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ASSESSING THE IMPACT OF FINANCIAL SECTOR RESTRUCTURING ON BANK PERFORMANCE IN A SMALL DEVELOPING ECONOMY

ABSTRACT

The present paper examines the impact of mergers and acquisitions on the technical efficiency of the Malaysian banking sector. The analysis consists of three stages. Firstly, by using the Data Envelopment Analysis (DEA) approach, we calculate the technical, pure technical, and scale efficiency of individual banks during the period 1997-2003. Secondly, we examine changes in the efficiency of the Malaysian banking sector during the pre and post merger periods by using a series of parametric and non-parametric univariate tests. Finally, we employ the multivariate regression analysis to examine factors that influence the efficiency of Malaysian banks. Although the merger program was unpopular, perceived by the market as impractical, and controversial, the empirical findings from this study suggest that the merger program among the Malaysian domestic commercial banks was driven by economic reasons.[2]

JEL Classification: *G21; D24*

Keywords: *Mergers and Acquisitions, Data Envelopment Analysis, Multivariate Regression Analysis, Malaysia*

1. INTRODUCTION

Against the backdrop of the Asian financial crisis in 1997, many Asian countries have undergone massive reforms in their financial sector. Consolidation of domestic banking institutions in these countries is an essential concomitant of this strategy. In the case of Malaysia, the proposed major restructuring plan for the banking sector was announced by the central bank of Malaysia, Bank Negara Malaysia (BNM) on July 1999. Among the main objective of the merger program was to create bigger and stronger domestic banks that are able to withstand competition from the foreign banks when the financial sector is liberalized under the World Trade Organization (WTO) agreement.

The central bank of Malaysia has always encouraged the domestic banking institutions to merge. For example, in 1994 a two-tier banking system was introduced as an incentive to promote mergers, especially among the small domestic banking institutions. Under the two-tier systems, the highly capitalized banks (with the tier-1 status) are allowed to offer a wide range of financial products and services. However, the move was unsuccessful in getting the desired results, as there were only a few mergers among the Malaysian financial institutions

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took place to take the advantage of the tier-1 banking group status[3]. The smaller banks with the tier-2 status had instead augmented their capital to graduate to tier-1 status. Furthermore, to secure sufficient return on capital, several tier-2 banks have also been lending aggressively.

The merger program for the domestic banking institutions, initiated in 1999 was concluded in 2000. Approval was granted for the formation of 10 anchor banking groups. The 10 anchor banks are: Malayan Banking Berhad, RHB Bank Berhad, Public Bank Berhad, Bumiputra-Commerce Bank Berhad, Multi-Purpose Bank Berhad, Hong Leong Bank Berhad, Perwira Affin Bank Berhad, Arab-Malaysian Bank Berhad, Southern Bank Berhad, and EON Bank Berhad.

The ten anchor banks emerged having complied with all the requirements of anchor bank status, such as minimum capitalization, total asset size, and other prudential requirements. Each bank had minimum shareholders' fund of 2 billion Ringgit and asset base of at least 25 billion Ringgit. With the formation of these 10 banking groups, the number of domestic banking institutions was substantially reduced to 29 banking institutions consisting of 10 commercial banks, 10 finance companies, and 9 merchant banks. Table 1 summarizes the post merger banking institutions.

Table 1

Malaysian Banks Mergers and Acquisitions As At 30 June 2000

Anchor Banks	Banks Acquired	Anchor Banks Total Assets as at 30 June '00 RM billion	Post-Merger Assets RM billion	% of System Assets
Maybank	The Pacific Bank	127	150	24.0
Bumiputra-Commerce Bank	N.A.	63	67	10.7
RHB Bank	N.A.	51	56	9.0
Public Bank	Hock Hua Bank	43	50	8.0
Arab-Malaysian Bank[1]	N.A.	11	39	6.2
Hong Leong Bank	Wah Tat Bank	29	35	5.6
Multi-Purpose Bank	Sabah Bank	9	14	2.2
Affin Bank[2]	BSN Commercial Bank	15	30	4.8
Southern Bank	Ban Hin Lee Bank	24	25	4.0
EON Bank	Oriental Bank	14	25	4.0

[1] The merger between Utama Banking group, comprising Bank Utama and Utama Merchant Bank with Arab-Malaysian banking group did not proceed due to a disagreement over the ultimate control of the merged entity initially

[2] Another merger that failed to materialize was that of Multi-Purpose Bank and MBf Finance due to Multi-Purpose Bank's minority shareholders balking at the price involved. The Arab-Malaysian Banking Group however acquired MBf Finance from Danaharta. Source: Bank Negara Malaysia

3 There were three mergers instituted during the earlier part of the 1990s: DCB Bank with Kwong Yik Bank, DCB Finance with Kwong Yik Finance, and United Overseas Bank with Chung Khiaw Bank, which resulted in both DCB Bank and Kwong Yik Bank granted the tier-1 institutions status.

The proposed major restructuring plan for the banking sector caught many by surprise. The merger program was very unpopular, perceived by the market as impractical and provoked serious criticisms (Chin and Jomo, 2001). Among the controversial issues are some very small banks have to take over larger banks[4] while in some cases the size of the anchor banks would not necessarily be much larger than before the merger[5]. Furthermore, Chong, Liu and Tan (2006) argued that the merger program was not driven by economic reasons. Their results show that the merger program destroys shareholders wealth in aggregate, while the acquiring banks tend to gain at the expense of the target banks.

In light of Chong, Liu and Tan (2006) argument, it is interesting to examine the impact of the Malaysian mergers and acquisitions program on the efficiency of the banks involved. In essence, the paper attempts to answer two important fundamental questions: 1) What is the impact of the mergers and acquisitions program on the efficiency of the banks involved post merger, and 2) Did a more (less) efficient bank become the acquirer (target)?

To do so, we follow a three-stage procedure. Firstly, by using the Data Envelopment Analysis (DEA) approach, we calculate the technical, pure technical, and scale efficiency of individual banks during the pre and post merger periods. Secondly, by using a series of parametric and non-parametric univariate tests we examine changes in the efficiency of the Malaysian banking sector during the pre and post merger periods. Finally, we employ the multivariate Tobit regression analysis to examine factors that influence the efficiency of Malaysian banks during the pre and post merger periods.

The paper is structured as follows: the next section reviews the main literatures in regard to bank mergers and acquisitions. Section 3 outlines the approaches to the measurement of efficiency change as well as the method for the estimation of the determinants of bank efficiency. Section 4 discusses the results, and finally, Section 5 provides some concluding remarks.

2. REVIEW OF THE RELATED LITERATURES

The empirical literature analyzing the effects of mergers and acquisitions on bank performance follows two major approaches. The first major approach follows the event study type methodology, often based on changes in stock prices around the period of the announcement of the merger (e.g. Cybo-Ottone and Murgia, 2000; Houston, James and Ryngaert, 2001; Scholtens and de Wit, 2004; Cornett, McNutt and Tehranian, 2006; Campa and Hernando, 2006; Campa and Hernando, 2008; Crouzille, Lepetit and Bautista, 2008; Altunbas and Marques, 2008; Petmezas, 2009). These studies typically try to ascertain whether the announcement of a bank merger creates shareholder value, normally in the form of cumulated abnormal stock market returns for the shareholders of the target, the bidder, or the combined entity.

The second strand of literature analyzes the impact of mergers and acquisitions on bank efficiency. These studies typically examine the productive efficiency indicators, such as cost, profit, and/or technical efficiency (e.g. Kohers, Huang and Kohers, 2000; Hahn, 2007; Koetter, 2008; Rezitis, 2008; Al-Sharkas, Hassan and Lawrence, 2008). The empirical evidence from the U.S. and Europe have generally suggest that the acquiring banks are relatively more cost efficient and more profitable than the target banks (e.g. Berger and

4 For example, Perwira Affin Bank and Multi Purpose Bank were required to acquire banks that are many times their size, which leads to accusations of unfairness.

5 For example Southern Bank will still remain many times smaller than the pre-merger size of Malaysia's largest bank, Maybank. This raised concern that the bank may not survive the effects financial market liberalization.

Humphrey, 1992; Pilloff and Santomero, 1997; Peristiani, 1997; Focarelli, Panetta and Salleo, 2002).

In regard to the frontier efficiency techniques, two main approaches are commonly used to assess the impact of mergers and acquisitions on bank efficiency, namely the parametric and non-parametric approaches. The parametric approach on one hand comprises of three major approaches namely the Stochastic Frontier Approach (SFA), the Distribution Free Approach (DFA), and the Thick Frontier Approach (TFA). On the other hand, Data Envelopment Analysis (DEA) and Free Disposal Hull (FDH) are non-parametric approaches. While both techniques require the specification of a cost or production function or frontier, the former involves the specification and econometric estimation of a statistical or parametric function/frontier, the non-parametric approach provides a piecewise linear frontier by enveloping the observed data points.

The DEA method has been widely applied in the empirical estimation of financial institutions, health care, and education sectors' efficiency worldwide. Notwithstanding, the technique has increasingly been the preferred method to investigate the impact of mergers and acquisitions on bank efficiency, in particular if the sample size is small. Previous studies undertaken to analyze a small number of mergers and acquisitions includes among others Avkiran (1999), Liu and Tripe (2002), and Sufian and Majid (2007).

Avkiran (1999) employed DEA and financial ratios to a small sample of 16 to 19 Australian banks during the period of 1986-1995, studied the effects of four mergers on efficiency and the benefits to public. He adopted the intermediation approach and two DEA models. He reported that the acquiring banks were more efficient than the target banks. He also found that the acquiring banks do not always maintain their pre-merger efficiency, but that, during the deregulated period, technical efficiency, employees' productivity and return on assets (ROA) improved. There were mixed evidence from the four cases on the extent to which the benefits of efficiency gains from mergers were passed on to the public.

Liu and Tripe (2002) analyzed a small sample of 7 to 14 banks employed accounting ratios and two DEA models to explore the efficiency of 6 bank mergers in New Zealand between 1989 and 1998. They found that the acquiring banks to be generally larger than their targets, although they were not consistently more efficient. They found that five of the six merged banks had efficiency gains based on the financial ratios, while another only achieved a slight improvement in operating expenses to average total income. Based on the DEA analysis, they found that only some banks were more efficient than the target banks pre-merger. The results suggest that four banks had obvious efficiency gains post-merger. However, they could not decisively conclude on possible benefits of the mergers on public benefits.

Using a small sample size of 6 banks, Sufian and Majid (2007) employed Data Envelopment Analysis (DEA) to examine the effects of mergers and acquisitions on the Singapore domestic banking groups' efficiency. They applied a variant of the intermediation approach to two models to detect for any efficiency gains (loss) resulting from the mergers and acquisitions. The results from both models suggest that the merger has resulted in higher mean overall efficiency of Singapore banking groups post-merger. They do not find evidence of more efficient acquirers compared to the targets, as the findings from both models suggest that both the targets are more efficient relative to the acquirers. The empirical results further support the hypothesis that the acquiring banks' mean overall efficiency improved post-merger resulting from the merger with a more efficient bank.

3. ESTIMATION METHODOLOGY

3.1 DATA ENVELOPMENT ANALYSIS (DEA)[6]

A non-parametric Data Envelopment Analysis (DEA) is employed with variable return to scale (VRS) assumption to measure input-oriented technical efficiency of Malaysian banks. DEA involves constructing a non-parametric production frontier based on the actual input-output observations in the sample relative to which efficiency of each firm in the sample is measured (Coelli, 1996). The term DEA was first introduced by Charnes, Cooper and Rhodes (1978), (hereafter CCR), to measure the efficiency of each Decision Making Units (DMUs), that is obtained as a maximum of a ratio of weighted outputs to weighted inputs. This denotes that the more the output produced from given inputs, the more efficient is the production. The weights for the ratio are determined by a restriction that the similar ratios for every DMU have to be less than or equal to unity. This definition of efficiency measure allows multiple outputs and inputs without requiring pre-assigned weights. Multiple inputs and outputs are reduced to single 'virtual' input and single 'virtual' output by optimal weights. The efficiency measure is then a function of multipliers of the 'virtual' input-output combination.

The analysis under DEA is concerned with understanding how each DMU is performing relative to others, the causes of inefficiency, and how a DMU can improve its performance to become efficient. In that sense, DEA calculates the relative efficiency of each unit in relation to all other units by using the actual observed values for the inputs and outputs of each DMU. It also identifies, for inefficient DMUs, the sources and level of inefficiency for each of the inputs and outputs.

Let us give a short description of the DEA. Assume that there is data on K inputs and M outputs for each N bank. For ith bank these are represented by the vectors x_i and y_i respectively. Let us call the K x N input matrix – X and the M x N output matrix – Y. To measure the efficiency for each bank we calculate a ratio of all inputs, such as $(u'y_i/v'x_i)$ where u is an M x 1 vector of output weights and v is a K x 1 vector of input weights. To select optimal weights we specify the following mathematical programming problem:

$$\begin{aligned} &\min_{u,v} (u'y_i / v'x_i), \\ &u'y_i / v'x_i \le 1, \quad j = 1, 2, \ldots, N, \\ &u, v \ge 0 \end{aligned} \tag{1}$$

The above formulation has a problem of infinite solutions and therefore we impose the constraint $v'x_i = 1$, which leads to:

$$\begin{aligned} &\min_{\mu,\varphi} (\mu' y_i), \\ &\varphi' x_i = 1 \\ &\mu' y_i - \varphi' x_j \le 0 \quad j = 1, 2, \ldots, N, \\ &\mu, \varphi \ge 0 \end{aligned} \tag{2}$$

where we change notation from u and v to μ and φ, respectively, in order to reflect transformations. Using the duality in linear programming, an equivalent envelopment form of this problem can be derived:

6 The routine to perform the DEA analysis is written on the DEAP 2.1 software program developed by Coelli (1996).

$$\begin{aligned} &\min_{\theta,\lambda} \theta, \\ &y_i + Y\lambda \geq 0 \\ &\theta x_i - X\lambda \geq 0 \\ &\lambda \geq 0 \end{aligned} \tag{3}$$

where θ is a scalar representing the value of the efficiency score for the *i*th DMU which will range between 0 and 1. λ is a vector of *N* x 1 constants. The linear programming has to be solved N times, once for each DMU in the sample. In order to calculate efficiency under the assumption of VRS, the convexity constraint ($N1'\lambda = 1$) will be added to ensure that an inefficient bank is only compared against banks of similar size, and therefore provides the basis for measuring economies of scale within the DEA concept. The convexity constraint determines how closely the production frontier envelops the observed input-output combinations and is not imposed in the constant returns to scale (CRS) case.

The estimation with these two assumptions allows the technical efficiency (TE) to be broken down into two collectively exhaustive components: pure technical efficiency (PTE) and scale efficiency (SE) i.e. TE = PTE x SE. The former relates to the capability of managers to utilize banks given resources, whereas the latter refers to exploiting scale economies by operating at a point where the production frontier exhibits CRS.

3.2 MULTIVARIATE TOBIT REGRESSION ANALYSIS[7]

As defined in equations 1 to 3, the DEA score falls between the interval 0 and 1 ($0 < h^* \leq 1$) making the dependent variable a limited dependent variable. Following among others Das and Ghosh (2006) and Pasiouras (2008), the second stage regressions in this study are estimated by using a Tobit regression model. The standard Tobit model can be defined as follows for observation (bank) *i* :

$$\begin{aligned} &y_i^* = \beta' x_i + \varepsilon_i \\ &y_i = y_i^* \quad \text{if} \quad y_i^* \geq 0 \\ &\text{and } y_i = 0, \text{ otherwise} \end{aligned} \tag{4}$$

where x_i is a vector of explanatory variables and β is the set of parameters to be estimated. $\varepsilon_i \sim N(0, \sigma^2)$ denotes the error term. y_i^* is a latent variable and y_i is the efficiency score obtained from the DEA model[8].

By using the efficiency scores as the dependent variables, we estimate the following model:

$$\gamma_{jt} = \beta_0 + \beta_1 \Sigma Characteristics + \zeta_2 \Sigma Econ + \varepsilon_{jt} \tag{5}$$

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7 The Tobit regression model is performed by using the econometric software EViews 6.0.

8 The likelihood function (L) is maximized to solve β and σ based on 191 observations (banks) of y_i and x_i is $L = \prod_{y_i=0}(1-F)\prod_{y_i>0}\frac{1}{(2\Pi\sigma^2)^{1/2}} \times e^{-[1/(2\sigma^2)](y^i-\beta x_i)^2}$ where $F_i = \int_{-\infty}^{\beta x_i/\sigma} \frac{1}{(2\Pi)^{1/2}} e^{-t^2/2} dt$,

The first product is over the observations for which the banks are 100 percent efficient ($y = 0$) and the second product is over the observations for which banks are inefficient ($y > 0$). F_i is the distribution function of the standard normal evaluated at $\beta' x_i/\sigma$.

where, γ_{jt} is the technical efficiency of the *j*th bank in period *t* obtained from the DEA model, *Characteristics* is a set of bank specific traits variables and *Econ* is a vector of economic and market conditions.

3.3 DATA AND CONSTRUCTION OF VARIABLES

We use annual bank level data of all Malaysian commercial banks covering the period 1997-2003. The variables are collected from published balance sheet information in annual reports of each individual bank, while the macroeconomic variable is sourced from various issues of Bank Negara Malaysia's annual reports. The total number of commercial banks operating in Malaysia varied from 33 banks in 1997 to 22 banks in 2003 due to entry and exit of banks during the past decade. This gives us a total of 191 bank year observations. The sample represents the whole gamut of the industry's total assets.

As in most recent studies, (e.g. Isik and Hassan, 2002; Pasiouras, 2008), we adopt the intermediation approach. Accordingly, three inputs and three output variables are chosen. The input vectors used are (X1) Total Deposits, (X2) Capital, and (X3) Labour, while, (Y1) Total Loans, (Y2) Investments, and (Y3) Non-Interest Income are the output vectors. The summary of data used to construct the efficiency frontiers are presented in Table 2.

Table 2
Descriptive Statistics for Inputs and Outputs, Input Prices (in million of RM)

	Y1	Y2	Y3	X1	X2	X3
Min	53,411.00	205.00	14.00	131,352.00	1,248.00	1,898.00
Mean	12,335.73	3,767,524.55	180,873.30	888,037.68	184,255.20	152,612.30
Max	109,070.50	36,423.40	1,800,718.00	137,864.10	1,417,961.00	1,419,973.00
S.D	5,790.82	2,346,414.05	80,638.77	6,551.73	61,636.41	78,243.08

Notes: Y1: Loans (includes loans to customers and other banks), Y2: Investments (includes dealing and investment securities), Y3: Non-Interest Income (defined as fee income and other non-interest income, which among others consist of commission, service charges and fees, guarantee fees, and foreign exchange profits), X1: Total Deposits (includes deposits from customers and other banks), X2: Capital (measured by the book value of property, plant, and equipment), X3: Personnel Expenses (inclusive of total expenditures on employees such as salaries, employee benefits and reserve for retirement pay)[9].

Source: Banks annual reports and authors own calculations

The bank specific variables included in the second stage multivariate regression models are, LNDEPO (log of total deposits), LOANS/TA (total loans divided by total assets), LNTA (log of total assets), LLP/TL (loans loss provisions divided by total loans), NII/TA (non-interest income divided by total assets), NIE/TA (total overhead expenses divided by total assets), and EQASS (book value of stockholders' equity as a fraction of total assets). To measure the relationship between economic and market specific factors and bank efficiency, LNGDP (natural logarithm of gross domestic products), PRE_MER (binary variable that takes a value of 1 for the pre merger years, 0 otherwise), POST_MER (binary variable that takes a value of 1 for the post merger years, 0 otherwise), and CR_3 (concentration in terms of assets of the three largest banks) are used. The independent variables and their hypothesized relationship with efficiency are detailed in Table 3.

9 As data on the number of employees are not readily made available, personnel expenses have been used as a proxy measure.

Table 3

Descriptive of the Variables Used in the Regression Models

Variable	Description	Hypothesized Relationship with Efficiency
	Bank Characteristics	
LNDEPO	Natural logarithm of total deposits	+/-
LOANS/TA	Total loans over total assets	+/-
LNTA	Natural logarithm of total assets	+/-
LLP/TL	Loan loss provisions over total loans	-
NII/TA	Non-interest income over total assets	+
NIE/TA	Non-interest expense over total assets	-
EQASS	Total book value of shareholders equity over total assets	+/-
DUMACQ	Binary variable that takes a value of 1, if a bank is an acquiring bank, 0 otherwise.	+/
CON_GRP	Binary variable that takes a value of 1, if a bank does not involve in any merger during the years, 0 otherwise.	+/
	Economic/ Market Conditions	
LNGDP	Natural logarithm of gross domestic products	+/-
CR_3	Proxy for the concentration in terms of assets of the three largest banks.	+/-
PRE-MER	Binary variable that takes a value of 1 for the pre merger years, 0 otherwise.	+/
POST_MER	Binary variable that takes a value of 1 for the post merger years, 0 otherwise.	+/

Source: Authors own calculations

Our data cover the registered M&As that took place in the Malaysian banking sector during the year 2000. To be included in the sample, both the target and the acquiring banks must not have been involved in any other merger in the three years prior to the merger. In

addition to the banks that were involved in M&As during the study period, we have also included 19 other domestic and foreign banks that have not been involved in any M&As during the years as a control group in the analysis. In the spirit of maintaining homogeneity, only commercial banks that make commercial loans and accept deposits from the public are included in the analysis. Therefore, Investment Banks, Finance Companies, and Islamic banks are excluded from the sample. In the study population, there were seven major M&As that fit into our sample which were analyzed:

Case 1: Affin Bank Berhad acquisition of BSN Commercial Bank Berhad.

Case 2: Alliance Bank Berhad acquisition of Sabah Bank Berhad.

Case 3: EON Bank Berhad acquisition of Oriental Bank Berhad.

Case 4: Hong Leong Bank Berhad acquisition of Wah Tat Bank Berhad.

Case 5: Maybank Berhad acquisition of The Pacific Bank Berhad.

Case 6: Public Bank Berhad acquisition of Hock Hua Bank Berhad.

Case 7: Southern Bank Berhad acquisition of Bank Hin Lee Bank Berhad.

It is observed from Table 4 that the acquiring banks are relatively larger and have a bigger share of market for deposits. The differences in the mean are statistically significantly different from zero at the 1% level for both the parametric and non-parametric tests. The acquiring banks also seem to generate a higher proportion of income from non-interest sources and are better capitalized. On the other hand, the target banks seem to have relatively higher loans intensity, higher proportions of provisions for loans losses, and relatively high operating costs.

Table 4

Summary of Parametric and Non-Parametric Tests

	Test Groups					
	Parametric Test		Non-Parametric Test			
Individual Tests	*t*-test		Mann-Whitney [Wilcoxon Rank-Sum] test		Kruskall-Wallis Equality of Populations test	
Hypotheses			$Median_{Acquirer} = Median_{Target}$			
Test Statistics	*t* (Prb > *t*)		*z* (Prb > *z*)		χ^2 (Prb > χ^2)	
	Mean	*t*	Mean Rank	*z*	Mean Rank	χ^2
LNDEPO						
Acquirer	16.6180	-	29.57	-4.264***	29.57	18.181***
Target	15.2299	5.109***	13.43		13.43	
LOANS/TA						
Acquirer	0.6412	0.931	21.76	-0.138	21.76	0.019
Target	0.6593		21.24		21.24	
LNTA						
Acquirer	16.8221	-	29.81	-4.390***	29.81	19.269***
Target	15.4104	5.136***	13.19		13.19	
LLP/TL						
Acquirer	0.221	0.991	23.67	-1.145	23.67	1.310
Target	0.384		19.33		19.33	
NII/TA						
Acquirer	0.081	-1.294	23.95	-1.296	23.95	1.679
Target	0.071		19.05		19.05	
NIE/TA						
Acquirer	0.153	1.488	19.07	-1.283	19.07	1.646
Target	0.175		23.93		23.93	
EQASS						
Acquirer	0.828	-0.367	22.05	-0.289	22.05	0.084
Target	0.791		20.92		20.92	

Note: Test methodology follows among others, Aly, Grabowski, Pasurka and Rangan (1990), Elyasiani and Mehdian (1992), and Isik and Hassan (2002).

***, **, * indicates significant at the 0.01%, 0.05%, and 0.10% levels respectively.

Source: Authors own calculations

4. EMPIRICAL RESULTS

In the spirit of Rhoades (1998), we develop a [-3, 3] event window to investigate the effects of M&As on Malaysian bank efficiency. The choice of the event window is motivated by Rhoades (1998, p. 278), who pointed out that there has been unanimous agreement among the experts that about half of any efficiency gains should be apparent after one year and all gains should be realized within three years after the merger. The whole period (i.e. 1997-2003) is divided into three sub-periods: 1997-1999 refers to the pre-merger period, 2000 is considered as the merger year, and 2001-2003 represents the post merger period. During all periods the targets and acquirers' mean technical efficiency along with its decomposition of pure technical and scale efficiency scores are compared. This could help shed some light on the sources of inefficiency of the Malaysian banking sector in general, as well as to differentiate between the targets' and acquirers' efficiency scores. To allow inefficiency to vary over time, following Isik and Hassan (2002) among others, the efficiency frontiers are constructed for each year by solving the linear programming (LP) problems rather than constructing a single multi-year frontier.

4.1 DID THE MERGERS AND ACQUISITIONS RESULT IN A MORE EFFICIENT BANKING SECTOR?

Table 5 illustrates the TE estimates, along with its decomposition into PTE and SE. It is apparent that during the pre merger period, Malaysian banks have exhibited a mean TE of 57.4%. The results imply that during the pre merger period Malaysian banks could have produced the same amount of outputs with only 57.4% of the amount of inputs used. In other word, Malaysian banks could have reduced their inputs by 42.6% and still could have produced the same amount of outputs. The decomposition of the TE into its mutually exhaustive components of PTE and SE suggest that during the pre merger period, Malaysian banks' inefficiency were largely due to scale (34.4%) rather than pure technical (13.1%). The empirical findings imply that during the pre merger period, Malaysian banks have been managerially efficient in controlling their operating costs but were operating at a relatively non-optimal scale of operations.

Table 5

Summary of Mean Efficiency Levels of Malaysian Banks

Bank	ABB	Pre Merger*			During Merger**			Post Merger***		
		TE	PTE	SE	TE	PTE	SE	TE	PTE	SE
Affin Bank	AFF	0.533	0.903	0.585	0.836	0.897	0.932	0.853	0.926	0.921
Alliance Bank	ALB	0.539	0.925	0.579				0.888	0.949	0.936
Arab Malaysian Bank	AMB	0.855	1.000	0.855	1.000	1.000	1.000	0.871	1.000	0.871
Ban Hin Lee Bank	BHL	0.413	0.791	0.523						
Bumiputra-Commerce Bank	BCB	0.741	1.000	0.741	0.831	1.000	0.831	0.873	1.000	0.873
Bank Utama	BUB	0.411	0.874	0.467	0.923	0.926	0.997	1.000	1.000	1.000
BSN Commercial Bank	BSN	0.591	0.859	0.687						
EON Bank	EON	0.517	0.934	0.556	0.874	1.000	0.874	0.842	0.980	0.858
Hock Hua Bank (Sabah)	HHS	0.281	0.425	0.668						
Hock Hua Bank	HHB	0.355	0.740	0.473						
Hong Leong Bank	HLB	0.462	0.911	0.507	0.754	0.911	0.827	0.786	0.989	0.793
Maybank	MBB	0.519	1.000	0.519	0.870	1.000	0.870	0.907	1.000	0.907
Oriental Bank	OBB	0.450	0.808	0.553						
Phileo Allied Bank	PAB	0.609	0.719	0.842						
Public Bank	PBB	0.428	0.903	0.474	0.755	1.000	0.755	0.822	0.955	0.865
RHB Bank	RHB	0.617	1.000	0.617	0.944	1.000	0.944	0.930	1.000	0.930
Sabah Bank	SBH	0.378	0.607	0.636						
Southern Bank	SBB	0.492	0.951	0.516	0.880	0.999	0.882	0.942	0.968	0.972
Pacific Bank	PAC	0.423	0.769	0.548						
Wah Tat Bank	WTB	0.309	0.542	0.548						
ABN-Amro Bank	ABN	0.580	0.719	0.841	0.791	0.826	0.958	0.942	0.942	1.000
Bangkok Bank	BBB	0.453	0.875	0.549	0.586	1.000	0.586	0.969	0.986	0.983
Bank of America	BOA	0.536	0.700	0.731	0.957	0.964	0.993	0.826	0.834	0.991

Bank of Nova Scotia	BNS	1.000	1.000	1.000	1.000	1.000	1.000	0.831	1.000	0.831
Bank of Tokyo	BOT	0.903	1.000	0.903	1.000	1.000	1.000	1.000	1.000	1.000
Citibank	CIT	0.628	0.922	0.677	0.949	1.000	0.949	1.000	1.000	1.000
Deutsche Bank	DEU	0.877	0.967	0.900	1.000	1.000	1.000	0.971	1.000	0.971
Hongkong Bank	HBB	0.475	0.957	0.491	0.665	1.000	0.665	1.000	1.000	1.000
JP Morgan Chase	JPM	1.000	1.000	1.000	1.000	1.000	1.000	0.843	0.983	0.858
OCBC Bank	OCB	0.593	0.991	0.598	0.914	0.948	0.964	0.805	0.985	0.813
OUB Bank	OUB	0.825	1.000	0.825	1.000	1.000	1.000	0.916	1.000	0.916
Standard Chartered Bank	SCB	0.549	1.000	0.549	0.955	1.000	0.955	0.909	1.000	0.909
UOB Bank	UOB	0.609	0.893	0.682	0.870	0.956	0.910	0.916	0.918	0.998
Mean		**0.574**	**0.869**	**0.656**	**0.885**	**0.971**	**0.911**	**0.902**	**0.976**	**0.925**

* 1997-1999; ** 2000; *** 2001-2003

TE – Technical Efficiency; PTE – Pure Technical Efficiency; SE – Scale Efficiency.

Source: Authors own calculations

The empirical findings clearly suggest that the merger has resulted in the improvement of Malaysian banks' TE during the post merger period. It is apparent from Table 5 that the Malaysian banks have exhibited mean TE of 90.2% during the post merger period, higher than the 57.4% recorded during the pre merger period. It is also interesting to note that with the exception of two foreign banks, all Malaysian banks have exhibited a higher mean TE during the post merger period. A closer look at the decomposition of TE into its PTE and SE components reveals that the improvement in TE during the post merger period was mainly attributed to the improvement in SE.

The results seem to suggest that the consolidation has resulted in a more managerially efficient banking system as banks expand in size. A plausible reason could be due to the advantage that the large banks have to attract a larger chunk of deposits and loans, which in turn command larger interest rate spreads. Additionally, large banks may offer more services and in the process derive substantial non-interest income from commissions, fees, and other treasury activities (Sufian and Majid, 2007). The large banks extensive branch networks and large depositor base may also attract cheaper source of funds (Randhawa and Lim, 2005).

To examine the difference in the efficiency of the Malaysian banking sector between the two periods i.e. before and after the mergers, we perform a series of parametric (*t*-test) and non-parametric (Mann-Whitney [Wilcoxon] and Kruskal-Wallis) tests. The results are presented in Table 6. The results from the parametric *t*-test support the findings that the Malaysian banking sector has exhibited a higher mean TE post merger (0.57555 < 0.89896) and is statistically significant at the 1% level (*p*-value = 0.000). The decomposition of the TE changes into its PTE and SE components suggest that the improvement in the Malaysian banking sector's TE post merger was mainly attributed to a higher SE (0.65814 < 0.92259) and is statistically significant at the 1% level. Likewise, the Malaysian banking sector has also exhibited a higher PTE during the post merger period (0.86778 < 0.97497) and is significant at the 1% level (*p*-value = 0.000). It is observed from Table 6 that the results from the

parametric *t*-test are further confirmed by the non-parametric Mann-Whitney [Wilcoxon] and Kruskal-Wallis tests. Thus, we conclude that the Malaysian banking sector has exhibited a higher TE during the post merger period mainly attributed to the improvements in SE.

Table 6

Summary of Parametric and Non-Parametric Tests

	Test Groups					
	Parametric Test		Non-Parametric Test			
Individual Tests	*t*-test		Mann-Whitney [Wilcoxon Rank-Sum] test		Kruskall-Wallis Equality of Populations test	
Hypotheses			$Median_{Pre\ Merger} = Median_{Post\ Merger}$			
Test Statistics	*t* (Prb > *t*)		*z* (Prb > *z*)		χ^2 (Prb > χ^2)	
	Mean	*t*	Mean Rank	*z*	Mean Rank	χ^2
Technical Efficiency (TE)	0.57555	-	58.64	-8.013***	58.64	64.203***
Pre Merger	0.89896	11.261***	119.14		119.14	
Post Merger						
Pure Technical Efficiency (PTE)	0.86778	-4.989***	69.16	-5.098***	69.16	25.988***
Pre Merger	0.97497		104.56		104.56	
Post Merger						
Scale Efficiency (SE)	0.65814	-	59.69	-7.688***	59.69	59.109***
Pre Merger	0.92259	10.564***	117.69		117.69	
Post Merger						

Note: Test methodology follows among others, Aly, Grabowski, Pasurka and Rangan (1990), Elyasiani and Mehdian (1992), and Isik and Hassan (2002).

***, **, * indicates significant at the 0.01%, 0.05%, and 0.10% levels respectively.

Source: Authors own calculations

4.2 Are the Acquirers the More Efficient Banks?

We now turn to the assessment of how the mergers and consolidation process affects the mean TE of the involved banks. First, we analyze the pre merger performance of the banks concerned. Theoretically, the more efficient banks should acquire the less efficient ones. A more efficient bank is assumed to be well organized and has a more capable management. The idea is that since there is room for improvement concerning the performance of the less efficient bank, a takeover by a more efficient bank will lead to a

transfer of the better management quality to the inefficient bank. This will in turn lead to a more efficient and better performing merged unit. In order to see whether indeed it is the case that banks that are more efficient acquire the inefficient ones, we calculate the difference in the technical efficiency between the acquiring and the target banks. This efficiency difference is measured as the mean TE of the acquiring banks minus the mean TE of the target banks for the last observation period before consolidation.

Table 7
Summary of Mean Efficiency Levels of Targets and Acquirers Banks

Bank	Target/Acquirer	Acquirer More Efficient Than Target	Pre Merger		
			TE	PTE	SE
			AFF + BSN		
Affin Bank	ACQUIRER	**NO**	0.533	0.903	0.585
BSN Commercial Bank	TARGET		0.591	0.859	0.687
			ALB + SBH		
Alliance Bank	ACQUIRER	**YES**	0.539	0.925	0.579
Sabah Bank	TARGET		0.378	0.607	0.636
			EON + OBB		
EON Bank	ACQUIRER	**YES**	0.517	0.934	0.556
Oriental Bank	TARGET		0.450	0.808	0.553
			HLB + WTB		
Hong Leong Bank	ACQUIRER	**YES**	0.462	0.911	0.507
Wah Tat Bank	TARGET		0.309	0.542	0.548
			MBB + PAC		
Maybank	ACQUIRER	**YES**	0.519	1.000	0.519
Pacific Bank	TARGET		0.423	0.769	0.548
			PBB + HHB		
Public Bank	ACQUIRER	**YES**	0.428	0.903	0.474
Hock Hua Bank	TARGET		0.355	0.740	0.473
			SBB + BHL		
Southern Bank	ACQUIRER	**YES**	0.492	0.951	0.516
Bank Hin Lee Bank	TARGET		0.413	0.791	0.523

TE – Technical Efficiency; PTE – Pure Technical Efficiency; SE – Scale Efficiency.

The font in bold indicate banking group that is relatively more efficient.

Source: Authors own calculations

It is clear from Table 7 that during the pre merger period, the acquirers were relatively more technically efficient compared to the targets in six out of the seven merger cases analyzed. With the exception of the merger between AFF (acquirer) and BSN (target), all the acquirers have exhibited a higher TE levels compared to the target banks. It is clear from

Table 7 that during the pre merger period BSN's mean TE of 59.1% is higher compared to AFF's mean TE level of 53.3%.

In the next step, we again perform a series of parametric (*t*-test) and non-parametric (Mann-Whitney [Wilcoxon] and Kruskal-Wallis) tests to verify whether the difference between the acquirers' and targets' efficiencies. The results are presented in Table 8. The result seems to suggest that the acquirers were more technically efficient (0.49890 > 0.41676) and is statistically significant at the 5% level (*p*-value = 0.014), mainly attributed to higher PTE (0.93252 > 0.73143) and is statistically significant at the 1% level (*p*-value = 0.000). On the other hand, the target banks seem to be more scale efficient compared to the acquiring banks (0.53452 < 0.56671) although is not statistically significant at any conventional levels. The *t*-test results are further confirmed by the results derived from the Mann-Whitney [Wilcoxon] and Kruskal-Wallis tests. We therefore can conclude that the acquiring banks were more technically efficient compared to the target banks mainly attributed to a higher PTE.

Table 8

Summary of Parametric and Non-Parametric Tests

	Test Groups					
	Parametric Test		Non-Parametric Test			
Individual Tests	*t*-test		Mann-Whitney [Wilcoxon Rank-Sum] test		Kruskall-Wallis Equality of Populations test	
Hypotheses			$Median_{Acquirer} = Median_{Target}$			
Test Statistics	*t* (Prb > *t*)		*z* (Prb > *z*)		χ^2 (Prb > χ^2)	
	Mean	*t*	Mean Rank	*z*	Mean Rank	χ^2
Technical Efficiency (TE)						
Acquirer	0.49890	-2.569**	17.07	-2.340**	17.07	5.475**
Target	0.41676		25.93		25.93	
Pure Technical Efficiency (PTE)						
Acquirer	0.93252	-	12.48	-4.778***	12.48	22.834***
Target	0.73143	5.800***	30.52		30.52	
Scale Efficiency (SE)						
Acquirer	0.53452	1.160	24.40	-1.535	24.40	2.356
Target	0.56671		18.60		18.60	

Note: Test methodology follows among others, Aly, Grabowski, Pasurka and Rangan (1990), Elyasiani and Mehdian (1992), and Isik and Hassan (2002).

***, **, * indicates significant at the 0.01%, 0.05%, and 0.10% levels respectively.

Source: Authors own calculations

4.3 The Determinants of Bank Efficiency

Regression results focusing on the relationship between bank efficiency and the explanatory variables are presented in Table 9. The equations are based on 191 bank year observations during the period 1997-2003. Saxonhouse (1976) pointed out that heteroscedasticity can emerge when estimated parameters are used as dependent variables in the second stage analysis. Thus, following Hauner (2005) and Pasiouras (2008) among others, QML (Huber/White) standard errors and covariates are calculated. Several general comments regarding the test results are warranted. The model performs reasonably well in at least two respects. For one, results for most variables remain stable across the various regressions tested. Secondly, the findings suggest that all explanatory variables have the expected signs and in most cases are statistically different from zero.

In models 2 and 3 regressions when we add the other group of variables to the baseline specification that include the bank specific attribute variables, the coefficients of the baseline variables stay mostly the same: they keep the same sign, the same order of magnitude, they remain significant as they were so in the baseline regression model (albeit sometimes at different levels), and with few exceptions, do not become significant if they were not in the baseline regression model. Therefore, for models 2 and 3 regressions, we will only discuss the results of the new variables added to the baseline specification.

Table 9

Multivariate Tobit Regression Analysis

$$\gamma_{jt} = \alpha + \beta_1 \text{LNDEPO} + \beta_2 \text{LOANS/TA} + \beta_3 \text{LNTA} + \beta_4 \text{LLP/TL} + \beta_5 \text{NII/TA} + \beta_6 \text{NIE/TA} + \beta_7 \text{EQASS} + \zeta_8 \text{LNGDP} + \zeta_9 \text{CR\_3} + \zeta_{10} \text{PRE\_MER} + \zeta_{11} \text{POST\_MER} + \varepsilon_j$$

The dependent variable is bank's technical efficiency scores derived from the DEA. LNDEPO is a measure of bank's market share calculated as a natural logarithm of total deposits. LOANS/TA is a measure of loans intensity calculated as the ratio of total loans to total bank assets. LNTA is a proxy measure of bank size measured as the natural logarithm of total bank assets. LLP/TL is a proxy measure of risk calculated as the ratio of total loan loss provisions divided by total loans. NIE/TA is a measure of bank management quality calculated as total non-interest expenses divided by total assets. NII/TA is a measure of bank's diversification towards non-interest income, calculated as total non-interest income divided by total assets. EQASS is a measure of capitalization measured by banks' total shareholders equity divided by total assets. LNGDP is natural logarithm of gross domestic product. CR_3 is the 3 bank concentration ratio. PRE_MER is a binary variable that takes a value of 1 for the pre merger years, 0 otherwise. POST_MER is binary variable that takes a value of 1 for the post merger years, 0 otherwise.

Values in parentheses are *z*-statistics

***, **, and * indicate significance at 1, 5, and 10% levels.

	Model 1	Model 2	Model 3
CONSTANT	-12.07107***	4.113445**	3.586330
	(-8.519629)	(1.997860)	(1.560172)
Bank Characteristics			
LNDEPO	-0.213410***	-0.250925***	-0.252137***
	(-3.531557)	(-4.104366)	(-4.244993)
LOANS/TA	0.398846***	0.382714***	0.363745***
	(3.678475)	(4.220306)	(3.521629)
LNTA	0.233922***	0.253146***	0.260590***
	(3.628733)	(3.895242)	(4.067355)
LLP/TL	0.386265	-0.006068	0.231259
	(1.131903)	(-0.019931)	(0.725165)
NII/TA	12.63603***	11.15732***	11.21229***
	(6.382575)	(5.022878)	(5.002308)
NIE/TA	-9.048737***	-10.50992***	-9.750526***
	(-3.234440)	(-3.992717)	(-3.503848)
EQASS	0.420112***	0.033549	0.082439
	(2.621180)	(0.241566)	(0.576965)
Economic/ Market Conditions			
LNGDP	0.912747***	-0.331009*	-0.681946***
	(6.267161)	(-1.829567)	(-2.881078)
CR_3	0.049198***	0.002485	0.090216***
	(4.955759)	(0.235493)	(8.152025)
PRE_MER		-0.373957***	
		(-9.832471)	
POST_MER			0.293684***
			(9.347191)
Log likelihood	79.53888	122.5838	109.2452
R^2	0.545655	0.692528	0.666944
Adj. R^2	0.520413	0.710329	0.646477
No. of Observations	191	191	191

Source: Authors own calculations

The proxy for network embeddedness, LNDEPO reveals a negative relationship and is statistically significant at the 1% level, suggesting that the more technically efficient banks are associated with banks with a smaller branch networks. On the other hand, LOANS/TA reveals a positive relationship and is statistically significant at the 1% level. The findings imply that banks with higher loans-to-asset ratios tend to have higher technical efficiency scores. Thus, bank loans seem to be more highly valued than alternative bank outputs i.e. investments and securities. Likewise, LNTA shows positive coefficients suggesting that the larger the bank, the more efficient the bank will be, purely because of the economies of scale arguments. Hauner (2005) offers two potential explanations for which size could have a positive impact on bank efficiency. First, if it relates to market power, large banks should pay

less for their inputs. Second, there may be increasing returns to scale through the allocation of fixed costs (e.g. research or risk management) over a higher volume of services or from efficiency gains from a specialized workforce. Thus, assuming that the average cost curve for Malaysian banks is U-shaped, the recent growth policies of the small and medium Malaysian banks seem to be consistent with cost minimization.

The coefficient of NII/TA has consistently exhibit strong positive and significant relationship with TE. The elasticity and TE with respect to NII/TA is quite high and is statistically significant at the 1% level. The results imply that banks tend to become more efficient as they increase their income from non-interest sources. The results seem to suggest that NIE/TA has consistently exhibit negative relationship with bank efficiency and is statistically significant at the 1% level. The finding is in consonance with the *bad management* hypothesis of Berger and DeYoung (1997). Low measure of cost efficiency is a signal of poor senior management practices, which apply to input-usage and day-to-day operations. Clearly, efficient cost management is a prerequisite for the improved efficiency of the Malaysian banking system i.e. the high elasticity of technical efficiency to this variable denotes that banks have much to gain if they improve their managerial practices.

EQASS exhibits positive relationship with bank technical efficiency in the baseline regression model. The empirical findings seem to suggest that the more technically efficient banks, *ceteris paribus*, use less leverage (more equity) compared to their peers. The findings may also imply that the more efficient banks are involved in riskier operations and in the process tend to hold more equity, voluntarily or involuntarily, i.e. the reason may be due to deliberate efforts by banks to increase the safety cushions. However, the coefficient of the variable loses its explanatory power when we control for the pre and post merger periods.

During the period under study, the empirical findings seem to suggest that macroeconomic conditions (LNGDP) exhibit a positive relationship with technical efficiency. Again, when we control for the pre and post merger periods, the coefficient of the variable is no longer statistically significant in the regression models. The three-bank concentration ratio (CR_3) entered the baseline regression model with a positive sign. Similarly, the coefficient of the variable is positive in regression model 3, but is not statistically significant at any conventional levels in regression model 2. The empirical findings suggest that market concentration has a positive influence on technical efficiency during the post merger period. The binary variable PRE_MER entered the regression model with a negative sign suggesting Malaysian banks have been relatively inefficient during the pre merger period. On the other hand, the coefficient of the binary variable POST_MER has a positive sign and is statistically significant at the 1% level suggesting that the Malaysian banking sector has been relatively more technically efficient during the post merger period.

5. CONCLUSIONS

Applying a non-parametric frontier approach Data Envelopment Analysis (DEA), the paper attempts to investigate the effects of mergers and acquisitions on the efficiency of Malaysian banks. The sample period is divided into three sub-periods, i.e. pre merger, during merger and post merger periods, to compare the differences in Malaysian banks' mean technical, pure technical and scale efficiency levels during all periods.

The results from DEA suggest that Malaysian banks have exhibited technical efficiency level of 57.4%. We find that during the post merger period, Malaysian banks have exhibited higher mean technical efficiency levels compared to the pre merger period. Similar to the pre merger period, the empirical results seem to suggest that scale inefficiency outweighs pure technical inefficiency in the Malaysian banking sector during the post merger

period. The empirical findings suggest that the acquirers are relatively more efficient compared to the targets in six out of the seven merger cases analyzed.

The results from the multivariate regression analysis suggest that LNDEPO has a negative relationship with technical efficiency, implying that the more efficient banks are associated with banks with smaller branch networks. On the other hand, LOANS/TA reveals a positive relationship implying that banks with higher loans-to-asset ratios tend to have higher technical efficiency scores. LNTA shows positive coefficients suggesting that the larger the bank, the more efficient the bank will be, purely because of the economies of scale arguments. The coefficient of NII/TA has consistently exhibits strong positive and significant relationship with TE. The results imply that banks tend to become more efficient as they increase their income from non-interest sources.

The findings seem to suggest that NIE/TA consistently exhibit negative relationship with bank efficiency levels. The finding is in consonance with Berger and DeYoung's (1997) *bad management* hypothesis. Clearly, efficient cost management is a prerequisite for the improved efficiency of the Malaysian banking system. EQASS exhibits positive relationship with bank technical efficiency suggesting that the more technically efficient banks, *ceteris paribus*, use less leverage (more equity). The findings may also imply that the more technically efficient banks are involved in riskier operations and in the process tend to hold more equity, voluntarily or involuntarily. However, when we control for the pre and post merger periods, the variable is no longer significant in the regression models. The empirical findings suggest that market concentration has positive influence on the Malaysian banking sector's technical efficiency during the post merger period. The results seem to suggest that Malaysian banks were relatively more technically efficient during the post merger compared to the pre merger period.

The empirical findings of this study have considerable policy relevance. First, in view of the increasing competition resulting from the more liberalized banking sector, the continued success of the Malaysian financial sector depends on its efficiency and competitiveness. Therefore, bank managements as well as the policymakers will be more inclined to find ways to obtain the optimal utilization of capacities as well as making the best use of their resources, so that these resources are not wasted during the production of banking products and services. From the regulatory perspective, the performance of the banks will be based on their efficiency and productivity. Thus, the policy direction will be directed towards enhancing the resilience and efficiency of the financial institutions with the aim of intensifying the robustness and stability of the financial system (Bank Negara Malaysia, 2005).

Secondly, during the pre merger period most of the banks in Malaysia were relatively small by global standards. Within the context of the Malaysian banking sector, earlier studies have found that the small financial institutions are at disadvantage in terms of technological advancements compared to their large counterparts (see among others Sufian, 2008). Thus, the relatively larger institutions post merger could have better capability to invest in the state of the art technologies. To this end, the role of technology advancement is particularly important given that banks with relatively more advanced technologies may have added advantage compared to their peers. Consolidation among the small banking institutions may also enable them to better withstand macroeconomic shocks like the Asian financial crisis. Furthermore, from economies of scale perspectives, the merger program could have entailed the small Malaysian banks to better reap the benefits of economies of scale.

Thirdly, the empirical findings from this study clearly suggest that the merger program has resulted in a relatively more efficient Malaysian banking sector during the post merger period. With the exception of two foreign banks, the results suggest that all Malaysian banks have exhibited a higher efficiency levels during the post merger period. All banks that were

involved in the merger program have also demonstrated their abilities to reap merger synergies, thus exhibits higher efficiency levels during the post merger compared to the pre merger period. Thus, it could also be argued that the merger program has been successful in eliminating the redundancies in the banking system.

Finally, although the merger program was unpopular, perceived by the market as impractical, and controversial, the empirical findings from this study clearly reject the notion that the merger program among the Malaysian domestic commercial banks was not driven by economic reasons. Furthermore, the results from this study also suggest that the selection of the anchor banks is supported by the economies of scale reasons.

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PROCJENA UTJECAJA RESTRUKTURIRANJA FINANCIJSKOG SEKTORA NA PERFORMANSE BANAKA U MALOM GOSPODARSTVU U RAZVOJU

SAŽETAK

Rad istražuje utjecaj spajanja i akvizicija na tehničku efikasnost malezijskog bankarskog sektora. Analiza se sastoji od tri faze. Koristeći DEA (Analiza omeđenih podataka) pristup, najprije smo izračunali čisto tehničku i efikasnost s obzirom na opseg djelovanja pojedinih banaka u periodu 1997.-2003. Nakon toga, istražili smo promjene u efikasnosti malezijskog bankarskog sektora tijekom perioda prije i poslije spajanja koristeći niz parametarskih i neparametrijskih univarijatnih testova. Na kraju smo primijenili multivarijatnu regresijsku analizu kako bismo ispitali čimbenike koji utječu na efikasnost malezijskih banaka. Iako je program spajanja bio nepopularan i od strane tržišta shvaćen kao nepraktičan i kontroverzan, empirijski nalazi ovog istraživanja pokazuju da je program spajanja domaćih malezijskih banaka potaknut ekonomskim razlozima.

Ključne riječi: *Spajanja i akvizicije, analiza omeđenih podataka, multivarijatna regresijska analiza, Malezija*