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IMPACT OF FINANCIAL SECTOR LIBERALISATION ON COMPETITION AND EFFICIENCY IN THE GHANAIAN BANKING INDUSTRY

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Abstract

This paper describes an application of market concentration ratios and Data Envelopment Analysis (DEA) to assess the impact of financial sector liberalisation on the performance of Ghanaian Banks. The market concentration technique ascertains the incidence and intensity of competition and DEA measures the relative performance of banks in a multi input-output scenario. Our empirical implementation of the analytical techniques shows that competition has increased and the banks have become more efficient although there is evidence of stagnation on both measures in recent years. Further, the banks have become more profitable due to the oligopolistic nature of the market that enables them to reap supernormal profits. These are important findings to the extent that regulators rely on market structure to formulate and evaluate policy decisions.

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Résumé

Cette étude utilise les ratios de concentration et l'analyse statistique de l'enveloppe afin d'évaluer l'impact de la libéralisation financière sur les performances des banques ghanéennes. Les ratios de concentration du marché évaluent l'incidence et l'intensité de la compétition tandis que l'analyse statistique de l'enveloppe mesure la performance relative des banques dans un scénario d' input-output. L'application empirique de ces techniques analytiques montre que la compétition a augmenté et que les banques sont devenues plus efficientes malgré une certaine stagnation de la valeur de ces deux mesures récemment. De plus, les banques sont devenues plus rentables à cause de la nature oligopolistique du marché qui leur permet de réaliser des profits anormaux. Ce sont des résultats importants dans la mesure où les décideurs se basent sur la structure du marché pour formuler et évaluer des décisions politiques.

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Executive Summary

Ghana's Financial Sector Adjustment Programme (FINSAP) was introduced in 1988 to enable the banks to better support the real sector and thereby enhance the effectiveness of the structural adjustment programme by promoting competition, innovation and efficiency within the financial sector. After more than a decade of FINSAP, its contribution to the economy is still being debated. Our computations indicate that profitability has soared over the last 9 years and the banks are sounder now than they were a decade ago. But the high profitability could be said to owe less to efficiency and competitiveness than to the oligopolistic nature of the industry that enables most banks to reap supernormal profits (Ziorklui and Gockel 2000). Also, the curtailing of operations in rural areas by the banks in the post FINSAP era has been a source of worry to many.

Our primary objective is to establish whether with the implementation of FINSAP the banking industry has witnessed increased competition and efficiency. We used the Herfindahl Index and Lorenz to determine the incidence and intensity of competition; and the Data Envelopment Analysis (DEA) to assess the relative efficiency of the industry.

Competition can be researched from various angles. First, it is important to establish the *incidence of competition* i.e. is there competition? Second, one needs to ascertain the *intensity of competition*. Third, the *basis of competition* must be also considered. The Herfindahl Index (HI) and Lorenz curves are tools for assessing competition in the industry. Competition impacts on the efficiency of the industry. Often such efficiency is achieved means by the effective allocation and utilisation of factor inputs. We have used the nonparametric DEA approach to assess the relative efficiency of the banks because nonparametric analysis may be more powerful compared to parametric methods when it is suspected that normality conditions may not be satisfied (Mendenhall *et al* 1986) within a particular investigation as in our case. The definition of inputs and outputs of banks is not straightforward and an extended and unresolved controversy remains in the literature, giving rise to alternative approaches (Santos and Dyson, 1999). Controversy centres mainly on the treatment of deposits. Since we are interested in using the input-orientation concept of DEA to investigate a competitive resource structure seen as an essential ingredient for sustaining an aggressive commercial strategy, we have chosen the production approach to the modelling of bank output and have therefore treated deposits as output.

We hypothesised that competition will increase with the implementation of FINSAP. Our analysis indicated that this is true for the Ghanaian banking industry. We also hypothesised that as the policy measures of FINSAP become more embedded in the financial sector, competition will increase even further. This view seems to be true for deposits and net income. But this has not been so for loans since 1995. The market is driven mainly by the four leading banks who together control a large portion of the market. The smallest of the Top 4 banks in 1990 became the leading bank in 1999. This bank raised its market share from 9% in 1990 to 24% in 1999. The biggest bank in 1990, with 52% of the market at the time has seen its market share drop to just about 20% in 1999.

There appears to be a *zero sum game* among them. The market shares of the rest of the banks have moved within a rather narrow band implying that they have not made significant inroads by way of wresting market share from the Top 4 banks or 'growing' their own markets.

Lorenz analyses give another dimension to the story. We tested three related hypotheses here. First, if competition is increasing then market concentration will reduce. Second, for both loans and deposits we expect market concentration to reduce in the second period. Finally, we hypothesised that where competition exists, the ranking of the banks in terms of their shares in the loan and deposit markets will change. These were largely rejected. The Lorenz curves showed evidence of huge disparities in the distributions of both deposits and loans.

We tested and confirmed the hypothesis that efficiency has increased with competition. The industry however needs only 61% of the actual inputs it uses to generate its outputs. The incidence of allocative inefficiency is smaller than that of technical inefficiency; bank managers do better in allocating resources than in utilising allocated resources. We recorded inefficiency of 7% for the industry as a whole. This is largely due to the high incidence of increasing returns to scale in the industry. Our study confirmed the hypothesis that there is a positive correlation between efficiency and profitability.The level of profitability is high in the industry but this is due to the structure of the market which enables banks to reap supernormal profits.

The concentration of the market in the hands of a few banks has interesting implications for the nature and intensity of competition. Structurally, as the market becomes more concentrated, competition reduces until at the extreme the monopoly structure evolves. The banks will then seek to avoid ruinous price competition and channel their main marketing efforts into sales promotion and product innovation; activities which enhance profitability. This in part explains the widening margins and rising ROE of the industry.

There is a certain measure of competition in the industry but this has neither significantly driven down loan prices nor raised savings returns. Fiscal discipline, consolidations and strategic alliances as well as a well informed and mobile customer base are necessary to resolve the problem.

The causes of inefficiency in the Ghanaian banking industry are basically similar to those of any other industry. The allocative inefficiency component arises mainly from the overuse of capital inputs relative to staff cost whereas technical inefficiency is attributed to managerial shortcomings. Scale inefficiency stems from operating under increasing returns to scale by a majority of banks. For certain banks, branch operations in the rural areas are severely limited in scope. Perhaps the regulators may want to expand the remit of the newly formed ARB Apex Bank and arrange to place commercial bank branches in rural areas under its jurisdiction. The Apex Bank will in turn support them to stay in operation so as to enable them contribute to the goal of rural poverty alleviation.

1. Introduction

Ghana's economic decline in the 1970s and the early 1980s adversely affected the banking industry. The Banking Supervision Division (BSD) of the Bank of Ghana lists some of the problems facing the industry during that period as effort concentration in high-risk areas, excessive exposure to a few clients, weak recovery efforts, non-performing loans, under-capitalisation, and deficient accounting and internal controls. The Financial Sector Adjustment Programme (FINSAP)[1] was launched in 1988 with support from the World Bank and the IMF to address these problems. After a decade, its contribution to the economy is still being debated.

Supporters of FINSAP point to the transformation in the banking industry. With deregulation, lucrative interest rates, a moderately expanding economy, the increasing use of Information Technology (IT) in service delivery, and their own competitive efforts, the industry seems to be doing very well as Figure 1 shows.

[See Figure 1, end of document]

Profitability has soared in recent years with return on equity (ROE) between 16% and 45%, averaging 32% over the last 9 years. Since 1994, capital adequacy ratios have considerably outpaced the allowable minimum of 6%. In real terms, bad debts have been falling, and the problem of non-performing assets seems to have been tackled.

[1] A detailed description of the industry and FINSAP can be found in Anin (2000).

It could however be argued that all is not that rosy with the industry. The high profitability could be said to owe less to efficiency and competitiveness than to the structure of the industry that enables most banks to reap supernormal profits (Ziorklui and Gockel, 2000). Also, a cursory analysis of the balance sheets of most of the banks suggests that they have generated extra returns by taking greater risks. The curtailing of operations in rural areas by the banks in the post FINSAP era has lent credence to the view that FINSAP has skewed the distribution of banks in favour of the urban areas; thereby intensifying the financial marginalisation of areas considered as unprofitable.

This study aims to clarify, empirically, aspects of the debate relating to competition and efficiency in the banking industry. Our objective is to establish the impact of financial sector liberalisation on the relative performance of the industry. We therefore attempt to investigate whether; (i) competition has increased with the implementation of FINSAP, (ii) competition will increase even further as the policy measures of FINSAP become more embedded in the financial sector, (iii) where competition exists, the ranking of the banks in terms of their shares in the loan and deposit markets will change, (iv) efficiency has increased with competition, and (v) there is a positive relation between efficiency and profitability.

To achieve our research objective, we used the Herfindahl Index and Lorenz analysis to determine the incidence and intensity of competition and Data Envelopment Analysis (DEA) to assess the relative efficiency of the industry. The main results of our empirical application of the analytical techniques are that FINSAP has had a positive impact on the incidence and intensity of competition. The increased competition has raised the relative efficiency of banks. However, the banks are profitable mainly due to the oligopolistic

structure of the market, which enables many banks to reap supernormal profits.

The paper proceeds as follows. In the next section we review the literature on competition, and efficiency and describe our research methodology. We discuss our empirical findings in Section 3 and in Section 4 we detail the implications of the paper and policy recommendations. Finally, we summarise the paper and present our conclusions in Section 5.

2. Background Study and Methodology

Competition arises where two or more providers of services/goods offer their products, as substitutes, to buyers in the same market. Competition can be researched from various angles. First, it is important to establish the *incidence of competition* i.e. is there competition? A market with several suppliers makes collusion (anti-competitive behaviour) difficult to enforce. Furthermore, where firms are of similar sizes, competition increases because none of them can dictate to the market (Oster, 1995). The Herfindahl Index (HI) is a concentration measure that can be used as a tool for assessing the incidence of competition. It is given by the formula:

$$HHI = 10{,}000 \sum S_i^2 , \tag{1}$$

where S_i is market share of the i^{th} firm.

HI can vary from 0 (perfectly competitive industry) to 10,000 (monopoly). A market with HI in excess of 1800 is generally considered as highly concentrated and adverse market power effects can be presumed. The index is however an *absolute* and not a *relative* measure and is therefore not suited for investigating the degree of disparity or irregularity in the shares of total firms that produce for the market. Such disparities can be analysed using Lorenz curves and associated Gini-coefficients. They are based on the shares of the market that accrue to different groups of firms starting with the smallest and working up to the biggest.

Second, one needs to ascertain the *intensity of competition.* Competition often intensifies with the entry of new suppliers into a market that is not expanding proportionately. ISSER (1999), for example, used the level of "competitive advertisement" (or adversarial advertising) as an indication of competition in the Ghanaian banking industry. One way of operationalising this would be to measure the relative share of advertising as a percentage of sales or total expenses over time. We would not expect a rising trend for these fractions since the industry does not appear to advertise a lot and if it the trend increases causes other than competition could account for that. We therefore suggest changes in market share as an alternative proxy for competition. Another aspect of competition of relevance to this research is the *basis of competition*. It can take place in three main areas, namely: pricing, product attributes, and channels of distribution. There seems to be very little price competition in the commercial banking sector, as evidenced by the widening spread between deposits and lending (ISSER 1999). This has been attributed to the high transaction costs due in part to the inefficiency of the banks, among others. Thus there is the need to investigate how efficient banks have been and whether, if efficiency is controlled for, one can detect traces of price competition.

Measures of efficiency require optimising behaviour with respect to outputs as well inputs (Siems and Barr, 1998) and are based on the distance of an observation from a projected *best practice frontier* in an output-input space. Conventionally, the distance is measured either horizontally (for input efficiency) or vertically (for output efficiency). As pointed out by Berg et. al. (1991), a horizontal measurement compares the observed input usage of a decision making unit (DMU) with that needed by a firm on the best practice frontier to produce the observed output of the DMU. Measuring vertically means that observed outputs are compared with potential outputs at the frontier for observed inputs, keeping the relative composition of outputs as observed.

We have chosen to focus on input saving efficiency because of the expressed interest in the banking sector of cutting costs (Berg et. al., 1993). Input efficiency can be broken down into two viz. pure technical efficiency and allocative efficiency. Pure technical efficiency derives from the average cost of producing goods given a specified level of output. Pure technical inefficiency arises if a unit uses more inputs than should be required to produce a given level of output. Allocative efficiency is measured by the extent to which the industry produces the mix of goods, which reflect the preferences of consumers as expressed by their consumption decisions (Flynn, 1997).

There are two main models in the literature, which are used to assess the performance of banks in relation to the efficient utilisation of inputs. These are the parametric translog cost approach and the nonparametric DEA approach. We have used the DEA approach and so it has been reviewed below. We adopted the DEA method because nonparametric analysis may be more powerful compared to parametric methods when it is suspected that normality conditions may not be satisfied as in our case (Mendenhall et. al.,

1986). Besides, the parametric approach requires more information than is typically available for estimating the frontier (Berg et. al., 1991; and Sobodu and Akiode, 1998). In fact some of the detailed information which the parametric approach would typically require are not available for this study.

The DEA optimisation process seeks to minimise the distance of an observation from a projected *best practice frontier* spanned by a linear combination of efficient units. Unlike the parametric model which fits a regression line to the data, DEA envelops the data via a piece-wise linear surface on top of the observations. Figure 2 illustrates the concept for the special case of using just one input to generate one output.

[See Figure 2, end of document]

The longer the distance of an observation from the best practice frontier the less relatively efficient it is. For inefficient individual observations that lie below the frontier in Figure 2, DEA is capable of identifying the sources and level of inefficiency.

2.1 Technical Efficiency Model

Assuming k inputs, m outputs and a sample of n observations[2], the DEA optimisation process for determining the input saving efficiency measure for any bank j is given by:

$$Min_z\, q_j \quad \textit{subject to} \tag{2}$$

$$Yz_j \geq y_j, \tag{3}$$

$$Xz_j \leq q_j x_j, \tag{4}$$

$$\sum z_j = 1, \tag{5}$$

$$z_j \geq 0 \quad \forall\, j, \quad j = 1,2,...,n. \tag{6}$$

where; $q \in [0,1]$ is the input saving efficiency measure for unit j (i.e. a decision making unit or a bank which uses multiple inputs to produce multiple outputs), Y is the (mxn) matrix of outputs from all units, y_j is the (mx1) vector of outputs for unit j, X is the (mxn) matrix of inputs for all units, x_j = (kx1) vector of inputs for unit j, and z_j is the (1xn) vector of intensity weights defining the linear combination of best practice to be compared with unit j. Equation (3) states that the observed outputs of unit j must not exceed a linear combination of outputs of the best practice reference units. Equation (4) means that the use

[2] The inputs used were staff costs, non staff operating costs, and capital (premises and fixed assets). Staff costs include director emoluments, salaries and bonuses, travel expense, social security and provident fund contributions as well as other staff related costs such as medical care. The outputs were deposits, loans and commissions & fees. Table A1 (appendix) gives highlights of the inputs and outputs. The sample used for this study consists of banks, which operated in the industry from 1988 to 1999 excluding two banks, which were recently liquidated. A total of 16 different banks appear in the sample over this 12-year period. Due to entries and exits, an acquisition, and the omission of certain banks due to incomplete records, the size of the sample at hand is 135. The sample embraces all the active banks in the country with the exception of two small banks and the rural banks and is therefore representative of the core banking industry in Ghana. To make comparisons more meaningful, we transformed the raw data from nominal into real figures, using 1999 as the base year.

of inputs at the linear combination of reference units must not exceed the inputs used by unit j. To obtain the technical efficiency score for each of the n units in the sample implies solving the system n times. The solution q_j^* measures the fraction of inputs required to produce the output vector recorded for unit j. If it is not possible to produce the recorded output with a smaller input vector, $q_j^* = 1$. In the presence of pure technical inefficiency $q_j^* < 1$.

2.2 Allocative Efficiency Model

Allocative inefficiency is found by deriving overall input inefficiency and pure technical inefficiency and deducting the latter from the former. If the prices of factor inputs are available and ω denotes the vector of these prices, then overall cost efficiency in relation to inputs is determined from a slightly different specification of the system (2)–(6) as follows:

$$Min_z \; wx \qquad subject\ to \tag{7}$$

$$Yz_j \geq y_j, \tag{8}$$

$$Xz_j \leq x_j, \tag{9}$$

$$\sum z_j = 1, \tag{10}$$

$$z_j \geq 0 \quad \forall\, j. \tag{11}$$

In this case the optimisation process determines the minimum input vector x_j^* for each unit given the price vector w. The scalar $w.x^*$ is then the minimum total production cost which can be attained by unit j for its output level. In this study, the data available on the observed input vector x_j for unit j is stated in value terms for the three inputs and not in units and so w = (1 1 1). This assumes that observations face similar input prices. This

assumption was necessitated by the lack of data on physical units, which compelled us to use the total balances on accounts. A cursory analysis of the data does not render this assumption unrealistic. By comparing the observed input cost vector x_j with the DEA projected efficient cost vector x_j*, it can be determined where and by how much cost inefficiency permeates the operations of unit j. The vector x* together with the score q_j* are then used to quantify overall cost (in)efficiency which is then decomposed into technical and allocative inefficiency using the following formulae[3]:

(i) Overall cost efficiency = $(\omega \cdot x_j^* / \omega \cdot x_j)$

(ii) Allocative efficiency = $(\omega x_j^* / \omega \cdot \theta j^* \cdot x_j)$

(iii) Amount by which overall cost inefficiency raises cost above attainable min = $(\omega \cdot x / \omega \cdot x_j^*) - 1$

(iv) Amount by which tech inefficiency raises cost above attainable min = $\{\omega x_j(1-\theta j^*)/\omega x_j^*\}$

(v) Amount by which allocative inefficiency raises cost above attainable min = $(\omega \cdot \theta j^* \cdot x_j / \omega x_j^*) - 1$

2.3 Classification of Input-Output Matrix

The definition of inputs and outputs of banks[4] is not straightforward and an extended and unresolved controversy remains in the literature, giving rise to alternative approaches (Santos and Dyson, 1999). This controversy is largely due to the multi-product

[3] The scale of production of unit j can be determined by observing the sum of intensity weights DEA assigns to the observations whose linear combination forms the best practice reference frontier for unit j when the solution under CRS is considered. In this case increasing returns to scale applies if $\Sigma \mathbf{z_j} < \mathbf{1}$ but if $\Sigma \mathbf{z_j} > \mathbf{1}$, then decreasing returns to scale applies. The scale efficiency score (SE) will then be defined as $SE = q_j^*{}_{CRS} / q_j^*{}_{VRS}$. The CRS production frontier envelops the data less closely than VRS so $\theta_j^*{}_{CRS} \leq \theta_j^*{}_{VRS}$ and hence $0 \leq SE \leq 1$.

[4] A bank offers various services or products. These are differentiated and they share the same set of inputs. One link between inputs and outputs when output is differentiated is captured by economies of scope. Evidence concerning efficiency gains from economies of scope is not conclusive. The literature suggests that studies to date typically focus on outputs currently produced and find very slight or no potential efficiency gains. The methodologies used to evaluate advantages from joint production have typically been criticized on the grounds that most functional forms utilised for bank cost analysis are still ill suited for analysing economies of scope. Due to the empirical difficulties we have decided not to use the concept in our study. Gilligan et. al. (1984) and Berger et. al. (1987) applied the concept in analysing competitive viability of banks in America.

nature of banks and the subsequent lack of agreement on appropriate proxies for both particular and general measures of lending and non-lending bank services (Clark, 1984). In 1985 Humphrey discussed two alternative approaches to the modelling of bank production behaviour namely the 'production approach' and the 'intermediation approach'. The *production approach* views banks as producers of *services* associated with individual deposits and loan accounts and therefore treats both as bank output. This corresponds to what is sometimes called the *value-added approach* (Berg et. al., 1991; Berger and Humphrey, 1990b). The appropriate bank output in this regard is the *number* of deposit accounts and outstanding loans. The inputs considered are usually (but not always) physical units of inputs such as labour, capital and materials[5] (Kim, 1989). The total cost for this approach is given by all operating costs (excluding interest costs) incurred in producing the specified outputs (Santos and Dyson, 1999).

The *intermediation approach* on the other hand views banks as financial intermediaries linking savers and investors rather than producing deposit and loan account services. With this approach, opinion is divided on whether to treat deposits as inputs or outputs (Santos and Dyson, 1999). Some of the researchers who adopt this approach treat deposits as inputs along with labour, capital and materials. And consistent with this approach is to expand inputs costs to include interest costs.

We are interested in using the input-orientation concept of DEA to investigate a competitive resource structure seen as an essential ingredient for sustaining an aggressive

[5] We used questionnaires, interviews, and review of documents to generate both primary and secondary data. The normal tests for non-response bias revealed no such bias. The BSD of the Bank of Ghana and KPMG have rich sources of data on the operating costs and outputs of all banks. A cross-check of data from KPMG with that obtained from the BSD and individual banks suggests that the data are as accurate as they could be. The data triangulation is important because DEA is a non-stochastic technique therefore the severity of the resulting problem of confounding noise with inefficiency depends upon the accuracy of the underlying data.

commercial strategy so we have chosen the production. This is in line with the vast majority of studies published in the last decade within the DEA framework. Also treating deposits as input would make banks with more money market funding appear more efficient because they need less deposits. DEA analysis requires careful handling of two issues. First, it is instructive for observations in the sample to have identical reporting formats. Second, the analysis will make sense if the number of observations included in the sample is substantially larger than the number of variables specified. The more the variables that are included in the model, the more will certain observations appear efficient only for the lack of truly efficient banks which deal in some of the specified variables.

3. Empirical Findings

The findings of our study are detailed below. They have been presented in the order in which our research questions were posed to facilitate linking the two.

3.1 Incidence of Competition

Table 1 shows year on year Herfindahl Indexes from 1988 to 1999 with average figures for 1988 - 1993 and then for 1994 – 1999.

Table 1: Year on Year Herfindahl Indexes

YEAR	DEPOSITS	LOANS	INCOME
1988	**3 396**	**1 688**	**4 508**
1989	3 418	1 859	2 242
1990	3 077	1 867	2 221
1991	3 219	1 483	1 782
1992	2 296	1 613	1 490
1993	3 112	1 342	1 456
Average (1988-93)	**3 086**	**1 642**	**2 283**
1994	2 133	1 335	1 462
1995	1 462	1 185	1 737
1996	1 618	1 373	1 572
1997	1 597	1 585	1 447
1998	1 575	1 554	1 444
1999	1 558	1 666	1 530
Average (1994-99)	**1 657**	**1 450**	**1 532**

In line with the dominant view of the financial sector liberalisation literature, we hypothesised that competition will increase with the implementation of FINSAP. This is borne out by Table 1which shows that generally, competition has increased over the period. However the lag time for FINSAP to impact on competition differs among the three variables. Whereas the deposits market became competitive after seven years, it took only three years for net income [6] to show signs of competition. We also hypothesised that as the policy measures of FINSAP become more embedded in the financial sector, competition will increase even further. Taking a 5-year period as the time for such measures to become fully embedded in the financial sector, this hypothesis means that the industry would become more competitive year on year from 1993. However, since 1995, contrary to expectations, the loans market is becoming less competitive year on year and competition in the deposits market has stagnated. Net income appears to be the area where

[6] Net income stands for profit before exceptional items. This variable did attain negative values time and again for certain banks in the pre FSL era. Since the advent of FSL, shareholders have been demanding at least 5% real return on equity and consequently achieving a high net income has become a variable of competition. Banks compete for the best in HR, technology, etc which reflects through net income. We do not see it as a market as such (in the true sense of the word) but rather as a variable, which gives an indication of competitiveness in a desire to satisfy shareholders. Some of the banks have gone public in the post FSL era.

banks have focused their competitive energies. The policy implications of this finding are treated later. Overall, though competition has increased over the period, it does not appear to be as intense as one would have expected after a decade of FINSAP. This finding is further clarified with the results of our market concentration tests.

3.1.1 Market Concentration (Market Shares for Deposits)

It is interesting to note that even though there has been a certain measure of competition, it is mainly among the four leading banks that together control a is proportionately large portion of the market. The smallest of the four leading banks in 1990 became the leading bank in 1999.

[See Figure 3, end of document]

In real terms, this bank raised its market share from 9% in 1990 to 24% in 1999. By contrast, the biggest bank in 1990, which had 52% of the market at the time has seen its market share drop[7] to just about 20% in 1999. A comparison of the market share of the leading banks in Ghana with that of South Africa and Nigeria reveals that market concentration is prevalent in these countries. The four leading banks in Ghana and South Africa control about 80% of their respective deposits markets. The picture is similar for Nigeria. The oligopolistic nature of the market enables smaller and relatively efficient banks to remain profitable by following the pricing of the four leading banks.

[7] In the pre-FSL era, the minister of finance had the sole prerogative of fixing interest rates and determining the sectoral allocation of loans. The banks were therefore price-takers and they responded to this by creating as many branches as possible to generate more profit. The bank whose market share was halved had more than 150 branches nation-wide. When interest rates were deregulated in the post FSL era, it was left with branches, which became a drag on its capital (such branches are currently being either closed or reorganised). Meanwhile the better-managed banks capitalised on service quality to aggressively raise market share. Deregulation-induced competition was therefore the main driving force behind the gains and losses in market share.

3.1.2 Lorenz Analysis

Lorenz curves give another dimension to the picture being painted. We tested three related hypotheses here. First, if competition is increasing then market concentration will reduce. Second, for both loans and deposits we expect market concentration to reduce in the second period. Finally, we hypothesised that where competition exists, the ranking of the banks in terms of their shares in the loan and deposit markets will change. Tables 2 and 3 report the cumulative share of the market accounted for by banks in different quintiles of the banking market for two periods: 1988 – 1993 and 1994 - 1999. They show evidence of huge disparities in the distributions of both deposits and loans.

Table 2: Distribution of Deposits

	1988 – 1993		**1994 – 1999**	
	%	**Cumulative %**	%	**Cumulative %**
Lowest Fifth	3.40	3.40	2.65	2.65
Second Fifth	5.37	8.76	6.82	9.47
Third Fifth	9.90	18.66	11.91	21.38
Fourth Fifth	17.34	36.00	26.69	48.07
Highest Fifth	64.00	100.00	51.94	100.00
Total	**100.00**		**100.00**	

Table 3: Distribution of Loans

	1988 – 1993 Loans		**1994 – 1999 Loans**	
	%	**Cumulative %**	%	**Cumulative %**
Lowest Fifth	4.2	4.2	2.1	2.1
Second Fifth	8.7	12.9	7.3	9.4
Third Fifth	16.1	29.1	14.5	23.9
Fourth Fifth	24.8	53.9	21.8	45.8
Highest Fifth	46.1	100.0	54.2	100.0
Total	**100.0**		**100.0**	

For the period 1988-93, the Top 20% (which coincides with the Top 4 banks) controlled 64% of the deposits market, but this figure dropped to 52% for the 1994-99 period. Comparable market shares for loans were 46% (1988-93) and 54% (1994-99). Figure 4 graphs this information.

[See Figure 4, end of document]

The diagonal straight line shows that it is expected that 50% of firms in the industry would account for 50% of market share. Thus the extent to which the Lorenz curve bulges out from the diagonal line gives an indication of the extent of concentration; the greater the curvature, the higher the concentration of the market. For deposits, the outer curve represents 1988-93 and the inner curve represents 1994-99. The reverse is true for loans. It is apparent that the disparity in the share of deposits mobilisation *decreased* during the second half of the 1990s and that it *increased* for the distribution of loans. Combining Table 3.1 and Figure 3, it is clear that in the presence of competition, market shares do change.

3.2 Levels of Intensity of Competition

Table 4 presents summary statistics on the deposits market shares of the various banks. The market share of a Top 4 bank averaged 19.25% whereas that of the other banks averaged only 2.67%.

Table 4: Summary Statistics on Deposits Market Shares (1988 -99)

	Top 4 Banks	**Rest of Market**
Average market share	19.25 %	2.67 %
Standard deviation	6.75 %	0.75 %

Coefficient of variation	35.06 %	28.09 %

The top 4 banks showed a higher variation in their market shares (with standard deviation of 6.75% and coefficient of variation of 35.06%) than the rest of the banks (whose standard deviation and coefficient of variation were 0.75% and 28.09% respectively). Also a closer look at the deposits information in Table 3.2 indicates that the banks that were classified in the highest fifth for 1988-93 were the same for the corresponding classification for 1994-99, except that their market shares changed. It therefore appears to be a *zero sum game* among the four leading banks in the sense that what the biggest bank (until 1998) had lost, the other three have gained. The market shares of the rest of the banks have moved within a rather narrow band implying that they have not made significant inroads by way of wrestling market share from the Top 4 banks or 'growing' their own markets. This points to more intense competition among the four leading banks. This should not be surprising since they are all commercial banks and perform similar retail banking activities.

3.3 Technical Efficiency

Table 5 provides summary statistics of the E-scores for both variable returns to scale (VRS) and constant returns to scale (CRS) assumptions as well as scale efficiency scores.

Table 5: Industry Summary of Computed E-scores

	VRS	CRS	Scale Efficiency
Mean	0.77	0.71	0.93
Median	0.78	0.70	0.98
St Dev	0.187	0.191	0.21
Min	0.32	0.32	0.49
Max	1.00	1.00	2.84

We computed E-scores for all 135 observations in the sample using the DEA model. The observed minimum technical score of 0.32 under both assumptions is much less than 1 implying that there is significant inefficiency spread.

3.3.1 Trend of Efficiency

Table 6 shows that efficiency improved year on year until 1995. It has remained relatively stable ever since as Table 6 shows.

Table 6: Average Efficiency Scores for All Banks (1988-99)

Year	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Score	0.65	0.65	0.73	0.77	0.77	0.72	0.81	0.84	0.83	0.82	0.79	0.84

We tested the hypothesis that efficiency will increase with competition by comparing the E-scores with the Herfindahl indexes for deposits, loans and income. Tables 7 and 8 show the results.

Table 7 : Herfindahl Indexes vis-à-vis E-Scores

	DEPOSITS (HI)	LOANS (HI)	INCOME (HI)	TECHNICAL EFFICIENCY (%)
1988	3 396	1 688	4 508	65
1989	3 418	1 859	2 242	65
1990	3 077	1 867	2 221	73
1991	3 219	1 483	1 782	77
1992	2 296	1 613	1 490	77
1993	3 112	1 342	1 456	72
1994	2 133	1 335	1 462	81
1995	1 462	1 185	1 737	84
1996	1 618	1 373	1 572	83
1997	1 597	1 585	1 447	82
1998	1 575	1 554	1 444	79
1999	1 558	1 666	1 530	84

Table 8: Correlation Matrix

	DEPOSITS	LOANS	INCOME
Efficiency	-0.90	-0.57	-0.70

In the wake of competition HIs must decline and in the wake of enhanced efficiency E-Scores must increase. We observed significant negative correlation between the HIs for deposits, loans and income on one hand and efficiency on the other. The best improvement in efficiency is in the area of deposit mobilisation.

3.3.2 Cost of Inefficient Production

An important by-product of DEA efficiency assessment is the derivation of a set of input-output targets which, when achieved, will eliminate inefficiency and render an observation efficient. Furthermore, it enables us to calculate the magnitude of inefficiency in terms of cost and also to determine by what percentage a bank's inefficiency raises its production cost above the attainable minimum as explained in Section 2. Table 9 shows the summary for the industry. It presents DEA input targets, which will make the industry as a whole efficient and competitive if achieved.

Table 9: Observed Costs vs. DEA Projected Costs (in Real Terms)

	Observed Cost (¢ million)	**DEA Cost (¢ million)**	**DEA cost as a % of Observed Cost**
Staff Cost	1,905,796	1,133,250	60
Other Operating costs	1,155,838	826,966	72
Real Capital	1,770,728	981,321	55
Total	**4,832,362**	**2,941,537**	**61**

The table clearly shows that the industry uses more than necessary inputs to produce its outputs; implying technical inefficiency. To be technically efficient and competitive, the industry requires only 60% of its staff costs, 72% of its non-staff operating costs and only 55% of real capital inputs. There is therefore much scope for cost efficiency improvement.

3.3.3 Allocative Inefficiency

Figure 5 reinforces the case for cost efficiency. It is evident, from Panel A of Figure 5 that staff costs account for the biggest share of inputs costs in the industry (39%) followed closely by capital inputs (37%) with material costs accounting for the remaining 24%. DEA's optimal input mix (Panel B) is 39% for staff cost, 33% for capital inputs and 28% for the third cost element.

[See Figure 5, end of document]

This shows an element of allocative inefficiency, which appears to be in the area of real capital and non-staff operating costs (designated as materials). The banks are allocating more resources to these areas than appropriate with negative implications for costs. To quantify cost efficiency and allocative efficiency we used the model discussed in Section 2 (see Table 10).

Table 10: Cost and Allocative Efficiency

	Cost Efficiency	Allocative Efficiency
Average	61.0%	82.3%

The average Ghanaian bank is 82.3% efficient in its input allocation. Thus allocative inefficiency amounts to 17.7%. This level of allocative inefficiency raised observed total cost by 26.9% above the cost that could possibly be attained if the industry were efficient. This is shown in Table 11.

Table 11: Amount by which Various Inefficiencies Raise Cost above the Optimum Cost

	Overall	**Allocative**	**Technical**
% increase above min cost	64.3	26.9	37.4

From Table.9, we calculated the amount by which observed total cost for the industry exceeds the DEA prescribed (minimum) cost, which is 64.3%. Since overall cost inefficiency is the sum of allocative and technical inefficiency, the percentage by which the latter raises cost above the minimum is found to be 37.4%.

We observed earlier on that the average technical efficiency of the industry as a whole is 77% implying a technical inefficiency of 23%. This level of technical inefficiency raises total cost by 37.4%. In real terms inefficiency cost the banks ¢1,890,825 million between 1988 and 1999.

3.4 Size and Performance

Table 12 summarises evidence of economies of scale with respect to Deposits mobilisation.

Table 12: Economies of Scale (Real Terms)

Deposit Class	Total	IRS	CRS	DRS
(¢ Million)	Frequency	Frequency	Frequency	Frequency
0 -100,000	50	40	8	2
100,000 -200,000	33	16	7	10
200,000 -300,000	16	9	3	4
300,000 -400,000	6	3	2	1
400,000 -500,000	13	5	0	8
500,000 -800,000	5	0	0	5
800000- 1500000	9	1	0	8
1500000 and over	3	1	0	1
Full Sample	135	75	20	39

We found out that 75 DMUs (i.e. 56% of the lot) operated under increasing returns to scale over the period whereas 39 of them (i.e. 29%) operated beyond an ideal size (i.e. diminishing returns to scale). Only 21 DMUs (15%) operated under constant returns to scale - the right size. This implies that the industry generally operates under increasing returns to scale. The level of output that will pull cost to the bottom of the industry's cost curve has not been reached.

Table 12 shows that IRS is pervasive in Ghanaian banking as banks could be found along all classes of deposits with much higher frequencies. To eliminate the cost inefficiency from size, an output orientation approach would have to be employed to determine the right size of output. We did not investigate this, suffice it to say however that within the Ghanaian context, the mean deposits of the banks producing under CRS is about ¢250 billion, the equivalent of approximately US$73 million using an exchange rate

of ¢3450: $1 for year end 1999.

A closer examination of the sum of intensity weights from which the scale properties (IRS, CRS and DRS) were assigned to the DMUs however indicates that the sizes of most of those operating either under IRS or DRS are not far CRS. In most cases the sum of intensity weights is only a tad below or above 1. Therefore, the scale efficiency of the industry as a whole is 93% implying a scale inefficiency of 7%. It must be pointed out that the extent to which such a small gap could raise operating cost above what would obtain if CRS applied could be substantial.

3.5 Efficiency and Profitability

Figure 6 links profitability indexes and technical efficiency scores of DMUs using an analytical paradigm applied by Dyson *et al* (1990) and amplified by Santos and Dyson in a study conducted in 1999 involving 168 DMUs in Portuguese banking. The profitability index of a DMU is obtained by dividing the net earnings margin by total costs (including interest costs). This ensures that bigger banks are not favoured in the profit dimension of the matrix. The joint use of profitability and efficiency addresses the shortcoming of using only one of them for performance evaluation.

[See Figure 6, end of document]

The correlation coefficient between the two variables was calculated under the two alternative assumptions (CRS and VRS). We found out that the coefficients of 0.32 for CRS and 0.2 for VRS are both statistically significant. The slope of regressing profit index on efficiency is also significant. There is therefore a positive relation between efficiency

and profitability; but the relationship is weak. It is clear from the diagram that high profitability does not necessarily imply efficient operation because many DMUs score well on profitability and low on efficiency and vice-versa.

The picture painted by the panel supports the argument raised by many observers that the high profits of most banks owe less to efficiency than to their near monopoly position, high returns on risk-free government treasury bills, asymmetric information and the reluctance of loyal customers to shop around

We isolated the efficiency and profitability indexes for the last three years. We observed a slightly better upward trend than the one presented in Figure 6. The correlation coefficient in this case is 0.36, which is higher than that for the whole sample. This indicates that banks are matching efficiency with profitability much better.

4. Implications of Study and Policy Recommendation

We observed that in the first two years of FINSAP, both competition and efficiency remained stagnant and between 1990 and 1995 when competition increased, there were significant gains in efficiency year on year. Since 1995, competition appears to have slackened and so has improvements in efficiency. In a similar study, KIPPRA also found that since 1996, the impact of FSL has slackened in Kenya. The implications are that (i) it takes time for financial sector liberalisation to impact on competition and efficiency (ii) once an FSL program is introduced it should be reviewed and updated on an ongoing basis in order for its benefits to be optimised.

We also observed that margins (in real terms) have been rising in the post FINSAP era implying that the modest gains in efficiency are not being passed on to consumers. This is partly due to the oligopolistic structure of the market, which is concentrated in the hands of four leading banks. Their dominance enables them to dictate to the market and they are in a position to pass on their inefficiencies to customers. The smaller and relatively efficient banks benefit from this by pricing as followers of the larger banks. This has interesting implications for the nature and intensity of competition. Structurally, as the market becomes more concentrated, competition reduces until at the extreme the monopoly structure evolves (Pass et. al., 1993). The banks will then seek to avoid ruinous price competition and channel their main marketing efforts into sales promotion and product innovation; activities which enhance profitability. This is happening to a greater extent in the Ghanaian banking industry.

For real prices to fall it is necessary for the industry to contend with more sophisticated customers whose demands are reflected through a well informed and mobile customer base. Achieving this is a difficult quest but attempts could be made at educating consumers on alternative financial products and promoting these products e.g. unit trusts and insurance products. Besides, consolidations and strategic alliances should be encouraged and any attempts at fostering these in the industry may focus on the lower-middle end of the market. This will make the market more contestable, help in breaking the concentration on the market and pave way for real price competition.

In an FSL regime, it is essential for government to be disciplined and ensure that its policies complement monetary policies. The declining competition in the loans market and the stagnation in efficiency gains is attributed to government's deficit financing which

pushes up interest rates thereby enabling banks to generate risk free returns through the purchase of government treasury bills. A stable macroeconomic environment is *sine qua non* for effective financial sector liberalisation.

5. Causes of Inefficiency and Suggestions

The causes of inefficiency in the Ghanaian banking industry are similar to those of any other industry. Allocative inefficiency arises primarily from market distorting factors such as regulation. Pure technical inefficiency is attributed to management's inability to optimise utilisation of factor inputs due to weak market forces that put hedges around inefficient banks. Scale inefficiency is induced either by stringent regulation or market limitations, which put the optimal level of output beyond the reach of banks.

We found that allocative inefficiency component arises mainly from the overuse of capital relative to staff cost. In the pre FINSAP era, regulation of interest rates and the sectoral allocation of loans removed price competition from the market and the banks responded by creating more branches to raise service levels and thereby earn more. Now that regulation has been lifted, some of them are left with substantial capital inputs that contribute disproportionately to the production process. But this inefficiency has been falling as the banks continue to react to the pressures of competition. It must be noted that allocative inefficiency is smaller than technical inefficiency in the industry. This means that on average bank managers do better in assigning factor inputs to productive ends than they do in utilising the inputs so assigned. Even though technical inefficiency has been falling due to competition, it still remains the driving force behind overall inefficiency in the industry. This seems to suggest that the frequent berating of the regulators regarding the inefficient cost burden they impose on the process of bank production may be somewhat exaggerated. The banks will benefit greatly by reviewing their internal processes on an ongoing basis to remove all *input-slackness* deriving from under-utilisation from their production process.

The reported scale inefficiency of 7% is attributed mainly to most banks operating under increasing returns to scale (i.e. with technically small sizes). Against this backdrop is the finding that the banks under-utilise labour and other inputs. Therefore the industry and society as a whole will benefit if the banks are able to expand their scale of operations to fully utilise the potential of labour and capital. The proportion of costs allocated to staff vis-à-vis other inputs is about right. The problem lies with the extent to which staff (and other inputs) are utilised. A way around this is to encourage strategic alliances between the banks and other financial institutions, to intensify the cross selling of products and make efforts to grow the market rather than merely capturing market shares from others. This will provide avenues for the effective utilisation of staff. We did not quantify the extent to which scale inefficiency impacts on costs but then relatively minor efficiency gaps could significantly raise costs above the attainable minimum.

6. Summary and Conclusion

Competition in the Ghanaian banking industry is increasingly important if banks in both are to satisfy the needs of the public at the least social cost. The nature, incidence and intensity of competition have an important impact on market performance and have high relevance to devising and applying a competition policy. Even though there has been a certain measure of competition since the advent of FINSAP, it is not as intense as one would have liked to see and the competition is driven mainly by the four leading banks who together control the biggest chunk of the market. Structurally, as the market progressively becomes concentrated, competition among the many reduces to competition among the few until at the extreme the monopoly structure evolves. The banks will then

seek to avoid ruinous price competition and channel their main marketing efforts into sales promotion and product innovation, activities, which enhance profitability. This appears to be the case with the Ghanaian banking industry.

Analysis of cost efficiency is of prime importance in a deregulated environment. At the micro level it enables management to determine the size of output and the corresponding cost which accord with their objective of profit maximisation. This relationship also has implications for public policy. The relationship between cost and size (economies of scale) must concern not only management but regulators and consumers as well. Even though almost all the banks are now more efficient than they were at the onset of FINSAP and five years ago, there is much more scope for efficiency improvements. The cost efficiency of the industry is only 61%, implying that the industry losses a substantial portion of its cost to inefficiency which they pass on to customers because of the structure of the industry. This inefficiency is decomposed into allocative and technical inefficiencies. The allocative component is due mainly to inefficient mix of inputs especially in the area of capital inputs and non-staff operating costs. Technical inefficiency reflects management's inability to fully utilise resources once allocated. Of the three inputs cited, real capital is the most under-utilised, followed by employees (staff) and then non-staff operating costs.

Integration of efficiency and profitability into the analysis shows that for most banks, profitability will improve if efficiency improves. Those that are fully efficient must focus on enhancing profitability.

Most banks operate under increasing returns to scale. For these banks, an increase

in branch network, or scope of operations is feasible. If the market doesn't support this, mergers and strategic alliances with other financial institutions should be explored. This will open up avenues for factor inputs to be fully utilised so as to shed off the cost arising from technical inefficiency. The new banks must attempt to attract a large client base or enhance scope of operations to avoid the inefficient costs deriving from inappropriate size. This is important because it has the potential of lowering prices, which are at the moment very high in the industry. In order for any resulting economies of scale not being channelled into asserting dominant positions in the industry, a healthy policy on competition could be introduced by the regulators; on restrictive trade agreements, anti competitive practices, mergers and acquisitions etc.

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APPENDIX

Table A1: Summary statistics of transformed secondary data (¢ million)

	INPUTS			OUTPUTS		
	Staff Cost	Others	Capital	Deposits	Loans	Comm. & Fees
Sum	1,911,222	1,155,828	1,777,784	37,903,975	12,306,777	1,704,252
Mean	14,370	8,756	13,267	280,770	91,161	12,624
SD	164,795	99,795	152,700	356,307	104,443	12,371
Min	181	189	684	7,190	2,537	114
Max	101,016	38,752	119,703	2,079,095	730,600	51,102

Table A2: Technical efficiency analysis results for individual banks on yearly basis

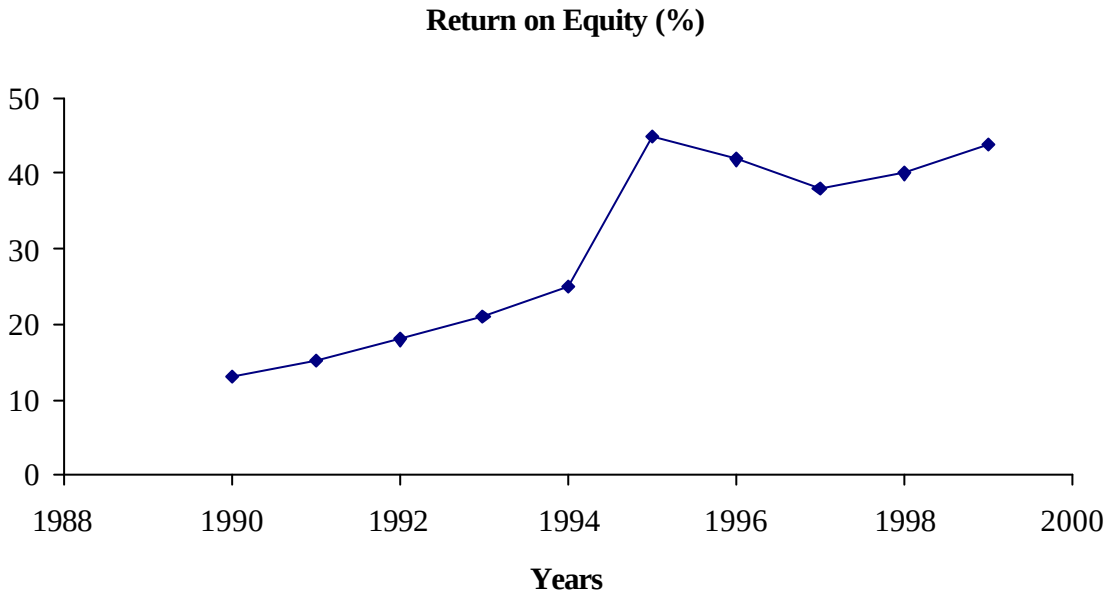
	Bank A			**Bank B**			**Bank C**			**Bank D**			**Bank E**			**Bank F**			**Bank G**			**Bank I**		
	VRS	CRS	SCE	VRS	CRS	SCE	VRS	CRS	SCE	VRS	CRS	SCE	VRS	CRS	SCE	VRS	CRS	SCE	VRS	CRS	SCE	VRS	CRS	SCE
1988	0.64	0.42	0.66	0.71	0.71	1.00	0.4	0.37	0.93	0.65	0.64	0.98	0.54	0.40	0.74				0.70	0.68	0.97	1.00	1.00	1.00
1989	1.00	0.78	0.78	0.56	0.56	1.00	0.67	0.67	1.00	0.57	0.57	1.00	0.71	0.50	0.70				0.8	0.8	0.99	0.3	0.9	2.84
1990	0.62	0.62	1.00	0.63	0.63	1.00	0.75	0.74	0.99	0.68	0.68	1.00	0.87	0.7	0.82	0.7	0.5	0.78	0.9	0.9	0.99	0.4	0.3	0.92
1991	0.76	0.76	1.00	0.72	0.71	0.99	0.76	0.73	0.96	0.54	0.53	0.98	0.97	0.9	0.88	0.9	0.9	0.93	0.7	0.7	1.00	0.5	0.5	0.98
1992	0.84	0.81	0.96	0.58	0.58	1.00	0.59	0.59	1.00	0.49	0.49	1.00	0.93	0.8	0.89	1.00	1	0.97	0.8	0.8	1.00	0.4	0.4	0.98
1993	1.00	1.00	1.00	0.46	0.46	1.00	0.47	0.47	1.00	0.51	0.51	1.00				1.00	1.00	1.00	1	1	1.00	0.5	0.5	1.00
1994	0.74	0.71	0.96	0.65	0.61	0.94	0.89	0.67	0.75	0.88	0.62	0.70	0.91	0.9	1.00	1.00	1.00	1.00	0.9	0.9	0.99	0.6	0.6	0.98
1995	0.77	0.70	0.91	0.83	0.70	0.84	0.61	0.61	1.00	0.91	0.70	0.77	1.00	1.00	1.00	1	1	0.99	1.00	1.00	1.00	0.5	0.5	0.98
1996	1.00	0.84	0.84	0.65	0.64	0.98	0.63	0.62	0.98	0.77	0.61	0.79	0.88	0.88	1.00	1.00	0.9	0.94	0.6	0.6	0.89	0.8	0.8	1.00
1997	1.00	0.84	0.84	1.00	0.96	0.96	0.48	0.48	1.00	0.63	0.54	0.86	1.00	1.00	1.00	1.00	1.00	1.00	0.8	0.8	1.00	0.7	0.6	0.94
1998	0.94	0.71	0.76	1.00	0.89	0.89	0.65	0.64	0.98	0.99	0.50	0.51	0.87	0.87	1.00	0.9	0.8	0.99	0.7	0.7	1.00	0.6	0.5	0.91
1999	1.00	0.86	0.86	1.00	1.00	1.00	0.80	0.74	0.93	1.00	0.81	0.81	1.00	1.00	1.00	1.00	1.00	1.00	0.9	0.8	0.99	0.5	0.5	0.98
1988 Score	0.64	0.42	0.66	0.71	0.71	1.00	0.40	0.37	0.93	0.65	0.64	0.98	0.54	0.40	0.74	0.00	0.00	0.00	0.70	0.68	0.97	1.00	1.00	1.00
88-93 Mean	0.81	0.73	0.90	0.61	0.61	1.00	0.61	0.60	0.98	0.57	0.57	0.99	0.80	0.66	0.81	0.89	0.84	0.92	0.82	0.81	0.99	0.51	0.60	1.29
94-99 Mean	0.91	0.78	0.86	0.86	0.80	0.94	0.68	0.63	0.94	0.86	0.63	0.74	0.94	0.94	1.00	0.97	0.96	0.99	0.80	0.78	0.98	0.61	0.59	0.97
Min	0.62	0.42	0.66	0.46	0.46	0.84	0.40	0.37	0.75	0.49	0.49	0.51	0.54	0.40	0.70	0.65	0.51	0.78	0.64	0.57	0.89	0.32	0.33	0.91
Max	1.00	1.00	1.00	1.00	1.00	1.00	0.89	0.74	1.00	1.00	0.81	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	2.84
88-99 Mean	0.86	0.75	0.88	0.73	0.70	0.97	0.64	0.61	0.96	0.72	0.60	0.87	0.88	0.81	0.91	0.94	0.91	0.96	0.81	0.80	0.98	0.56	0.59	1.13
SD	0.15	0.14	0.11	0.18	0.17	0.05	0.14	0.12	0.07	0.19	0.1	0.16	0.1	0.2	0.11	0.1	0.2	0.1	0.1	0.1	0	0.2	0.2	0.54

VRS – Variable returns to scale
CRS – Constant returns to scale
SCE – Scale efficiency

Table A2 con't

	Bank J			Bank K			Bank L			Bank M			Bank N			Bank O			Bank P			Bank Q		
	VRS	CRS	SCE	VRS	CRS	SCE	VRS	CRS	SCE				VRS	CRS	SCE	VRS	CRS	SCE	VRS	CRS	SCE	VRS	CRS	SCE
1988	0.70	0.7	1.00																			0.55	0.5	0.85
1989	0.54	0.43	0.80																			0.65	0.3	0.49
1990	0.87	0.73	0.84	1.00	1.00	1.00																0.70	0.5	0.69
1991	0.90	0.79	0.88	0.91	0.91	1.00																0.74	0.6	0.80
1992	0.80	0.79	0.99	1.00	1.00	1.00	1.00	1.00	1.00													0.82	0.6	0.72
1993	0.60	0.58	0.97	0.83	0.82	0.99	1.00	1.00	1.00													0.56	0.5	0.86
1994	0.74	0.72	0.97	1.00	1.00	1.00	0.7	0.65	1.00															
1995	0.97	0.87	0.90	0.6	0.58	0.92	1	0.96	0.99															
1996				0.6	0.49	0.83	1.00	1.00	1.00	0.66	0.5	0.79	0.96	0.5	0.55	1.00	0.9	0.89						
1997				0.6	0.48	0.81	0.7	0.51	0.77	0.79	0.70	0.89	0.91	0.5	0.54	1.00	1.00	1.00	1.00	0.53	0.53			
1998				0.5	0.44	0.96							0.84	0.5	0.64	1.00	0.8	0.79	0.9	0.53	0.62			
1999				0.6	0.57	1.00							0.64	0.5	0.77									
1988 Score	0.70	0.70	1.00	0.00	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.55	0.47	0.85
1988-93 Mean	0.74	0.67	0.91	0.94	0.93	1.00	1.00	1.00	1.00													0.67	0.49	0.73
1994-99 Mean	0.86	0.80	0.93	0.64	0.59	0.92	0.82	0.78	0.94	0.73	0.61	0.84	0.84	0.51	0.62	1.00	0.89	0.89	0.93	0.53	0.58			
Min	0.54	0.43	0.80	0.46	0.44	0.81	0.65	0.51	0.77	0.66	0.52	0.79	0.64	0.49	0.54	1.00	0.79	0.79	0.85	0.53	0.53	0.55	0.32	0.49
Max	0.97	0.87	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.79	0.70	0.89	0.96	0.54	0.77	1.00	1.00	1.00	1.00	0.53	0.62	0.82	0.59	0.86
Mean (88-99)	0.77	0.70	0.92	0.76	0.73	0.95	0.88	0.85	0.96	0.73	0.61	0.84	0.84	0.51	0.62	1.00	0.89	0.89	0.93	0.53	0.58	0.67	0.49	0.73
SD	0.15	0.14	0.08	0.2	0.24	0.1	0.2	0.22	0.1	0.09	0.1	0.1	0.14	0	0.1	0	0.1	0.1	0.1	0	0.07	0.11	0.1	0.14

Figure 1: Industry Performance Indicators



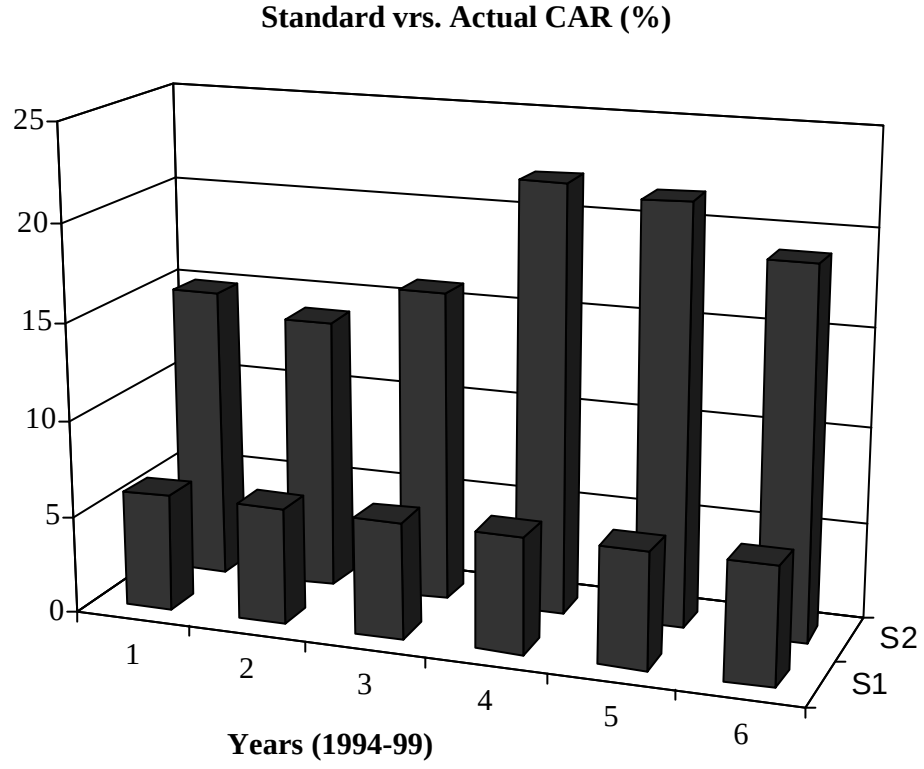
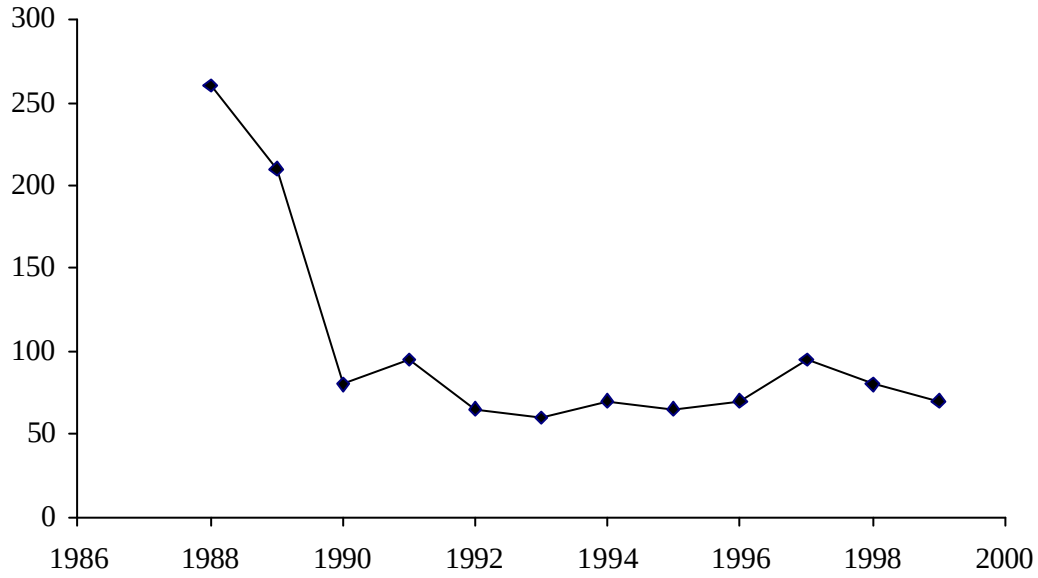

Standard vrs. Actual CAR (%)
25
20
15
10
5
0
1
2
3
4
5
6
S2
S1
Years (1994-99)

Figure 1 con't: Industry Performance Indicators

Real Bad Debts (¢ Billion)



Provisions as a % of Advances

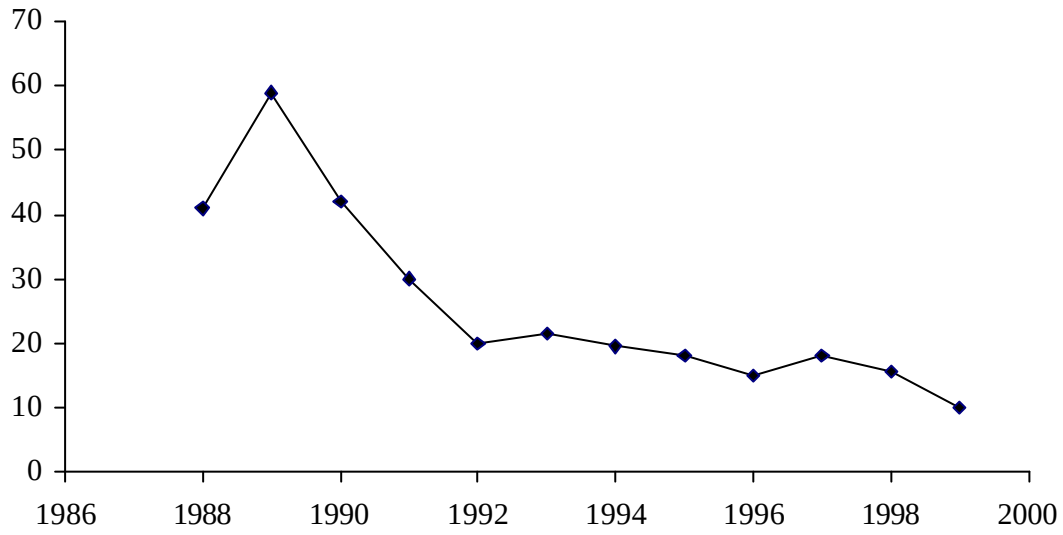


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Figure 2: DEA Frontiers and Efficiency Measurement

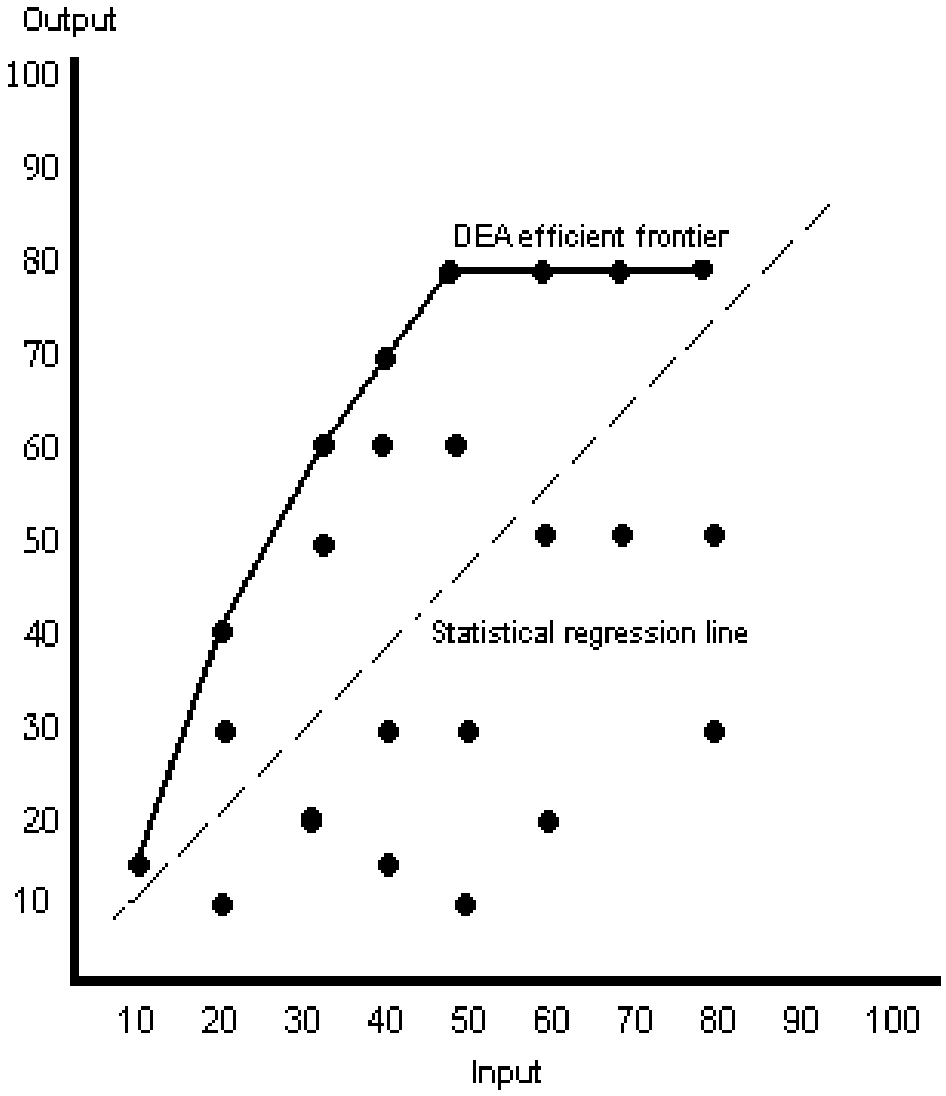

Figure 3: Deposits Market Shares for Top 4 Banks

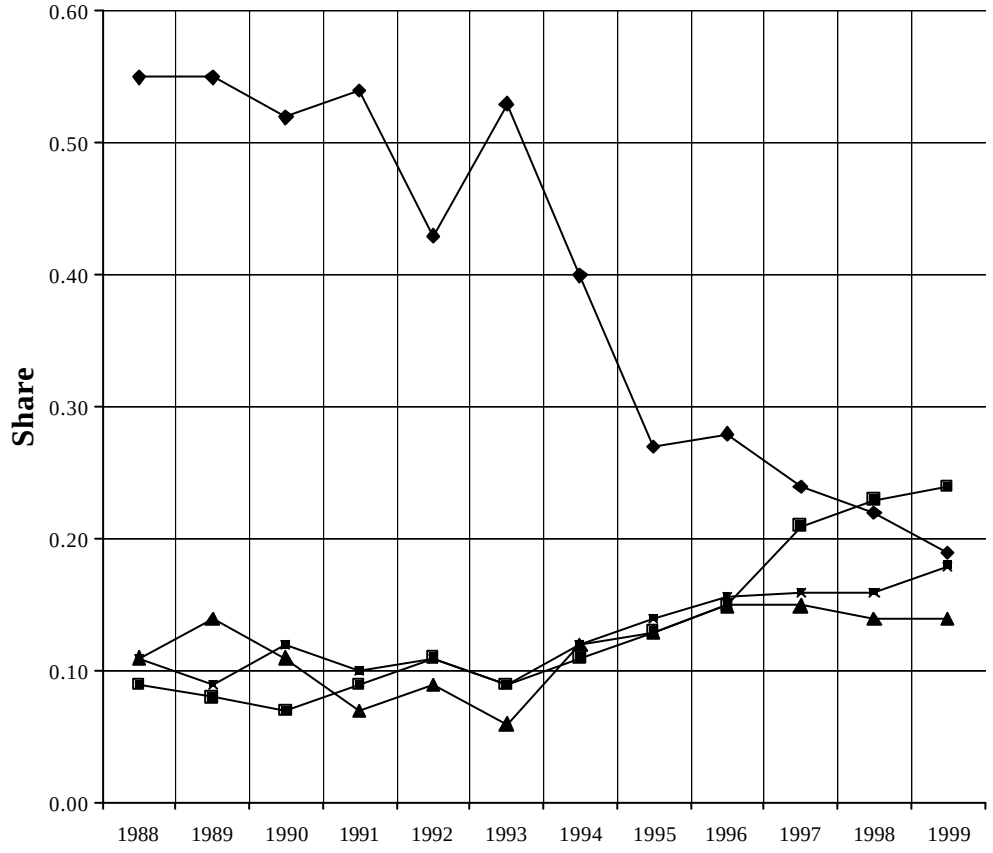

Figure 4: Market Concentration

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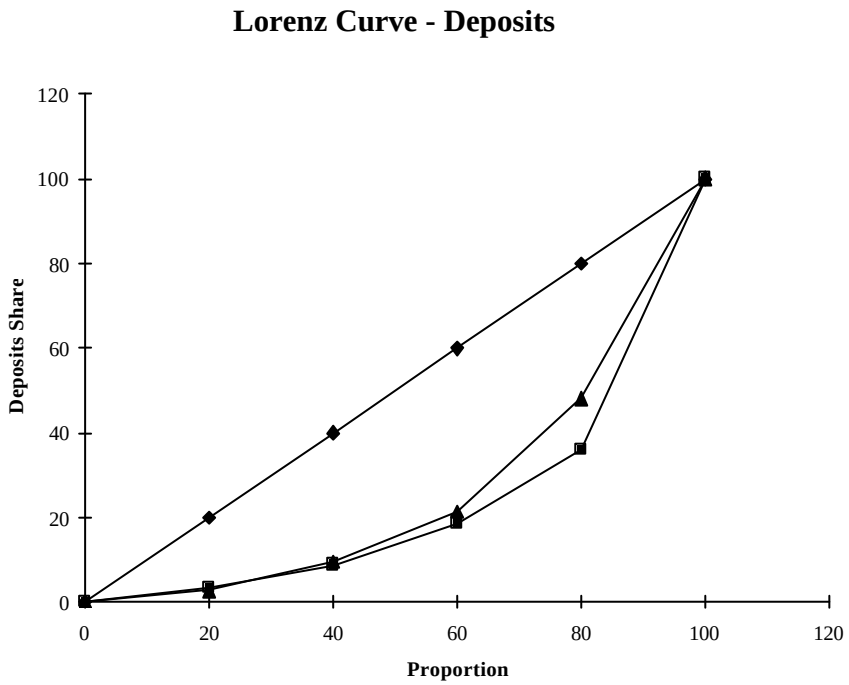

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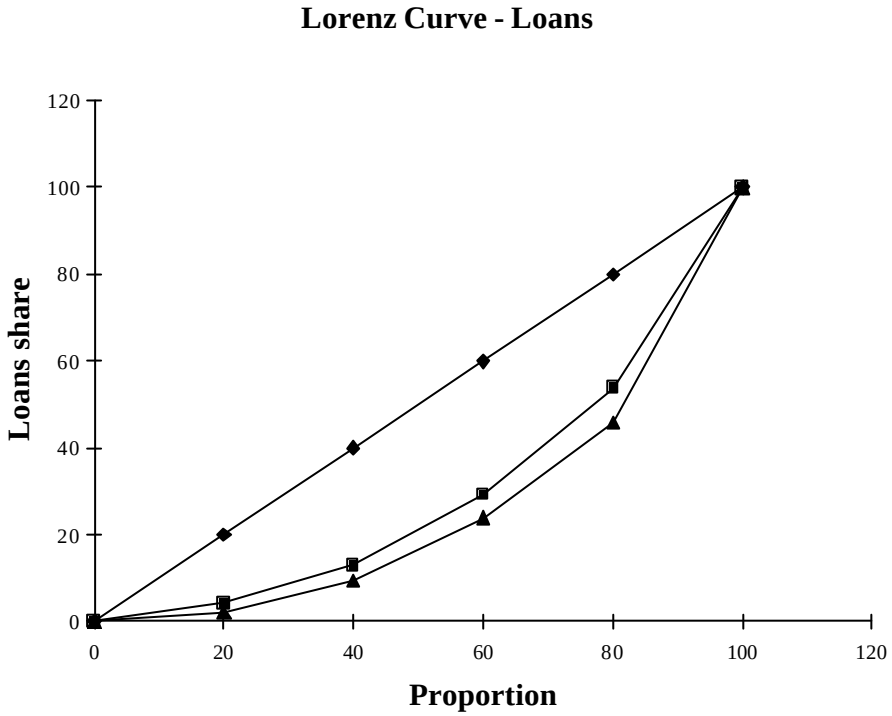
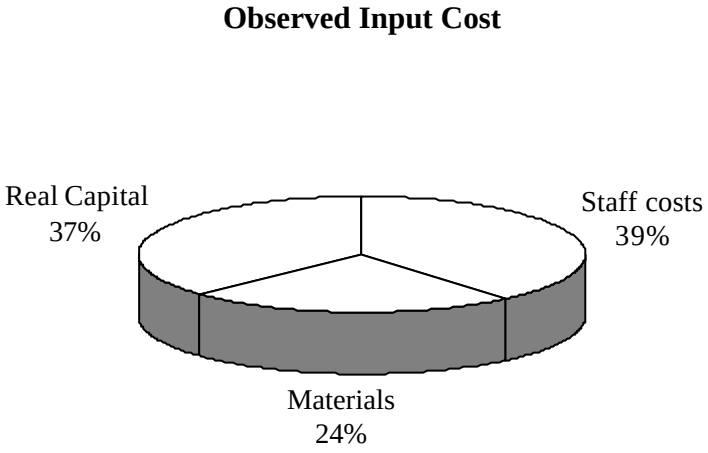

Lorenz Curve - Loans
Loans share
120
100
80
60
40
20
0
0
20
40
60
80
100
120
Proportion

Figure 5: Allocative Efficiency – DEA versus Actual



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DEA Input Cost

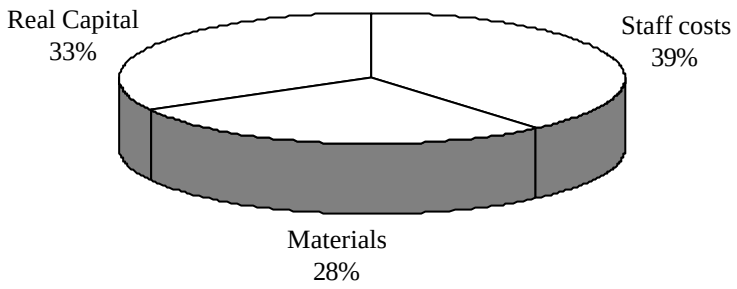

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Figure 6: Efficiency and Profitability