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Deregulation and Efficiency: The Case of Private Korean Banks*

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Abstract

This paper examines the productive efficiency of a sample of private Korean banks over the 1985 to 1995 time period. The goal of the analysis is to identify the key determinants of Korean bank efficiency (inefficiency) following the program of deregulation initiated by the government in the early 1980s and augmented in the early 1990s. Using the stochastic frontier cost function approach, efficiency scores were determined for each bank in the sample. A second stage efficiency regression was then estimated to identify the key determinants of operating efficiency. In general, the results show that banks with higher rates of asset growth, fewer employees per million won of assets, larger amounts of core deposits, and lower expense ratios were more efficient. In addition, banks which branched nationwide were found to be more efficient. The financial deregulation of 1991 was found to have had little or no significant effect on the level of sample bank efficiency.

Deregulation and Efficiency: The Case of Private Korean Banks

1. Introduction

From the early 1960s through the early 1980s, Korean banking institutions essentially served as agents of the government channeling investment funds to selected sectors under the country's economic development policy. The policy was designed to accelerate South Korea's transition from an agrarian economy to a modern industrialized state. By most accounts, the country was very successful in achieving its industrialization goals. Measured by any international standard, the economic development of South Korea over the last three decades has been exceptional. The policies supporting rapid industrialization and export growth placed South Korea among the world's fastest growing newly industrialized countries.[1]

The government's extensive involvement in the banking and financial markets during the period from 1960 to 1980 led to serious imbalances in the financial markets and in the industrial structure of the economy. As overall financial repression intensified, the deadweight costs associated with excessive regulation adversely impacted the efficiency of the financial system and resource allocation more generally. Restrictions on bank lending which favored loans to *chaebol* groups, i.e., large family controlled industrial conglomerates, as well as export and strategic industries, caused small and medium sized firms to turn to the informal sector for financing. The repression encouraged the growth of the informal credit market at the expense of the banking sector and more efficient resource allocation. An additional and perhaps more important implication of excessive government involvement in the banking system was the erosion of effective credit evaluation and risk assessment policies. As has been well documented, Korean banks had little discretion in allocating funds and therefore, little incentive to screen and monitor the activities of corporate customers. As a result, the banking sector became increasingly vulnerable to unbridled corporate expansion. When the economy experienced the recent

downturn (due, in part to the weakening of the Japanese yen against the dollar, and the fact that many *chaebols* and related firms either went bankrupt or sustained financial difficulties) Korean banks suffered immensely. The subsequent ballooning of non-performing loans on bank balance sheets and the resulting erosion of equity capital resulted in the collapse of numerous Korean banks.

While much of the blame for the ultimate collapse of the Korean growth miracle might be directed towards the unholy alliance of the government, the banks, and the *chaebol*, the adverse side effects of the alliance did not go unnoticed. Beginning in the early 1980s the government, in response to mounting public pressure, undertook a series of steps to liberalize the financial system.[2] Key among the steps were: reprivatization of the banking industry, removal of interest rate ceilings and entry restrictions, reduction of government directed lending, expanded product deregulation, and reduction of restrictions on foreign exchange transactions, among others. Additional reforms were implemented in 1991 to further liberalize the financial system: interest rates were further deregulated, greater autonomy was given to bank managements, bank security holdings and maturities on loans were liberalized, and further liberalization of foreign exchange transactions and foreign investment was undertaken. Only recently have the effectiveness of these liberalization efforts been examined.

Gilbert and Wilson (1998) recently examined the effectiveness of the Korean liberalization efforts of the early 1980s. These authors examined changes in productivity among Korean banks during the 1980-1994 period using Malmquist indexes of productivity. By using Malmquist indexes of productivity, Gilbert and Wilson were able to decompose productivity changes among the newly privatized Korean banks into changes in technical efficiency and changes in technology. The authors found that between 1980 and the mid-1990s, as Korea was privatizing banks and deregulating its financial industry, banks dramatically changed their mix of inputs and outputs. These changes, when combined with technological developments, led to significant

improvements in productivity and enhanced the potential output of the Korean banking sector.

As noted above, we believe that the Korean financial repression, while contributing to the growth miracle, also increased the deadweight costs associated with excessive governmental interference in the financial system. Gilbert and Wilson are sympathetic to this view as they conclude that, "whatever positive effects government control of the financial system may have had on growth of the Korean economy in the 1960s and 1970s must be weighed against the negative effects on the productivity of Korean banks."

In this paper we examine the productive efficiency of a sample of private Korean banks over the 1985 to 1995 time period. Our goal is to identify the key determinants of Korean bank efficiency (inefficiency) following the program of deregulation initiated by the government in the early 1980s and augmented in the early 1990s. Thus, we expand on the work of Gilbert and Wilson by identifying the key determinants of efficiency and by investigating the relationship between the macroeconomic performance of the Korean economy and banking industry efficiency. In section 2 of the paper, we set the stage for our analysis by briefly reviewing the recent history of the Korean banking system. In section 3, we examine whether the government's program of financial liberalization enhanced the productive efficiency of our sample banks. In contrast to Gilbert and Wilson, in section 4 we measure the efficiency of our sample banks directly from the banks' cost functions. This approach allows us to estimate a second stage efficiency regression to identify the key determinants of operating efficiency (inefficiency). In addition, we investigate whether the form of ownership was a key determinant of bank efficiency and examine our sample on a disaggregated basis in an effort to identify other key characteristics correlated with efficiency. A conclusion follows in section 5. Finally, in section 6 we discuss the efforts of the Korean government to restructure the banking system following its recent collapse. In particular, we comment on the ongoing efforts of

the government to merge and close weak and failed banks in light of our findings regarding the measured efficiency (inefficiency) of our sample banks.

2. Brief History of the Korean Banking System

The Korean banking system has undergone numerous transformations since the early 1950s. Modifications began with the creation of the central bank under the Bank of Korea Act of 1950 and a formalization of the commercial banking sector under the provisions of the General Banking Act of 1950. Fundamentally, both Acts established the present objectives of the Korean financial system. These objectives included economic progress through sound banking operations, protecting depositors, preserving a sound credit system, and price stability. However, despite these guidelines, the central bank and the existing banking institutions failed to properly exercise their roles during the 1950s. This was largely due to the fact that during this period all banks were essentially government-controlled and exhibited little autonomy. The reign of government control ended briefly as the government divested its ownership interest in the commercial banks in the late 1950s.

Up until about 1960, Korea continued to exist primarily as an agrarian state. After a military coupe in 1961, the new regime embarked on a series of five-year industrial economic development plans. Under these plans, the financial and banking sectors were used as a conduit for the regime's subsequent mix of import substitution policies and export promotion. Development plans evoked direct government authority over the country's financial resources, placing the entire Korean banking industry under tight government regulations. Once again, the government seized private commercial banks by acquiring a major portion of their equity capital, appointing their top managers, and setting their budgets. In 1962, the central bank was placed under government control through revisions to the Bank of Korea Act.

With the inception of the first five-year economic plan, the Korean government sought to increase project financing by creating specialized banks that operated outside the

authority of the central bank. Government policymakers set quantitative credit targets to channel funds to favored light industries such as cement, steel and fertilizers. While specialized banks provided long-term credit, commercial banks were directed by the government to supply short-term working capital. Commercial banks even lacked the autonomy to set their own interest rates on deposits and loans, rather they were set in accordance with the government's overall economic plans. Real interest rates on ordinary and economic development policy loans were frequently lower than the estimated average real rates of return and in some cases negative (See SaKong, 1993).

Well into the 1970s, subsequent five-year development plans increased government intervention into the banking and financial sectors. However, during this period the government recognized that Korea could no longer maintain its economic competitiveness by focusing on light manufacturing. Consequently, the government's focus shifted from aiding domestic light industry towards aiding heavy industrial products such as machinery, electronics, chemicals, autos, and shipbuilding. During this time, commercial banks were instructed to allow easy credit access and favorable loans rates to these industries. This required additional sources of funding that existing commercial banks were unable to meet. Subsequently, the government established specialized banks to fill the gap. Toward the latter part of the 1970s, policy loans, i.e., loans which supported government programs, accounted for nearly 80 percent of domestic credit extended during that period. During the 1970s, tightly regulated non-bank financial institutions were introduced in an effort to diversify financing sources and to attract funds into the organized market.

The industrial policy of the Korean government during this period gave rise to the *chaebol* groups. The development strategy bolstered the expansion of existing firms into targeted sectors through preferential access to bank credit at below-market rates. These firms not only expanded rapidly into many areas of specialization but also into many which were not explicitly targeted by government policy. As a result, these firms grew into

economic conglomerates and dominated the Korea economy. These firms also held equity investments in the commercial banks.

Although the economy was growing at a rapid pace under this strategy, some government policymakers recognized that privatization and deregulation of the banking sector was imperative. Market mechanisms provide banks with the incentive to exert self-discipline to effectively allocate financial resources, which is necessary to sustain economic growth. The government began to re-privatize the banking system near the end of the 1970s and undertook an additional series of financial reforms in the early 1980s. With revisions to the General Banking Act in 1982 and the launch of a new five-year economic plan in the early 1980s, direct government controls over banking practices were eased, and permissible banking activities were expanded. For example, permissible banking activities were expanded to include a wide variety of fee driven non-interest income activities including sales of commercial bills and government and public bonds under repurchase agreements. The government also eliminated policy preference loans and further steps were taken to liberalize interest rates.[3]

The General Banking Act was revised again in 1991, 1993, and 1994. These revisions gave commercial banks further autonomy in their business activities and management. For example, banks were allowed to act as leading underwriters for government and public bonds. In 1991, a four-stage plan for the full liberalization of interest rates was announced to effectively set the price mechanism of interest rates. Through interest rate deregulation, the competitiveness of domestic financial services industry could be strengthened to cope with continued global financial liberalization.

As is evident from the recent collapse of the Korean banking system, the liberalization initiatives were, in a larger sense, proven ineffective. In the years leading up to the crisis, *chaebols* suffered from heavy financial pressure due to low earnings on their highly leveraged investment projects. Despite the deterioration of corporate financial performance, bank lending to the *chaebols* and corporate debt/equity ratios continued to

grow. By the end of 1997, the debt/equity ratio of the 30 largest *chaebols* reached an average of 600 percent.

With a mounting domestic debt and growing number of large corporate failures, Korean banks are currently bearing the consequences of widespread corporate insolvency. As such, the country's current economic crisis demands a serious evaluation of both the financial reforms and the collusive links among the Korean government, the *chaebol*, and the privatized banking industry. As of late 1998, most bank stocks were trading well under $1 per share. Twelve small merchant banks and five small commercial banks were closed by the Korean government following the imposition of an International Monetary Fund rescue package. In addition, the government is currently engaged in a major restructuring of the banking system as the crisis continues. These more recent developments are discussed in section 5 of the paper.

3. Data and Empirical Methodology

Our sample data was taken from the annual balance sheets and income statements of 19 private Korean banks from 1985 to 1995 (See Table 1).[4] Nine of the 19 banks in our sample are national banks headquartered in the main financial district in Seoul with branch networks across the nation. Their main business focus is short-term loans and their main sources of funding are retail deposits and borrowing from the central bank. The rest are local banks which are headquartered in major metropolitan areas and provinces and also have branch offices in their province. Although both the size of these banks and the markets which they serve vary in our sample, studies have shown that if a banking office has an output below the level of diseconomies of scale, it can operate as efficiently as a branch of a larger organization. Therefore, bank size and market concentration do not prevent a bank from achieving efficiency in operating costs (See Gilbert, 1984). All financial variables were measured in 1990 constant won. The data used in calculating an operating efficiency index for each sample bank in each year and the data used in examining the determinants of efficiency were provided by the Korea Institute of Finance.

The data used in the correlation analysis which associates macroeconomic performance with the efficiency index were taken from the "World Tables" published by the World Bank.

Bank Efficiency

Our study of efficiency provides for a better understanding of market competitiveness and profitability. Such an analysis, in turn, can provide policymakers with information which may prove valuable in the design of public policy. The methodology allows us to identify best practice banks and thus might be useful in decisions regarding merging and closing banks. Rather than concentrating on traditional scale and scope analysis of productive efficiency, we concentrate on management efficiency. This focus results from recent research in banking which indicates that management's ineffectiveness in managing resources accounts for a significantly higher percentage of costs in banking compared to scale and scope efficiencies (Berger et al., 1993). Furthermore, instead of comparing the operating performance of our sample banks with a set of superior-operated banks by using financial ratios, we use production theory and econometric procedures to extract information on managerial efficiency.

The stochastic frontier approach was used to calculate a measure of production efficiency for each bank in our sample (see Aigner et al., 1977 and Meeusen and Broeck, 1977). This approach uses a parametric technique to estimate the characteristics of "best-practice" banks from bank cost functions. These best-practice banks represent institutions which produce their financial products and services at the lowest cost using the most efficient mix of productive inputs or factors of production. Individual bank efficiency indices were measured by computing the deviations of costs from the cost frontier estimated from the sample data. This inefficiency factor captures both allocative inefficiencies from failing to react optimally to relative prices of inputs, and technical inefficiencies resulting from employing excessive amount of the inputs to produce outputs. In this framework, systematic deviations of cost from the frontier or best-practice levels

are associated with poor management while random deviations can be attributed to uncontrollable factors that affect total costs, such as weather, luck, labor strikes, or machine performance.

The stochastic frontier cost function approach maintains that managerial or controllable inefficiencies only increase costs above best-practice levels and that random fluctuations or uncontrollable factors can either increase or decrease costs. Therefore, the model assumes that inefficiencies follow an asymmetric half-normal distribution, while random fluctuations follow the typical assumption of a symmetric normal distribution.

To calculate each bank's efficiency index, we first fitted a stochastic frontier cost function to characterize the efficient frontier for the sample banks. The form of the cost function is a standard translog cost function:

ln~TC~=~alpha~+~sum from {j = 1} to 3 beta_j ~ln~Y_j~+~1 over 2 ~sum from {j = 1} to 3 sum from {k = 1} to 3beta_jk~ln~Y_j~ln~Y_k~+~sum from {n = 1} to 3 gamma_n~ ln~w_n#+~1 over 2~ sum from {n = 1} to 3 sum from {p = 1} to 3gamma_np~ln~w_n~ln~w_p~+~ _i~ln~Z~+~1 over 2~

(1)

where TC is the total cost of inputs used to produce the bank's various outputs. TC includes all labor costs, physical capital expenses, and allocated interest expenses. Thus, we use the intermediation approach to the analysis of bank production which requires that

the output metric be defined in terms of dollars of loans and deposits rather than by the number of accounts and that interest expense be included in total cost. Allocated interest equals the product of the ratio of investments to earning assets times total interest expense. The allocation of interest was necessary because securities are specified as output and many banks incur substantial interest costs in financing their securities portfolio. The Y_j are three output quantities included in the cost function: total loans and securities, demand deposits, and fee income. Total loans are comprised of all retail loans, which include residential real estate, agricultural, personal, credit card and other loans, all commercial, industrial, and security loans and investments. Fee income is used to proxy other bank outputs. It is equal to the service charges and fees received on transaction and nontransaction accounts. The prices of inputs, W_n, used in the production of bank assets are the wage rate, interest for borrowed funds, and the price of physical capital. The wage rate is calculated by dividing total salaries and fringe benefits by the number of full-time equivalent employees. The interest for borrowed funds is calculated by taking the ratio of total interest expense to the sum of total funds. The price of physical capital equals the ratio of total expenses of premises and fixed assets to total assets. The cost function also includes the variable *Z*, equity capital for each bank, to adjust for increased costs of funds due to financial risk. The composite error terms, *u* and *v*, capture cost inefficiency and random error. The *u* is assumed to be normally distributed with truncation below zero. The *v*, on the other hand, is assumed to be independently, identically and normally distributed. Finally, ln denotes the natural logarithm. Standard homogeneity and symmetry restrictions were imposed in estimating the parameters of the cost function.

Table 2 presents summary statistics for the variables used to estimate the cost function in equation (1). The average equity capital to total assets ratio is around 5.4 percent and compares favorably with the standard suggested by the FDIC Improvement Act of 1991 for U.S. banks. This suggests that the banks in our sample had adequate levels of equity capital to provide the necessary cushion for unanticipated asset portfolio changes.[5]

We estimate the above cost equation to get estimates of ln *u*. The variable ln *u* is used to derive the cost inefficiency measure. The inefficiency measure (*INEFF*) is an exponential transformation of the raw estimate of ln *u*. *INEFF* has a minimum value of 1 for the most efficient bank; all other banks are above 1 (See DeYoung, 1997).

INEFF~=~exp(ln~u). (2)

We measure efficiency (*EFF*) by comparing the inefficiency index of each bank with the index of the most efficient bank. This gives a good measure of relative efficiency in the sample. The efficiency measure is bounded between 0 and 1. EFF is 1 for the most efficient bank, and close to 0 for the least efficient bank.

4. Efficiency and Its Determinants

Average estimated cost efficiency scores for the entire sample of banks for each of the 11 years are presented in Table 3. The grand mean efficiency score for the 207 observations was 0.8897 with a standard deviation of 0.08439. The highest efficiency index in the sample was 1 while the lowest index was 0.5411. Both the efficiency average and standard deviation of nationwide banks were similar to regional banks. The overall mean is well within the range estimated for other countries, including the U.S.[6] Studies

that have used stochastic econometric methodologies have found inefficiency on the order of 20 to 30 percent in U.S. banking (See Mester, 1996 and Berger and Mester, 1997). The average bank in our sample would have increased its efficiency level about 11.03 percent had it been able to operate on the efficient frontier. In other words, about 11.03 percent of costs are avoidable on average relative to a best-practice bank.

Table 3 describes statistics for estimated *EFF* for each of 11 years in our sample. A nonparametric sign test applied to this data shows that there is no inter-temporal improvement in either the mean or standard deviation of cost efficiency index over the sample period. Given the results reported in Gilbert and Wilson (1998) and the fact that our sample period began in 1985, the results of this test suggest that the bulk of the efficiency gains reported by Gilbert and Wilson were probably realized between 1980 and 1985—the time period immediately following the deregulation which began in 1980.

We examine the sources of efficiency by estimating a second stage efficiency regression. In this regression, the relationship between our efficiency index, *EFF*, and a set of economic, structural, and financial variables is explored. The second stage regression model is specified as follows:

EFF~=~f(AGE,~lnTA,~ GROW, ~STA, ~STA2,~ BTD,~\ETA,~ DDTD, ~NINTOP, ~NATION,# ~STA*NATION, ~BTD*NATION,~EC,~REFORM)~+~epsilon.

(3)

As noted earlier, the efficiency measure is bounded between 0 and 1. Therefore, the function used to specify equation (3) is required to be a monotonic increasing function that

projects from the real line to the [0, 1] interval. We therefore employ the logistic functional form. The function is defined as

f(x) ~=~{e^x} over {1~+~e^x},

(4)

and we estimated equation (3) using nonlinear *Ordinary Least Squares*.

The independent variables included in the model are defined as follows. AGE accounts for the efficiency difference between new and established banks. One might expect a positive coefficient on AGE as established banks should have developed good operative strategies to attain a higher level of efficiency. This follows the concept of "learning by doing." However, given that Korean banks have undergone periods of nationalization followed by periods of privatization, it is not clear that older banks will necessarily be more efficient than younger banks. The variable lnTA is the natural logarithm of total assets and is included to control for the impact of scale bias on efficiency. GROW is the growth rate of bank assets over the previous 12 months. This variable provides a standard measure for bank performance. Many studies have found that rapid asset growth does not always lead to improved performance. However, it is quite possible that more efficient banks grow faster by the very fact that they are efficient. Thus, we have no *a priori* expectations regarding the sign on the GROW variable. The variables STA and BTD are the ratios of salaries-to-assets and branches-to-deposits, respectively. They provide measures of the impact of overhead expenses on efficiency. Since they capture expense behavior, we expect these variables to have negative coefficients. STA2, the square of STA, is also included to capture nonlinear effects. ETA is the ratio of total employees-to-total assets. This ratio is used to measure the effect of

labor force size on efficiency. Since labor unions in Korea are quite strong and wield much control in the banking sector, we expect this variable to have a negative impact on bank efficiency. This is because unions can cause rapid increases in wages even when not justified by increases in worker productivity. The unions may also prevent banks from reducing their labor forces when it is clearly called for. DDTD is the ratio of demand deposits-to-total deposits and is included to capture the impact of deposit mix on efficiency. Having a higher proportion of demand deposits increases the level of efficiency because banks can utilize this source of financial capital (core deposits) without incurring high interest cost. NINTOP is noninterest income over operating profits. This ratio measures the impact of output mix on efficiency. The coefficient of NINTOP could be positive or negative depending on the bank's expertise and strategic objective. We would expect it to be positive if a bank has the technical ability to offer noninterest income product lines, i.e., fee based services, which permit the bank to achieve a higher level of efficiency from its resources (especially its human capital). We would expect it to be negative if the bank human capital resources and expertise is oriented more towards traditional commercial and industrial lending activities. Finally, NATION is included to capture the possible difference in efficiency between the nationwide and regional banks. It is equal to 1 if the bank is national and 0 if it is regional. To allow for the possibility that the effects of STA and BTD on the level of efficiency are different for nationwide banks, each of these two variables was interacted with the NATION variable. Since they are overhead expense variables, we expect the interaction terms to have negative coefficients. EC, equity capital, is included to adjust for different risk levels among the sample banks.

Finally, an indicator variable, REFORM, is included in the model to capture any effects of the 1991 deregulations.

Second Stage Regression Results

Table 4 presents summary statistics for the variables employed in the logistic regression model. The average age of the sample banks is 36 years. The average growth rate of bank assets was 16.44 percent and the average demand deposits-to-total assets was 38.05 percent. Banks with nationwide operations represented 47.4 percent of the sample while regional banks represented 52.6 percent.

The results of the second stage efficiency regression are presented in Table 5. As can be seen in this table, growth (GROWTH), the square of the ratio salaries-to-assets (STA2), the ratio of the number of employees-to-total assets (ETA), the ratio of demand deposits-to-total deposits (DDTD), the nationwide banking indicator (NATION), the interaction variable for salaries-to-assets with nationwide banking (STA*NATION), and the interaction variable for branches-to-deposits with nationwide banking (BTD*NATION) all had a statistically significant impact on bank efficiency. The results imply that banks with higher rates of growth enjoyed higher levels of efficiency. As noted above, some studies have reported finding a negative relationship between asset growth and efficiency. We interpret our finding as being consistent with a positive demand side effect of efficient operations, i.e., more effective service levels and/or better combinations of prices and quality. The coefficient estimate on the STA2 variable has a negative sign. Given that STA is not statistically significant, this result is difficult to interpret. It is quite possible that this variable is picking up elements of the tradeoff between capital and labor in production.

The coefficient estimate for ETA accords with our *a priori* expectations. The larger the number of bank employees per million won the less efficient is the bank. Similarly, the coefficient on the variable, DDTD, measuring the source of bank funding, accords with our *a priori* expectations regarding the efficiency benefits of using cheap funding sources on the balance sheet. Nationwide banking franchises were found to be significantly more efficient than regional franchises and likely reflects better access to inputs. As expected, the interaction terms involving the ratios salaries-to-total assets and branches-to-total deposits and nationwide banking had significantly negative coefficient estimates. Thus, although nationwide franchises were more efficient, the positive effects were offset when nationwide banks paid higher salaries relative to total assets (or employed more employees relative to assets) and under took large investments in branches to attract deposits. Finally, the financial deregulation of 1991 had no statistically significant effect on the level of efficiency. This is most likely due to the fact that most of the improvements in efficiency may have been realized during the years preceding 1985, the beginning point of our analysis. That is, immediately following the major reforms undertaken in the early 1980 and 1981. It is also quite possible that the reforms undertaken in 1991 may take longer to produce visible results, or that they simply will not have any impact on bank efficiency.

Auxiliary Findings

Reliable data on the percentage of *chaebol* and foreign equity ownership in our sample banks was not available for the years examined in this study. Similarly, reliable data on the level of nonperforming loans was not available. However, some reliable data on each of these variables has become available recently as a result of the ongoing

financial crisis in Korea. Using *chaebol* and foreign equity ownership data and nonperforming loans data for the year 1996, we computed the correlation between these ownership characteristics and the average efficiency scores of our sample banks.[7] The results of this auxiliary analysis produced some interesting findings.

The nationwide banks that improved their efficiency scores following the 1991 deregulation (a total of 6 banks) had lower bad loans ratios, higher foreign equity ownership, and higher *chaebol* equity ownership than those who did not have increasing efficiency scores. Conversely, the 5 regional banks that improved their efficiency levels following the 1991 deregulation, had lower bad loans ratios, and lower foreign and *chaebol* ownership percentages.

Of the 6 nationwide banks that improved their efficiency levels after the financial reforms instituted in 1991, 3 improved by a statistically significant amount with a confidence level of 10 percent. The specific banks were the Cho Hung Bank, Korea First Bank, and Hanil Bank. Comparing those banks that improved their efficiency levels after the 1991 deregulation, the nationwide banks were more efficient than the regional banks. However, the differences between these efficiency improving banks were not statistically significant.

We also examined the correlation between the average efficiency scores of our sample banks and some indicators of the macroeconomic performance of the Korean economy. In this analysis, the correlations were computed using data which was available for the years 1985 to 1993. The level of broad money, i.e., non-demand deposits and currency, was found to be positively correlated with the average efficiency score of the sample banks. Similarly, imports of nonfactor services was positively correlated with the

efficiency. The level of real long-term government debt was found to be negatively correlated with the average efficiency score of our sample banks. Curiously, the level of real exports of goods and nonfactor services was found to be negatively correlated with the average efficiency score of our sample banks. This might be related directly to the negative consequences to the banking sector of the government policy encouraging export related lending. Finally, the efficiency index is positively correlated with the level of foreign equity ownership but negatively correlated with the level of government ownership.

5. Conclusion

In this paper we extend the analysis of Gilbert and Wilson (1998) who examined the impact of banking deregulation on the productive efficiency of Korean private banks during the 1980 and 1994 period. While Gilbert and Wilson report on improvements in productive efficiency following the 1980s deregulation, they did not attempt to identify the key determinants of the efficiency gains. Using the stochastic cost frontier approach, we compute efficiency scores for a sample of 19 top Korean banks over the 1985 to 1995 period. Using these efficiency scores, we fit a second stage efficiency regression. We found that banks with faster growth rates, operating nationwide and which made extensive use of core deposits in funding their assets were most efficient. As might be expected given the strength of Korean labor unions, banks with fewer employees per million won in assets were more efficient. We also examined the correlation between banking sector average efficiency and indicators of macroeconomic performance. We found that average bank efficiency was positively correlated with foreign equity ownership in the banks, and

broad measure of money. Average efficiency was negatively correlated with the level of long-term private sector debt and the level of real goods exports.

6. Epilogue[8]

Following the Korean economic crisis, the country's unemployment rate reached its highest level in 31 years and during the first half of 1998, the country's GDP shrunk 5.3 percent- the largest drop in Korean history. In 1998, the GDP growth was estimated to be -5.5%. This dire macroeconomic situation is expected to worsen as the IMF's rescue program continues. Against this backdrop, the short term prospects for the Korean banking sector appear bleak. With nonperforming loans approaching as much as 30 to 40 percent of GDP and expected to rise further before falling, future prospects for the Korean economy depend significantly on the ability of the government to recapitalize and restructure the banking and financial systems. The prospects also depend on the country's ability to break the collusive links among government officials, the *chaebol*, and the banking industry. To this end, the government has committed to complete a significant amount of the needed restructuring of the financial sector by the end of 1998.

To date, of the 26 commercial banks in existence at the end of 1997, two banks—Korea First Bank and Seoul Bank—have been nationalized and are being prepared for sale to foreign investors. Twelve banks that failed to meet the 8 percent BIS capital adequacy standard at the end of 1997 were asked to submit rehabilitation plans and were subjected to asset quality diagnostic reviews. The plans of five of these 12 banks were deemed infeasible and these banks had their licenses suspended and have in the process of being acquired by five banks deemed be stronger (with the addition of public support) under purchase and assumption transactions. The remaining undercapitalized banks received conditional approval to operate and most have found merger partners. The nine healthy

banks not involved in mergers, including the five involved in the P&As, continue to operate under strict supervision to insure that they do not become distressed.

Regarding the disposition of the banks included in our original sample as noted above, as of December 1998, two of these banks—Korea First Bank (average efficiency score of 0.8455) and Bank of Seoul (average efficiency score of 0.9598) were nationalized. On December 31, 1998, the Korean government sold Korea First Bank to a U.S. consortium. This was the nation's first ever sale of a commercial bank to a foreign firm. The Commercial Bank of Korea (average efficiency score of 0.8945) and the Hanil Bank (average efficiency score of 0.8749) are merging on a voluntary basis but with some governmental assistance. The Kookim Bank (average efficiency score of 0.8728) acquired the Dae Dong Bank, a failed bank not included in our original sample. The Kookim Bank has subsequently become involved in a merger transaction with Korea Long-Term Credit Bank. Two banks—Chung Chong Bank (average efficiency score of 0.9003) and Kyungki Bank (average efficiency score of 0.8785) have been closed and sold in purchase and assumption transactions. Two banks—Shinhan Bank (average efficiency score of 0.9442) and KorAm Bank (average efficiency score of 0.9311) are acquiring failed banks in purchase and assumption transactions. KorAm is acquiring Kyungki Bank, one of the failed banks in our sample. Of the banks that received conditional approval to operate, Chungbuk Bank (average efficiency score of 0.7853) will be merging with Cho Hung bank (average efficiency score of 0.9329) which has already merged with Kangwon bank (average efficiency score of 0.8756).

The impact of *chaebol* bankruptcies on the Korean banking sector cannot be overstated. For example, the failure of Korea First Bank was linked to the failure of its

key *chaebol* borrowers: Kia motors, Hanbo Iron and Steel, Sammi, New Core, Sinho, and Tongil. Similarly, the Bank of Seoul was adversely impacted by the failure of its main *chaebol* customers: DaeNong, ChungGu, HanshinGongYoung, and Jindo. More generally, these bank failures can be traced to the failure of *chaebol's* active in construction and real estate. Following the financial crisis, the Korean government passed a series of acts to support corporate restructuring in connection to bank restructuring and recapitalization. The fundamental goals were to restore the creditworthiness of the *chaebols* and lower their debt service requirements to bring them in line with their projected cash flow. One of the key initiatives was to promote debt/equity conversion. A recent amendment to the Bank Act allowed banks to hold corporate equity up to 15 percent or higher subject to approval.

In addition, in a series of policy measures supporting corporate restructuring, Corporate Restructuring Vehicles (CRVs) were proposed. One main function of CRVs was to purchase debt from financial institutions and convert it into equity. In addition, CRVs' function extended to the management of converted equity. The forms of CRVs included trusts, partnerships, funds for qualified investors, and closed-end mutual funds. In an initial effort, 4 equity funds were created by the Ministry of Finance. Their funding came from 25 financial institutions, and they are to be managed by experienced international asset managers.

Furthermore, several banks deemed to be most healthy have been identified as lead banks in corporate restructuring for the 64 large *chaebol* groups deemed to be in financial distress. These banks include: Commercial Bank of Korea, Cho Hung Bank, Hanil Bank, Korea Exchange Bank, and Bank of Seoul. These banks have created internal Workout

Units which will address their *chaebol* bad loan problem. These bank workout units will be assisted by external financial advisors retained under the World Bank's technical assistance loan.

On January 13, 1998, Korean government officials and 5 top *chaebols* agreed on a restructuring plan aimed at improving management practices. One area focused on reducing moral hazard by requiring *chaebols* and creditor financial institutions to eliminate cross guarantees among companies within *chaebol* groups. Other areas were designed to improve operational efficiencies in order to raise the corporate sector's competitiveness in the global markets. These included business restructuring focusing on core competence, improving capital structure, enhancing corporate transparency and strengthening the supervisory role of government and creditor financial institutions.

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Table 1
Sample Commercial Banks

Nationwide Banks

1. Cho Hung Bank
2. Kookmin Bank
3. Hanil Bank
4. Korea First Bank
5. Commercial Bank of Korea
6. Bank of Seoul
7. Shinhan Bank
8. Korea Exchange Bank
9. KorAm Bank

Regional Banks

1. Daegu Bank
2. Pusan Bank
3. Kwangju Bank
4. Chungbuk Bank
5. Chung Chong Bank
6. Kangwon Bank
7. Kyungki Bank
8. Kyongnam Bank
9. Jeonbuk Bank
10. Bank of Cheju

Table 2
Variables Used in Translog Cost Function

(in million won)

Variable	*Mean*	*Standard Deviation*	*Maximum*	*Median*	*Minimum*
Total Costs	494057.1	483723.8	1726681	248635	26926.88
Total Loans	3058934	2886696	11838321	1639590	140895.5
Demand Deposits	959666.2	888602.2	3253754	586063.4	52046.96
Fee Income	41233.81	45658.52	174336.1	16257.95	1378.908
Wage Rate	11.77934	2.406335	18.77872	11.12292	8.402332
Interest for Borrowed Funds	0.072518	0.054909	0.614058	0.060771	0.033664
Price of Physical Capital	0.288544	0.109935	0.68766	0.263128	0.121245
Equity Capital	446920.2	417487	1470846	276738.4	19819.69

Table 3
Cost Efficiency (*EFF*)

Year	*N*	*Mean*	Std Dev	Minimum	Median	Maximum
1985	19	0.8729	0.1039	0.6888	0.9128	0.9906
1986	17*	0.8599	0.099	0.6892	0.8731	0.9901
1987	19	0.8595	0.06928	0.728	0.8489	0.9967
1988	19	0.8841	0.09555	0.5411	0.8966	0.9982
1989	19	0.9114	0.07246	0.7283	0.9327	0.9933
1990	19	0.9237	0.0942	0.5916	0.9604	1.0000
1991	19	0.9024	0.078801	0.6309	0.9193	0.9894
1992	19	0.8904	0.06121	0.7598	0.9117	0.9621
1993	19	0.9161	0.05828	0.7218	0.9278	0.9852
1994	19	0.9018	0.08299	0.6655	0.9264	0.9976
1995	19	0.8611	0.08907	0.6504	0.8689	0.9754

* Two banks have missing data in this year.

Table 4
Variables Employed in the Logistic Regression Model

(in million won)

Variable	*Mean*	*Standard Deviation*	*Maximum*	*Median*	*Minimum*
Efficiency Index	0.8897	0.08439	1	0.9115	0.5411
Age	36.21053	19.99408	98	29	14
Total Assets	8264394	8635184	37211919	3837055	310788.7
Growth Rate of Bank Assets	0.164434	0.142156	1.27533	0.146509	-0.08987
Salaries-to-Assets	0.008651	0.003409	0.017676	0.008617	0.002461
Employees-to-Total Assets	0.000843	0.00055	0.002552	0.000695	0.000108
Branches-to-Deposits	0.00007	0.000032	0.000177	0.000061	0.000027
Demand Deposits/Total Assets	0.380456	0.089305	0.704221	0.373751	0.19958
Noninterest Income/Op. Profits	1.200807	0.831106	5.57	1.032252	-0.84176
Nation	0.473684	0.500506	1	0	0
Equity Capital	446920.2	417487	1470846	276738.4	19819.69
Reform	0.363636	0.482201	1	0	0

Table 5
Efficiency Correlates - Logistic Regression Parameter Estimates and Simple Correlation Coefficients with Efficiency Score

Independent

L

ogistic Regression Parameter Simple Correlati

	Variable	Parameter Estimates (Standard error)	(Signifi
Intercept		2.955104 (3.16625)	
AGE		0.00292957 (0.0044518)	
lnTA		-0.04749 (0.4969)	
GROW		-0.184281 (0.16449)	-0.00833 (0.90
1.475799			(
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	STA	-38.282822 (174.5844)	- 0.05042 (0.4706)	
	STA2	16758.81 (7845.4)**	-0.04294 (0.53	
BTD		-104.190239 (4761.8)		
	ETA		- 1307.6 (404.1 3254)* **	-0.1089
	DDTD	3.084042 (0.89821)***	0.19854 (0.0041)	

NINTOP	0.088441		
	(0.09461)		-0.0301 (0.666
	NATION		
		2.935016 (0.82899)***	0.0226
	STA*NATION	-162.216092	
		(60.05065)***	-0.03973 (0.5698)
	BTD*NATION	-16480.83	
		(9103.9)*	-0.01357 (0.84
	EC		-3.22924E-7
			(3.19975E-7)	0.0218
	REFORM	0.029437	
		(0.205)	
		0.02433 (0.7278)	
	Adj R-Sq	0.1436	

Coefficients with ***, ** and * are statistically different from zero at the 1%, 5%, 10% levels of significance.

Endnotes

[1] For a discussion of the South Korean growth miracle, see for example, Park (1998).

[2] In the early 1950s, banks were owned by the government. After a brief period of privatization in the late 1950s, banks were once again nationalized in the early 1960s. Near the end of the 1970s and into the early 1980s, the government again privatized the banking system. An additional series of financial reforms took place in the early 1980s and were augmented again in the 1990s.

[3] Beginning in 1984, banks were permitted to vary their lending rates within a limited range depending on the creditworthiness of borrowers and to increase competition, openness, and efficiency, the government further lowered both entry barriers for bank and non-bank financial institutions and restrictions upon foreign bank branches. New commercial banks and investment and mutual savings companies were established as a result of the policy change. Discriminatory restrictions were also reduced to allow for equal treatment between foreign and domestic banks. Foreign banks were able to access the central bank rediscount window for financing, and engage in trust activities.

[4] There were a total of 26 commercial banks operating in the country during the period of our study. The 7 banks not included in the sample either had missing and unreliable data or were not deemed to be true private banks.

[5] It should be noted that trust account assets are included in the computation of the capital ratio. If these assets are deleted, the average capital-to-assets ratio of our sample banks is about 9.4% percent, a number which compares favorably with the B.I.S. standard of 8 percent.

[6] The average efficiency for our sample of Korean banks also compares favorably with estimates for the banks in the U.K., Germany, Sweden, Spain, and Canada, among others. See, Berger and Humphrey (1997).

[7] This analysis assumes that the level of nonperforming loans and the percentages of *chaebol* and foreign equity ownership in the banks as of 1996 fairly characterizes the percentages in previous years.

[8] This section draws directly from Claessens, Ghosh and Scott (1998) and from personal correspondence with Yung Chul Park, Chairman of the Hanil/CBK Merger Committee and officials at the Korean Institute of Finance and the Korean Ministry of Finance.