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PERFORMANCE EFFICIENCY OF THE ADVENTIST BOOK CENTERS IN INDONESIA: A DATA ENVELOPMENT ANALYSIS

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This paper aims to analyze the performance efficiency of the Adventist Book Centers (ABCs) in Indonesia. This paper uses DEA approach to analyze twelve (12) ABCs over the period 1993 – 2003. The findings shows that the ABCs have a TFP index mean of 1.027, which is decomposed to EFFCH index mean of 0.989 and TECHCH index mean of 1.038. It also shows that 7 of 12 are productive ones. Additionally, the finding shows that the ABCs have negative growth of efficiency. They have EFFCH mean index of 0.989 which is decomposed into PECH and SECH that have index scores of 0.992 and 0.997, respectively.

Keywords: performance efficiency, data envelopment analysis (DEA), book industry.

Introduction

The Seventh-day Adventist Church (SDA) is one of the Christian denominations in the world. It has a ten million worldwide membership spread in 209 countries. One of the main objectives of SDA Church is to prepare everyone to be ready for the second coming of the Jesus Christ. That is the reason why the Adventist is very aggressive to implement the Jesus Christ's command in Matthew 28:19-20, namely, to preach the God's gospel to everyone in the world and then baptized them in the name of the Father, the Son, and the Holy Spirit.

In order to preach the God's gospel to everyone in the world, the Adventist believes that it is not enough to do it through church programs or activities; but, it has also to be supported by non-church programs such as publishing programs, namely, to publish and sell various books and materials, relating to religion and health programs and other social programs. The institution or firm who is in charge of selling books and materials for religion and health programs is called "Adventist Book Center" or "ABC".

The mission of the ABC is "to proclaim, through print media the Gospel of Hope to the whole world in this generation." (Publishing Ministries Department the Southern Asia-Pacific Division, 2001:1). In order to achieve this mission, the SDA Church established 165 ABCs that spread over the world. Twelve (12) out of these ABCs are located in Indonesia.

In the past, the ABCs' operation in Indonesia experienced up-and-down performance from year to year. Some earned a gain, range from high to low gain, but some sustained a loss. Based on this fact, the ABC management attempted to improve the ABCs' performance by changing their management strategies. One of the main strategies, which were changed by the management, was to change the organizational structure from centralized to decentralized form. This change was meant to give more opportunities to each ABC to set up and implement their own plans and strategies so that they could improve their performance to be more productive and efficient.

Each organization or firm, regardless the type of organizations, has to do corporate performance evaluation. It is meant to know how productive and efficient the firm's operation. O'Mara, Hyland and Chapman (1998) stated that corporate performance evaluation is a crucial means for an organization to assess the effectiveness of its decision-making. This study, therefore, aims to analyze the performance efficiency of the ABC in Indonesia. Specifically, this paper has two (2) objectives: 1. To determine the factors that affect the productivity performance of the ABCs; 2. To identify the efficient book centers to be emulated in terms of performance by inefficient ones.

Theoretical Framework

This section reviews some theories or techniques related to this study. Those are production efficiency theory and data envelopment analysis (DEA).

***Production Efficiency Theory*.** Efficiency is a relative term. Efficiency is never absolute; it is always relative to some criterion. Definition of efficiency is diverse and complex. Broadly, the efficiency of production process, frequently called productivity, is defined as the ratio of output to input. In a similar vein, the efficiency is considered to be improved if more output is produced using the same amount of input, or the same amount of output is produced using less input (Nyrud & Bergseng, 2002; Lee, Park & Oh, 2000). Furthermore, Lee *et al*. (2000) stated that efficient improvement stems from multiple factors such as the substitution of old facility with new facility, the introduction of new production process and/or new materials, the human-embodied know-how due to learning by using, and the organizational and managerial innovation. Therefore, the measurement of efficiency or productivity deals with heterogeneous objects with multiple dimensions.

In 1957, Farrell (as cited by Lee *et al.*, 2000) proposed three kinds of efficiency measures, as follows: Technical efficiency: the ratio of actual output to ideal maximum input. It refers to the ability of a firm to produce maximal potential output from a given amount of input; Allocative efficiency: the degree of choosing the input mix at the lowest cost, given the price of input mix. It represents the ability of a firm to utilize the cost-minimizing input ratios or revenue-maximizing output ratios;

Overall efficiency: synthetic measure of the above two, computed by multiplying the technical efficiency and the Allocative efficiency.

The above concept can be explained by an isoquant portrayed in Figure 1. The isoquant represents the efficient production frontier of one unit of output, using two-input and one-output. Point A, B, C, D, E and F indicate the organizations of comparison. The efficient frontier is composed of A-B-D-E-F (whose technical efficiency score is one). C, however, is not located on the efficient frontier (whose technical efficiency score is smaller than one) and thus has to approach the target point G on the efficient frontier. In this case, the technical efficiency score of C is measured as OG / OC. However, when the input price condition is given as P1, G is not the minimum cost point producing the same amount of output. Given P1 input vector, D is the minimum cost point. Thus, the allocative efficiency score of C is measured as OH / OG. Finally, the overall efficiency score of C is measured as OG / OC – OH / OG.

In practice, it is common that enterprises produce multi-output using multi-inputs. A useful computational method of the total productivity for this purpose is Data Envelopment Analysis (DEA) approach. DEA is a non-parametric approach for measuring efficiency was introduced in 1978 by Charnes, Cooper, and Rhodes. They used mathematical programming to generalize single-output/single-input technical efficiency measure by transforming a multi-output/multi-input technology into one combined output and one combined input. Thus, the former Farrell's formula modified as follow, for illustration, the computation of efficiency of organization k with three-input and two-output is formulated as shown in Equation 1.

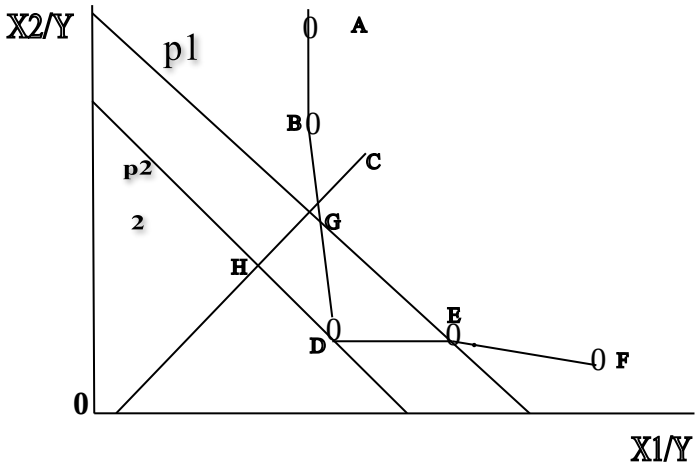

Figure 1. **Isoquant with two-input and one-output**

$$MAX \frac{\mu 1\gamma 1K + \mu 2\gamma 2K}{V1x1j + V2x2j + V3x3j}$$

$$s.t. \frac{\mu 1\gamma 1j + \mu 2\gamma 2j}{V1x1j + V2x2j + V3x3j} \leq 1 \; for \; all \; j \qquad \textbf{(1)}$$

In the above formulation, the decision variables are μ_i and $v_j \cdot x_k = (x_{1k}, x_{2k}, ..., x_{mk})$ represents input vector and $Y_k = (y_{lk}, y_{2k}, ..., y_{rk})$ denotes output vector of organization k with m-input and r-output, which are known.

The above basic model can be modified as follows to calculate the overall efficiency:

Min $P_k X$

$$s.t - \sum_{j=1}^{n} xj\lambda j \geq 0$$

$$\sum_{j=1}^{n} \gamma j\lambda j \geq \gamma k$$

$$\lambda j\lambda j \geq 0 \; for \; all \; j \; and \; X \geq 0 \qquad \textbf{(2)}$$

Given input price, P, the above formulation (2) seeks for the cost-minimizing input mix producing output Y_k. X^*, the optimal input mix, denotes the solution of the formulation.

The efficiency measure of Farrell is calculated as follows:

- Overall efficiency: $OE_k = P_kX^*/ P_kX_k$;
- Technical efficiency: TE_k = the value of the objective function of (1);
- Allocative efficiency: $AE_k = OE_k/ E_k$.

METHODOLOGY AND DATA SAMPLE

This study was designed to analyze the productivity performance of ABCs in Indonesia. The productivity performance of these ABCs were evaluated over period 1993 to 2003. There are twelve (12) ABCs involved in this study. Therefore, the aggregate period of analysis was 187 data years, which was a long-run analysis of productivity performance in this field.

Table 1. **The list of the Adventist Book Centers (ABCs).**

No.	Name of ABC	Code	Established	Address
1.	Central Sulawesi ABC	CSU	1965	Palu, Indonesia
2.	Central Sumatra ABC	CSM	1972	Sibolga, Indonesia
3.	East Java ABC	EJC	1913	Surabaya, Indonesia
4.	Irianjaya ABC	IJM	1950	Jayapura, Indonesia
5.	Kalimantan ABC	EKM	1953	Balikpapan, Indonesia
6.	Maluku ABC	MMA	1929	Ambon, Indonesia
7.	North Minahasa ABC	NMC	1923	Manado, Indonesia
8.	Nusa Tenggara ABC	NTM	1956	Kupang, Indonesia
9.	Sangihe Talaud ABC	STM	1964	Taruna, Indonesia
10.	South Minahasa ABC	SMC	1923	Tomohon, Indonesia
11.	South Sulawesi ABC	SSC	1939	Makassar, Indonesia
12.	South Sumatra ABC	SSM	1929	Palembang, Indonesia

Source: Seventh-day Adventist Yearbook 2002. Maryland, USA.

DEA approach used three (3) input variables and two (2) output variables. Those input variables are: (a) total operating expenses (see Galagedera & Silvapulle, 2002; Kleinsorge *et al.*, 1991), (b) inventories (see Yin, 1998; Balk, 2001), and (c) the number of permanent sales force (see Mahadevan, 2002; Revilla *et al.*, 2003; Alvarez & Crespi, 2003; Balk, 2001; Tong, 2001). Whereas, those output variables are: (a) total sales revenue (see Alvarez & Crespi, 2003; Revilla *et al.*, 2003), and (b) gross profit (see Liu & Tsai, 2004; Pavlyuk & Balash, 2004). These input-output variables are selected based on the availability of the data and their relevancy and consistency all throughout the period of analysis. This study used DEA Malmquist Index Method introduced by Fare, Grosskopf, Norris, and Zhang (1994). DEA Malmquist Index defines a productivity index based on output distance function. The index is the geometric mean of two Malmquist productivity indices. The output-oriented Malmquist productivity index can be defined as follow (Fare *et al.*, 1994, p. 71):

$$M_0(x^{t+1}, y^{t+1}, x^t, y^t) = \frac{D_0^{t+1}(x^{t+1},y^{t+1})}{D_0^t(x^t,y^t)} \times \left\{\left[\frac{D_0^t(x^{t+1},y^{t+1})}{D_0^{t+1}(x^{t+1},y^{t+1})}\right] \times \left[\frac{D_0^t(x^t,y^t)}{D_0^t(x^{t+1},y^{t+1})}\right]\right\}^{1/2} \quad (3)$$

Where: Mo = Malmquist productivity;
Do = Output-oriented distance function.

The Mo in Equation 3 represents the productivity index that measures the change over time, *t+1* and *t*, of input (x^{t+1}) and output (y^{t+1}), relative to a starting production point of input and output (x^t, y^t). The input(s) and output(s) are represented by x^t and y^t, respectively. The Total Factor Productivity (TFP) growth is the geometric mean of two outputs-based indices from period *t* to period *t+1*. TFP is a ratio of the distances between the two data points in a given output (y) and an input (x). All values derived from the Malmquist index which are greater than one indicates a positive TFP growth from period t to period t+1 while all values are lesser than one indicates a decrease in TFP growth or performance relative to the previous year (Tong, 2001). Equation (3) can be broken down into two components, namely: Efficiency Change (EFFCH) and Technical Change (TECHCH).

$$\textit{Efficiency Change} = \frac{D_0^{t+1}(x^{t+1},y^{t+1})}{D_0^t(x^t,y^t)} \quad (4)$$

$$\textit{Technical Change} = \left\{\left[\frac{D_0^t(x^{t+1},y^{t+1})}{D_0^{t+1}(x^{t+1},y^{t+1})}\right] \times \left[\frac{D_0^t(x^t,y^t)}{D_0^t(x^{t+1},y^{t+1})}\right]\right\}^{1/2} \quad (5)$$

Efficiency change (Equation 4) measures the movement towards the frontier from period *t* to period *t+1*. Technical change (Equation 5) measures the shift in the frontier technology. Thus, the Malmquist index of total factor productivity change (TFPCH) is the product of efficiency change (EFFCH) and technological change (TECHCH). This study used the output-oriented model of DEA-Malmquist to emphasize much on the expansion of output quantity out of a given level of inputs.

Empirical Results

A. Determine the factors that affect the productivity performance of the ABCs.

To achieve this objective, the Data Envelopment Analysis (DEA), particularly Malmquist productivity index or Total Factor Productivity index and its components (efficiency change and technological change) was employed. Table 2 summarizes the Malmquist index of annual means (averages) of the ABCs ranked by Total Factor Productivity (TFPCH). The table shows that there are seven (7) productive ABCs in Indonesia, namely: CSM, SSC, EKM, EJC, IJM, MMA and NTM that have TFP indices equal to or greater than one (1.000). Whereas, the other ABCs, namely: STM, NMC, CSU, SSM and SMC, are non-productive ABCs, because they have TFP indices less than one.

Furthermore, the table indicates that the CSM is the best productive performer, because it has the highest TFP index (1.167) while the SMC is the worst productive performer, because it has the lowest TFP index (0.957). Since CSM has a TFP index 1.167, implying there is a positive productivity growth of 16.7 percent per year. The TFP index (1.167) of the CSM decomposed to managerial or technical efficiency change (EFFCH) index (1.002) and the technological change (TECHCH) index (1.165). This indicates that the positive growth of 16.7 percent of CSM is influenced by EFFCH and TECHCH, because they have a positive growth as well. However, the stronger influence comes from TECHCH than EFFCH, because TECHCH has a positive growth 16.5 percent, which is higher compared to EFFCH that has 0.2 percent only.

Table 2. **Malmquist index summary of annual means of ABCs in Indonesia ranked by TFPCH: 1993-2003**

Rank	ABC	TFPCH	EFFCH	TECHCH
1	CSM	1.167	1.002	1.165
2	SSC	1.088	1.002	1.086
3	EKM	1.062	1.005	1.056
4	EJC	1.051	1.001	1.049
5	IJM	1.037	1.000	1.037
6	MMA	1.018	0.997	1.021
7	NTM	1.009	0.964	1.047
8	STM	0.998	0.990	1.008
9	NMC	0.992	0.990	1.001
10	CSU	0.987	1.001	0.987
11	SSM	0.974	0.959	1.015
12	SMC	0.957	0.958	0.999
Geometric	Mean	1.027	0.989	1.038

Table2 also indicates that the ABCs has a TFP index mean of 1.027 that decomposed to EFFCH index mean of 0.989 and TECHCH index mean of 1.038. This reveals that ABCs in Indonesia have a positive productivity growth of 2.7 percent per year. The productivity growth is supported by growing or increasing 3.8 percent per year of technological progress. However, the TFP growth is not supported by EFFCH that has a negative growth 1.1 percent per year. Therefore, if the management of ABCs in Indonesia wants to increase the productivity growth of the ABCs, it has to give more attention to EFFCH than TECHCH, because the EFFCH is still at the non-efficient frontier. The efficiency can be improved by increasing the outputs like total revenues and gross profit out of its given resources (inputs) like total operating expenses, inventories, and number of permanent sales force.

Figure 2. **Malmquist index summary of annual means of all ABCs in Indonesia**

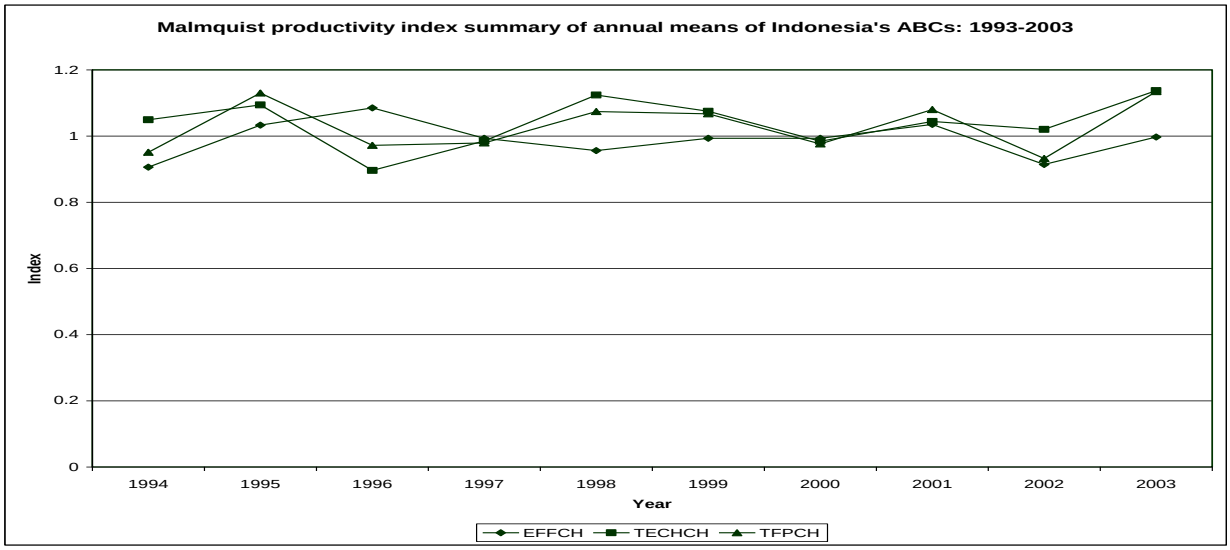

Figure 2 plotted the Malmquist productivity index (TFP, EFFCH and TECHCH) trends of all ABCs in Indonesia. The figure shows that TFP index has an upward trend. It also reveals that the upward trend of TFP is supported by TECHCH that shows an upward trend, too. Inversely, it is not supported by EFFCH that has a slightly downward trend. In terms of productivity performance of ABCs in Indonesia, the findings indicate that the ABCs have good performance. In addition, the findings indicate that the ABCs can improve their productivity performance by making improvement in managerial aspects in relating to human resource management (the right man in the right place), inventory management, and operating expenses controlling.

B. Identify the efficient book centers to be emulated in terms of performance by inefficient ones.

Figure 3. **Summary of efficiency & inefficiency performance of ABCs in Indonesia.**

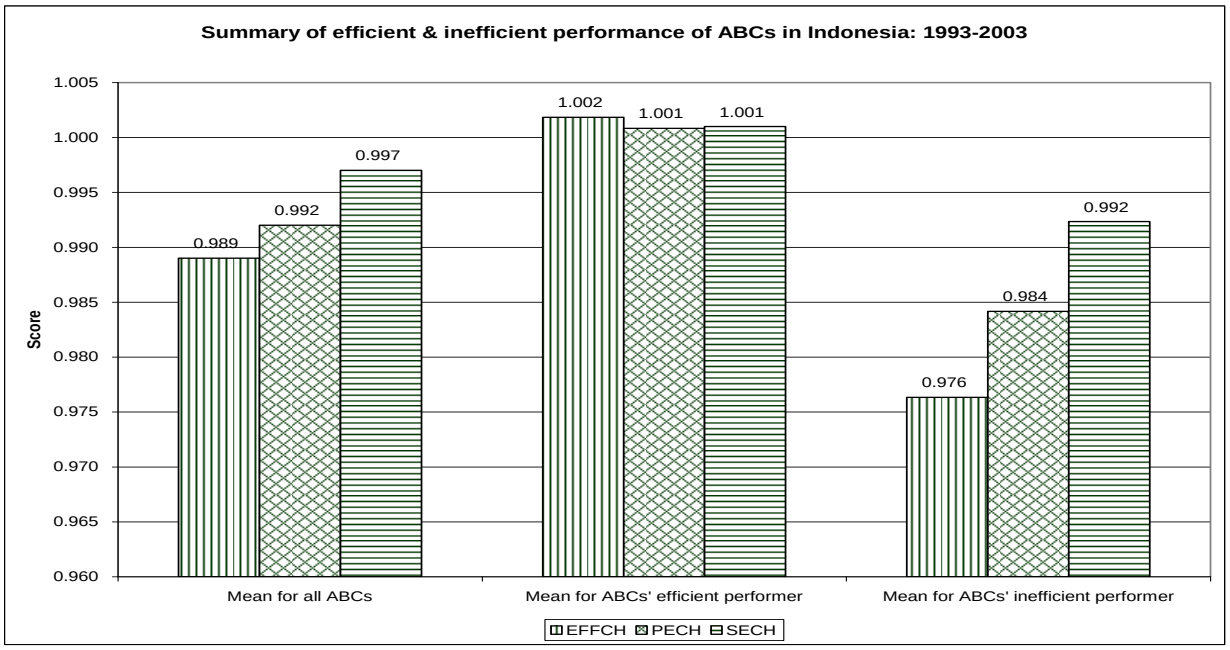

Figure 3 summarizes the average or means indices of EFFCH for all ABCs, efficient ABCs and inefficient ABCs in Indonesia. The EFFCH index is 0.989 for all ABCs. It means that ABCs in Indonesia operated below the frontier or the best practices. As known, EFFCH can be decomposed to PECH and SECH that have index mean of 0.992 and 0.997, respectively. Because none of these two indices has an index greater than one, so both indices are the main contributors to the inefficiency of ABCs in Indonesia. To be efficient, the findings indicate that ABCs in Indonesia have to improve their performance by at least 1.1 percent per year.

Table 3. **Ranking of Technical Efficiency and its Components, Ranked by EFFCH**

Rank	ABC	EFFCH	PECH	SECH
1	EKM	1.005	1.004	1.002
2	SSC	1.002	1.000	1.001
2	CSM	1.002	1.001	1.001
3	EJC	1.001	1.000	1.001
3	CSU	1.001	1.000	1.001
4	IJM	1.000	1.000	1.000
5	MMA	0.997	1.000	0.997
6	STM	0.990	1.000	0.990
6	NMC	0.990	0.988	1.003
7	NTM	0.964	0.996	0.968
8	SSM	0.959	0.958	1.001
9	SMC	0.958	0.963	0.995
Geometric Mean		0.989	0.992	0.997

Table 3 summarizes the ranking of the technical efficiency change and its components. It reveals that EKM ABC is the highest efficient performer while SMC ABC is the lowest one. The EKM ABC indices are 1.005, 1.004 and 1.002 for EFFCH, PECH and SECH, respectively. Since its EFFCH index is 1.005, meaning there is an efficient growth rate of 0.5 percent per year. The contributing factors of the efficient growth are both PECH and SECH due to indices above one.

The table also reveals that SMC ABC is the lowest efficient performer or the most inefficient ABCs in Indonesia. Its indices are 0.958, 0.963 and 0.995 for EFFCH, PECH and SECH, respectively. Since its EFFCH is 0.958, meaning there is an efficient decline rate of 4.2 percent (1 minus 0.958) annually. The contributors of the decline are PECH and SECH, with indices below one. This ABC needs to be improved by increasing its performance by at least 4.2 percent annually.

Furthermore, the table reveals that six of 12 or 50 percent ABCs in Indonesia have operated efficiently during the test period. The efficient ABCs are EKM, SSC, CSM, EFC, CSU and IJM. These efficient ABCs have EFFCH index mean of 1.002 (see Figure 3). It means that there is an efficient growth of 0.2 percent annually where the contributory of the growth comes from PECH (1.002) and SECH (1.001). On the other hand, there are another six (6) ABCs, which operate inefficiently. Those are MMA, STM, NMC, NTM, SSM and SMC. Their EFFCH index mean is 0.976. It means that there is an efficient decline rate of 2.4 percent (1 minus 0.976) annually. Therefore, these inefficient ABCs need to be improved by at least 2.4 percent annually so that they can operate efficiently in the same level as their peers.

Conclusions And Recommendations

There are some crucial points can be drawn from this study. Those points are: In terms of productivity and non-productivity performance of ABCs in Indonesia, the findings indicate that ABCs in Indonesia have a TFP index mean of 1.027, which decomposed to EFFCH index mean of 0.989 and TECHCH index mean of 1.038. This finding reveals that ABCs in Indonesia have a positive productivity growth of 2.7 percent per year during the test period. The productivity growth is supported by growing or increasing 3.8 percent of TECHCH per year. However, the TFP growth is not supported by EFFCH that has a negative growth of 1.1 percent per year.

There are seven (7) productive ABCs in Indonesia that have TFP indices are equal to or greater than one (1.000). Whereas, the other ones are non-productive ABCs, because they have TFP indices less than one. In addition, the CSM is the best productive performer, because it has the highest TFP index (1.167) while the SMC is the worst productive performer, because it has the lowest TFP index (0.957).

In connection to efficient or non-efficient performance of ABCs, findings indicate that ABCs in Indonesia have EFFCH mean index of 0.989. It means that ABCs in Indonesia operated below the frontier. This EFFCH index is decomposed into PECH and SECH that have index scores of 0.992 and 0.997, respectively. In order to be efficient, findings indicate that ABCs in Indonesia have to improve their performance by at least 1.1 percent annually.

Findings reveal that six of 12 or 50 percent ABCs in Indonesia have operated efficiently. These efficient ABCs have EFFCH mean index of 1.002 or growth rate 0.2 percent annually. The main contributory of the growth comes from PECH (1.002) and SECH (1.001).

Based on the findings of the study, the following recommendations are suggeste: The ABC management has to review its human resources management policy. The findings reveal that there is unbalance sales workforce of the ABC.

The ABC management has to review their current strategies in order to improve their production efficiency performance because the ABC has negative growth of EFFCH 1.1 percent annually. The ABC can increase sales volume (output) but decrease resources (input).

Lastly, this study provides avenues for further research. This study only used non -parametic approach (DEA). In order to get more views or perspectives about the result of the study in the future, it is better to conduct this study by combining DEA approach with other approaches like Financial Performance Measures (ratios), or Stochastic Frontier Approach.

REFERENCES

Alvarez, Roberto and Crespi, Gustavo. (2003). Determinants of Technical Efficiency in Small Firms. *Small Business Economics 20(3),* 233-244.

Balk, Bert M. (May 2001). Scale efficiency and productivity change. *Journal of Productivity Analysis 15(3),* 159-183.

Fare, Rolf *et. al*. (1994). Productivity Growth. Technical Progress, and Efficiency Change in Industrialized Countries. *The American Economic Review 84,* 66-83.

Galagedera, Don U.A. and Silvapulle, Param. (2002). Australian mutual fund performance appraisal using data envelopment analysis. *Managerial Finance 28(9),* 60-73.

Kleinsorge, Ilene K., Schary, Phillip B. and Tanner, Ray D. (1991). The Shipper-Carrier Partnership: A New Tool for Performance Evaluation. *Journal of Business Logistics 12(2),* 35-57.

Lee, Young-Yong, Park, Yong-Tae and Oh, Hyung-Sik. (2000). The impact of competition on the efficiency of public enterprise: The case of Korea Telecom. *Asia Pacific Journal of Management 17(3),* 423-442.

Liu, Fuh-Hwa and Tsai, Ling-Chuan. (2004). Ranking of DEA units with a set of weights to performance indices. [Review of Data Envelopment Analysis and Performance Management by Ali Emrouznejad & Victor Podinovski. Aston University, UK 2004]. 301-306.

Mahadevan, Renuka. (Dec 2002). A DEA approach to understanding the productivity growth of Malaysia's manufacturing industries. *Asia Pacific Journal of Management 19(4),* 587-600.

Nyrud, Anders Q. and Bergseng, Even R. (2002). Production Efficiency and Size in Norwegian Sawn. *Scand. J. For. Res. 17,* 566-575.

O'Mara, Charles E., Hyland, Paul W. and Chapman, Ross L. (1998). Performance measurement and strategic change. *Managing Service Quality 8(3),* 178-183.

Pavlyuk, Dmitry and Balash, Vladimir. (2004). An Efficiency Analysis of Russian Banks. [Review of Data Envelopment Analysis and Performance Management by Ali Emrouznejad & Victor Podinovski. Aston University, UK 2004]. 59-64.

Publishing Ministries Department Southern Asia-Pacific Division. Quinquennial Strategic Plans: 2001-2005.

Revilla E., Sarkis, J. and Modrego, A. (2003). Evaluating performance of public – private research collaborations: A DEA analysis. *Journal of the Operational Research Society 54,* 165-174.

Tong, Christopher S.P. (2001). Total Factor Productivity Growth and its Spatial Disparity across China's Township and Village Enterprises. *Journal of Contemporary China 10(26),* 155-172.

Yin, Runsheng. (1998). DEA: A new methodology for evaluating the performance of forest products producers. *Forest Prod. J. 48(1),* 29-34