu (2004). The impact of privatization and competition in the telecommunications sector around the world. *Journal of Law and Economics*, 47, 395–430.
- Mukherjee, K., S.C. Ray, S.M. Miller (2001). Productivity growth in large US commercial banks: The initial post-deregulation experience, *Journal of Banking and Finance*, 25, 913–939.
- Nakane, M., D. Weintraub (2005). Bank privatization and productivity: Evidence for Brazil. *Journal of Banking and Finance*, 29(8&9), 2259–2289.

- Otchere, I. (2005). Do privatized banks in middle- and low-income countries perform better than rival banks? An intra-industry analysis of bank privatization. *Journal of Banking and Finance*, 29, 2067–2093.
- Patti, Emilia B., Daniel C. Hardy (2005). Financial sector liberalization, bank privatization, and efficiency: Evidence from Pakistan, *Journal of Banking and Finance*, 29(8&9), 2381–2406.
- Reifschneider, D., R. Stevenson (1991). Systematic departures from the frontier: A framework for the analysis of firm inefficiency. *International Economic Review*, 32, 715–723.
- Rhoades, S.A. (1998). The efficiency effects of bank mergers: An overview of case studies of nine mergers. *Journal of Banking and Finance*, 22, 273–291.
- Saeed, A. (2002). An Economic Analysis of Productivity and Economies of Pakistan's Commercial Banking Sector. M. Phil. Thesis, Islamabad: Quaid-i-Azam University, Department of Economics.
- Sapienza, P. (2004). The effects of government ownership on bank lending. *Journal of Financial Economics*, 72, 357–384.
- Sealey, C.W., J.T. Lindley (1977). Inputs, outputs, and a theory of production and cost at depository financial institutions, *Journal of Finance*, 32(4), 1251–1265.
- Shleifer, A., R.W. Vishny (1997). A survey of corporate governance, *Journal of Finance*, 52, 737–783.
- State Bank of Pakistan (2003). *Pakistan Financial Sector Assessment 1990-2000*, Karachi: State Bank of Pakistan.
- Vander Venet, R. (1996). The effect of mergers and acquisitions on the efficiency and profitability of EC credit institutions. *Journal of Banking and Finance*, 20, 1531–1558.
- Williams, J., N. Nguyen (2005). Financial liberalization, crisis, and restructuring: A comparative study of bank performance and bank governance in South Asia. *Journal of Banking and Finance*, 29, 2119-2154.
- Wright, P., M. Kroll, A. Lado, B. van Ness (2002). The structure of ownership and corporate acquisition strategies, *Strategic Management Journal*, 23, 41–53.

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Abstract

In this paper we explore the role of the static, selection and dynamic corporate governance changes on performance of commercial banks. We use stochastic cost frontier and panel data methods for an unbalanced panel data of Pakistani banks from 1991 to 2005. We find overall bank cost inefficiency of 36%, which has decreased at the rate of 5.7% per annum. Our results indicate that the static and dynamic corporate governance changes lead to different short-term and long-term efficiency trends, which assure that the short-term efficiency gains (losses) do not preclude the possibility of a reversal in the long-term trends. Our results show that privatization and government restructuring of state-owned banks lead to substantial short-term efficiency losses, but their performance generally improves over time when these banks adjust and adapt to the new competitive environment. Similarly, efficiency gains associated with M&As overwhelm the increasing pre-governance change X-inefficiency levels. Our results also predict that the banks selected for corporate governance changes are expected to hold on to the X-inefficiency gains even in the near future. The paper thus enriches the line of studies in the corporate governance literature that could help policy makers engage in an informed decision-making to improve the efficiency of financial institutions.



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