International Journal of Social and Local Economic Governance (IJLEG) **E-ISSN: 2477-1929**
Vol. 5, No. 1, April 2019, pages 22-31 http://ijleg.ub.ac.id

THE DETERMINANTS OF EFFICIENCY OF HIGHER EDUCATION INSTITUTIONS WITH PUBLIC SERVICE AGENCY STATUS IN INDONESIA

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Abstract

The purpose of this study is to measure technical efficiency score of Higher Education Institutions (HEI's) especially Public Service Agencies (PSA) in Indonesia during 2013-2015 and analyse its determinants i.e. non service revenue, Service cost and financial independence. The data were utilized in this research were indigenous secondary data of financial statement 32 PSA's universities, forlap dikti, BAN PT and PPK BLU's directorate report. This research utilized 2 stages, in the first phase was to measure technical efficiency zooms colleges which methods were non parametrik with Data Envelopment Analysis (DEA) approaching VRS'S assumption and input oriented and the second phase used regression tobit's model. The results pointed out that the score of technical efficiency showed an increase in the period of 2013-2015. It means that there is an increase in the number of universities capable of optimizing the whole its resources (input) in producing output gradually towards efficient. Another result showed that the non service revenue, service cost and financial independence had positive affect to the technical efficiency.

Keywords*: Technical Efficiency, DEA, Public Service Agency, Higher Education Institution, Tobit*

1. INTRODUCTION

Education is one of the important factors of development of the country to guarantee the overall economic growth (Maric, 2013). The field of education became the center of the creation of ideas and science in the development of the nation as a whole. Higher Education Institutions (HEI's) become a major part in the development of science and the means of transfer of science leading to the achievement of economic development progress.

Efforts to improve the quality of education standards become the top priority of the Indonesian government. Government commitments are contained in the Act. No. 20 of 2003 on the national education system where the allocation of government funds amounted to 20 percent of the total state budget (APBN) used for improving the quality of education facilities and infrastructure of Indonesia. The allocation of this fund is quite large and the main objective is to improve the quality of Indonesian human resources as reflected in the Human Development Index (HDI).

The UNDP report for 2015 states that Indonesia's HDI is under Singapore, Brunei Darussalam, Malaysia and Thailand where it is based on three key indicators of assessment: life expectancy, access to science and income per capita. compared to those countries where the percentage of educational budget as input and score on the indicator of access to science as output, the performance of the education sector, especially universities in Indonesia is still relatively inefficient. Nevertheless, the government's efforts in overcoming inefficiency, especially in government agencies with the implementation of the Pattern of Financial Management of Public Service Agency (PSA). PSA is a government agency established to provide services to the public without prioritizing profit and operation based on efficiency and productivity principles. PSA has the privilege of flexibility in managing non-tax revenue (PNBP) funds.

In performance measurement in the public sector, efficiency is one of the key elements in the concept of value for money (VFM) (Glendinning, 1988). Efficiency in the public sector is the ratio of input to output in terms of service. Studies on efficiency in the public

sector, especially in the field of education have not been done in Indonesia, in particular the study of the efficiency of HEI who have implemented Pattern of Financial Management of PSA where performance has effective and efficient prin-ciples. In addition, most studies are limited to efficiency measures alone, while studies analyzing efficiency determinants have not been widely applied.

This study attempts to analyze the level of technical efficiency of PSA's HEI which is considered a public organization capable of addressing efficiency issues. This study is important because until now from the knowledge of the researcher there has been no study on the technical efficiency measurement at PSA's HEI and the analysis of the determinants of efficiency in universities. This study was divided into two stages, the first stage focused on the measurement of technical efficiency through the Data Envelopment Analysis (DEA) approach assuming Variable Return Scale (VRS) of input orientation is adjusted to the characteristics of Universities that utilize many inputs and produce various outputs. The inputs used the number of active students, the number of lecturers, and the number of courses while the output were the average student's GPA, the number of publication journal indexed scopus and the number of accredited courses A. The next stage was to analyze the determinants of efficiency factors of PSA's HEI through non service revenues, service cost and financial independence.

Some of the determinant factors that affect the efficiency include income and cost. In production theory, the organization will use the resources (input) that are owned to produce a product (output) is maximal. In the production process the organization will try to increase revenue in order to achieve maximum profit. One measure of organizational performance success is income generation and performance measure elements efficiency. Then the concept of efficiency conveyed Farrell (1957) states that the organization achieves efficiently if its able to reduce certain costs in order to obtain the same output.

The empirical study of the relationship between income and efficiency with DEA approach had a positive relationship (Aubyn et al., 2009; Cunha & Rocha, 2012). Increased university revenues through income from college tuition will improve the efficiency of universities in Europe. While the results of different studies found by Robst (2001) found a negative relationship between the influence of income on efficiency.

Cost is one of the factors that can explain the efficiency of the university. Farrell (1957) said that the company will achieve efficiency if the company can minimize production costs. Srivastava (1999) reveals organizations are called to be efficient if organizations are able to reduce costs in achieving certain outputs. Empirical studies conducted by Duan & Deng (2016) and Cunha & Rocha (2012) show a negative relationship between efficiency and university operational costs that include staff salary expenses and research costs. Volkwein (1986) conducted a study of the cost of services and administrative costs with the efficiency of colleges indicating a negative relationship.

Financial independence is defined as the level of the ability of the university in financing all operational activities in the context of services in the field of education compared to the allocation of government funds. Some studies provide an illustration of the relation-ship between efficiency and the allocation of government funds. The results of Robst (2001) found that increasing revenues from govern-ment funds would increase university spending in Europe and if the increase in spending is not accompanied by output quality it would lead to inefficiency of the university. Furthermore, Flegg et al. (2004) studied a number of UK universities where the budget was cut by the government, surprisingly the university's performance improved and positively impacted the efficiency of the university. In addition Derlacz et. al (2011) also proved that the composition of government funds towards high overall college funding would reduce the efficiency of universities.

This study aims to: first measure technical efficiency through DEA approach with VRS assumption of input orientation and rating PSA's HEI based on technical efficiency score. Second, this study investigates the effects of non-service revenue, service costs and financial independence on technical efficiency. The results of the research contributes theoretically to the development of efficiency theories, especially in the public sector through non-service income variables, service costs and

financial independence as a determinant of efficiency.

2. LITERATURE REVIEW

2.1. Efficiency Concept

The basic understanding of efficiency is how the organization is able to maximize the product yield obtained by utilizing existing resources. In other words efficiency is gained through measurement of outputs compared to inputs (Doumpos & Cohen, 2014; Mihaiu et al., 2010). Coelli et al.(2005: p. 2) argues efficiency is part of productivity by taking into account the ratio of output to input. Therefore, the accuracy of interpretation of the input and output of an organization becomes the most important thing in the measurement of efficiency.

Koopmans (1951) describes the initial concept of efficient organizational efficiency when generating increased output through the same input resources by reducing the use of resources. The concept was developed by Farrell (1957) who mentions three important things called efficient organization first, produce higher output with the use of the same input. Secondly by using fewer inputs for the same number of products. Third, through the use of more inputs to get more output quantities. The concept of efficiency itself is actually a development of the concept of microeconomic theory that is production theory and consumer theory. In production theory, companies will seek to increase revenue and profits by minimizing corporate costs while consumer theory says that consumers will have a tendency to maximize the level of satisfaction over the benefits and usefulness of a product.

Farrell (1957) classifies efficiency into three namely technical efficiency, allocative efficiency and economic efficiency. Measurement of technical efficiency, limited between activities performed to convert inputs into outputs. Allocative efficiency measures how organizational efficiency determines how much resources (input) to be used in accordance with predetermined price levels. The combination of technical efficiency and allocative efficiency is referred to as economic efficiency (cost efficiency) so that it can be said that the organization has economic efficiency if the organization has achieved technical and allocative efficiency.

2.2. Public Sector Efficiency

The concept related to organizational management is value for money (VFM) that submitted by Glendinning (1988) on the measurement of the performance of public organizations. VFM is a concept of how to use the financial resources used to be able to produce optimal productivity of an organization (Jacobs, 2009). The concept consists of three main things namely economic, effectiveness and efficiency into a standard measurement of performance of public services. Evaluation of organizational efficiency became one of the most important parts of the implementation, monitoring and evaluation of public sector reform (Worthington, 2001). The purpose of the evaluation is closely related to the improvement of public services, especially on improving services to the public.

The PSA is one of the concepts offered by the government to improve services in the public sector. The implementation of the financial management pattern PSA becomes an alternative to encourage the improvement of public services (Indarto, 2011) so that it is expected as a solution to overcome the poor use of government resources. PSA was born because of the implementation of New Public Management (NPM) which is a new paradigm related to public sector performance management (Barzelay, 1992). The main principles of NPM are emphasized on controlling the output of government policies through decentralization of management authority and service orientation to customers. The main principle given by Vigoda (2003) is the utilization of input resources to be processed into outputs through measurable performance activities so that the organization is able to evaluate and obtain the most efficient point of utilization of inputs.

Government Regulation no. 23/2005 defines PSA as an institution that has applied BLU financial management pattern which has flexibility in budget execution including revenue and expense management, cash management, and procurement of goods or services. PSA has a great responsibility towards improving public services through efficiency of inputs and output productivity in accordance with the responsibilities of services owned.

3. RESEARCH METHODS

This study was a quantitative research using a specific population or sample. The population in this study were HEI's with Public Service Agency (PSA) status. The sampling method in this study using purposive sampling technique by determining the sample based on certain criteria, among others 1) Universities which have been in PSA status for 3 years since they were assigned to become PSA and 2) Universities under the authority of the Ministry of Technology and Higher Education and Ministry of Religion, so that it was obtained the sample of 32 universities with PSA status.

Research data used secondary data in the period of 2013-2015 include the financial statements of the universities, academic reports, accreditation data of National Accreditation Agency for Higher Education and data publication indexed Scopus. The research data were obtained through the PSA supervisory board reports, the financial statements of PSA, the official site of Scopus (*www.scopus.com*), the official site of National Accreditation Bureau (*www.ban-pt.kemdikbud.go.id*) and the official site of Ministry of Research Technology and High Education (*www.forlap.ristekdikti.go.id*).

3.1. Research Variable

a. Dependent Variable

The dependent variable in this research is the technical efficiency score (Y) of HEI's with BLU status obtained through the efficiency measurement of the DEA approach. This efficiency value illustrates how each DMU uses input resources to produce output. Selection of input and output variables was critical in measuring the efficiency of the DEA approach as it would greatly affect the technical efficiency of DMU.

The input variables were divided into three, namely the number of students, the number of study programs, and the number of academic staff while the output variables are divided into three, namely the average GPA, the number of journal publications, and the number of accreditation study programs A.

b. Independent Variable

The independent variables in this study are Non-service revenue (X_1), Service cost (X_2), and Financial independence (X_3). All of three variables are considered to affect the value of efficiency.

Non-service revenue (X_1)

Non-service revenues show how high the dependence of universities on income derived from business results and revenue share of investment and other income to finance all operational activities. Non-service revenue is proxied through the ratio between the amount of non-service revenue and investment divided by total revenue. The higher the ratio of college income earned from business and investment results then the potential dependence of income drawn from tuition of college students will decrease so that universities no longer need to increase the number of students and increase tuition of students.

Service cost (X_2)

The cost of this service is obtained through the calculation of the ratio between total cost of education services divided by the total number of active students. This ratio shows how much efficiency level based on the management of universities in education operational activities (Indrajit & Djokopranoto, 2006).

Financial independence (X_3)

Independence is calculated through the summation ratio of all non-service revenue and service revenues (PNBP) divided by the total allocation of government funds (APBN / APBD). The higher the value of this ratio indicates the higher the degree of independence of the college to the state budget.

3.2. Stages of Research Analysis

In the analysis of efficiency at PSA's HEI was conducted with two stages. The first stage, through the DEA approach used to measure the technical efficiency during the period 2013-2015 to obtain technical efficiency score. The DEA approach used the assumption of Variable Return Scale (VRS) with input orientation. The input variables consisted of the number of active students, the number of lectures and the number of courses, while the output variables consisted of the average GPA, the number of accreditation A courses and the number of publication journal indexed scopus. Then the second stage, were implemented Tobit regression analysis because the technical efficiency score was censored between 0 and 1.

a. The First Stage: Measurement efficiency with DEA Approach

Measuring the level of efficiency with ratio analysis has a disadvantage in comparing the variables that have multiple inputs and many outputs and can not measure directly the efficiency between the Decision Making Unit (DMU) (Subekti, 2004). DEA is one of the nonparametric approaches that can be used in analyzing the efficiency between DMU which have many inputs and outputs. In DEA requires all evaluated DMU to have similar characteristics (Coelli et al., 2005). DEA is often used in evaluating DMU in both business organizations and public service institutions such as universities and hospitals.

The DEA approach is designed to calculate relative efficiency based on the ratio of the number of weighted outputs to the number of weighted inputs (Farrell, 1957). The efficiency score is said to be relative because it depends on the efficiency of other DMUs in the sample. DEA uses linear programming which will form the frontier of the DMU has the highest efficiency efficiency so efficiency is measured by knowing the distance from the production point of an observed DMU. Efficient frontier envelope all data from other DMU so called Data Envelopment Analysis. Each DMU will have an efficiency score ranging from 0 to 1 in which a DMU that is considered efficient has an 1 and an inefficient DMU value of <1. The efficiency equation can be seen below:

$$ET\,J = \frac{u_1 y_{1j} + u_2 y_{2j} + \cdots + u_s y_{sj}}{v_1 x_{1j} + v_2 x_{2j} + \cdots + v_m x_{mj}} \quad (1)$$

where: x_{ij} = The value of input i-th on unit J

v_i = Weighting for inputs i

y_{rj} = The value of output i-th on unit J

u_r = Weighting for outputs r

In its development the DEA approach has two models namely the CCR model developed by Charnes et al. (1978) and the BCC model developed by Banker et al. (1984). The CCR model is often referred as Costant Return to Scale (CRS) assuming that each input addition will affect the increase in output proportionally. The weakness of the CCR model can only be applied to the DMU that has been operating optimally and more appropriately used in manufacturing companies. While the BCC model is known as the Variable Return Scale model (VRS) where each addition of an input of x times is assumed not necessarily causing an increase of x times but may be smaller or larger. The VRS model is more effectively applied in evaluating the efficiency performance of service institution.

There are two orientations in the measurement of efficiency which are orientation based on input and orientation based on output. The input orientation assumes that efficiency is achieved when the UKE is able to reduce input proportionally without having to change the amount of output produced. Output-oriented efficiency requires an effort to increase the amount of output without having to change the input composition used.

In this study, the technical efficiency measure of the DEA approach used the BCC model through the VRS assumption of input-oriented. The BCC model of VRS assumption is aptly used in organizations that have characteristics in service areas such as universities where dominated by human resource factors. Furthermore, input orientation was chosen to be able to recommend improvements on the use of input resources. Measurement of DEA efficiency will be processed using EMS (Efficiency Measurement System) application.

b. The Second Stage: Tobit Regression Model Analysis

After obtaining the technical efficiency score of the DEA calculation, in the second stage a tobit regression model was used. The Tobit regression model was intended to analyze the determinant factors that were suspected to have an effect on the technical efficiency of PSA's HEI. The tobit regression was chosen because the DEA calculation of the dependent variable (efficiency) was limited in value (censored) between 0 to 1 and the other independent variables are unlimited. It is said that the tobit model is used to explain the relationship between the level of technical efficiency with non service revenue, Service cost and financial independence.

The empirical model was used in this study by using the tobit regression model as follows:

$$ET^* = \alpha + \beta_1 REV + \beta_2 COS + \beta_3 MAN + e \quad (2)$$

where : $1 > ET > 0$

The next step of this study was to analyze the tobit regression which was divided into two testing steps namely classical assumption test and hypothesis testing. Hypothesis testing used Likelihood Ratio / LR (Test G) test and Wald (Test Z) test while classical assumption test will use normality test, multicollinearity test, and heterokedastisity test. Data processing with tobit regression is using eviews 8.1.

4. RESULTS

4.1. First Stage of Efficiency Calculation Result

In the first phase calculated efficiency by using software EMS. The result of the technical efficiency measurement of the DEA approach of the VRS model of input orientation is seen in Table 1. The average efficiency score of PSA's HEI had increased in the period 2013-2015 showed an improvement in efficiency performance of PSA's HEI. Meanwhile, the number of PSA's HEI considered efficient has increased from 9 universities efficiently in 2013 to 13 efficient universities in 2015.

Table 1. Technical Efficiency PSA's HEI period 2013-2015 based on DEA

	2013	2014	2015
Total DMU*	32	32	32
Total Efficient DMU	9	10	13
Total Innefficient DMU	23	22	19
Persentage DMU's Efficient	28,13 %	31,25 %	40,66 %
Average value of efficiency	74,09 %	77,51 %	83,20 %
Standart Deviation	0,2059	0, 1788	0,1733
Minimal Score	45,8 %	49,0 %	55,0 %

Based on table 1. average value of efficiency of universities increases annually. In 2013 the average efficiency score of universities is 74.09% and 2014 increased by 77.51% and in 2015 increased by 83.20%. The result proves that the efficiency improvement of universities in three years of research period.

Table 2. Universities Ratings bases On Technical Efficiency Scores DEA Periods 2013-2015

(in persentage)

No.	High Education Institution	2013	2014	2015	Aver.
1	UIN Maulana Malik Ibrahim	100	100	100	100
2	University of Indonesia	100	100	100	100
3	University of Sultan A. Tirtayasa	100	100	100	100
4	UIN Raden Fatah Palembang	100	100	100	100
5	UIN Sunan Kalijaga Yogyakarta	100	100	100	100
6	Sepuluh November Institute of Technology	100	100	100	100
7	Bogor Agricultural Institute	100	100	100	100
8	Gajahmada University	100	100	100	100
9	UIN Syarif Hidayatullah	97,8	100	99,5	99,1
10	Hasanuddin University	100	100	76,5	92,2
11	Malang State University	98,9	66,3	100	88,4
12	University of Padjadjaran	81,2	76,5	100	85,9
13	Andalas University	68,6	81,2	100	83,3
14	Yogyakarta State University	64,1	88,4	93,5	82
15	Airlangga University	72,4	67,4	100	79,9
16	University of Jenderal Soedirman	65,6	71,7	88,8	75,4
17	Semarang State University	77,1	91,4	55	74,5
18	Brawijaya University	45,8	74,1	100	73,3
19	Bengkulu University	72,6	63,2	75,6	70,5
20	University of Surabaya	55,9	67,2	86,8	69,9
21	UIN Sultan Syarif Kasim Riau	62	72,8	72,2	69
22	Udayana University	64,9	68,8	69,6	67,8
23	UIN Sunan Gunung Djati	68,9	63	67,8	66,6
24	Gorontalo State University	52,7	72	69,1	64,6
25	Mataram University	61,9	62,6	68,1	64,2
26	Diponegoro University	53	55,5	80,8	63,1
27	Mulawarman University	51,8	67,2	67,4	62,1
28	Jakarta State University	57,1	57,9	58,2	57,7
29	Sebelas Maret University	46	59	61,8	55,6
30	Lampung State University	53,2	53,9	55,4	54,2
31	Riau University	53,3	49	58,2	53,5
32	Sriwijaya University	46,1	51,1	58,2	51,8

Table 2. is a universities rank based on the average value of technical efficiency for 3 years. There are 8 universities that have consistent efficiency for 3 consecutive years and there are 5 universities that have reached the efficient point of 2015 from inefficiency in the previous year. The increase in this score is dominantly influenced by declining in the use of student resources and accompanied by an increasing in the GPA score and an increasing in the number of journal publications.

4.2. Second Stage Tobit Regression Analysis

The second stage of this study first conducted hypothesis testing of tobit regression model using likelihood ratio test and wald test (Z test). The likelihood ratio test was used to test whether all independent variables have a tangible contribution to the dependent variable. The Z test showed the significance value of the influence of one independent variable in

explaining the variation of the dependent variable assumed that the other independent variable is constant.

Based on the result of output eviews obtained likelihood ratio value ($X_{statistic}^2$) equal to 28.06935 with level of probability (α) equal to 0.0000. Therefore $X_{statistic}^2 > X_{tabel}$ (7,815) and probability value was less than 0,05 so it can be concluded that all or one independent variable (non service revenue, service cost and independence) have an effect or contribute significantly to the variation change from technical efficiency of universities.

The testing of one-tailed hypotheses on the determinants of efficiency of universities in this second phase was done by using tobit regression during the period 2013-2015. Table 3 showed the results of tobit regression analysis through software eviews 8.1. Based on the table it was known that the probability value of the three variables, ie non-service revenues (REV), service cost (COST) and financial independence (MAN) were not greater than 5% indicating that all variables affect the technical efficiency of universities. So the model can be considered feasible for use in this study.

Table 3. Tobit Regression Results

Variable	*Coefficient*	z-*Statistic*	Prob.
C	0.330490	2.122975	0.0338
REV	1.104050	2.529525	0.0114
COST	1.37E-08	3.342021	0.0008
MAN	0.467424	2.059361	0.0395

The first hypothesis states that non-service revenues have a positive effect on the level of technical efficiency. In the Z test the REV variable proved empirically to positively affect the technical efficiency shown by the coefficient value of 1.104050 and the value $Z_{statistic}$ (2.529525) > Z_{table} (1,645). Then it can be concluded that the results of hypothesis testing 1 is **accepted**.

The second hypothesis states that the costs proxied through service cost negatively affect the technical efficiency of universities. Z test on COST variable proves that the value of the variable coefficient is 0.0000000137 (positive) and significant is 0.0008 and $Z_{statistic}$ (3.342021) > Z_{table} (1,645). These results indicate that service costs have a positive effect on technical efficiency so that based on it, the result of hypothesis 2 testing is **rejected**.

In the third hypothesis stated that financial independence affects the technical efficiency of universities. The test results show the value of MAN positive variable coefficient of 0.467424 with probability value of 0.0395 and the value $Z_{statistic}$ (2.059361) > Z_{table}(1,645). This means that financial independence has a positive effect on technical efficiency so it can be deduced that the hypothesis is **accepted**.

Then a classical assumption test is performed to satisfy the BLUE (Best Linear Unbiased Estimator) condition of the model. There were several assumptions that must be fulfilled in this study that were normal distributed data, no multicolorarity symptoms and no symptoms of heteroscedasticity. Normality test on the model is done by Jarque-Bera statistical test (JB) with eviews 8.1. The test results showed JB value of 4.319517 with probability value of 0.115353. It can be concluded that the residual variable in the regression model was normally distributed because the probability value was greater than 0.05.

Next was a multicolinearity assumption test where the model indicates multicolinearity problems if the correlation value between independent variables exceeds 0.90 (Ghozali, 2013: 83). The correlation value between the independent variables in the research model was not more than 0.9 then it is concluded that the model of research model does not occur multicollinearity symptoms among independent variables.

The next classical assumption test was a heterekedasticity test that tests the presence or absence of one observation variance with other observations on a regression model. Ghozali (2013) states that there is no heterokedastisity period if the points on the scatterplot chart spread or not form a pattern. Scatterplot chart shows that the points spreaded and did not form a clear pattern then concluded the model does not occur heterekedastisitas problem.

4. DISCUSSION

The focus of this study is to measure technical efficiency through the DEA approach and to analyze the determinants affecting the technical efficiency of PSA's HEI. The result of technical efficiency measurement shows that there is an increase of technical efficiency of PSA's HEI in the period of 2013 s.d. 2015

which is indicated by the average value of technical efficiency that tends to increase. This increase provides information that universities is able to improve its technical efficiency through optimization of input resources owned in this case the number of students, the number of lectures, and number of courses. For example, Universitas Brawijaya (UB) is known to have the lowest technical efficiency score compared to other university in 2013 (look table 5). This is caused by waste in input resources, it is known that UB has a very large number of students compared to others. The large number of students when compared with the output that has been obtained by other university looks inefficient. Because the technical efficiency is measured based on input orientation, UB should focus on reducing the number of students by 7.852 students (look slack movement) in accordance with the recommendation of EMS result.

Table 5. Potential Improvement of Brawijaya University 2013

Technical Efficiency Score:		45,80%		
PROJECTION SUMMARY:				
Variable		Original value	Radial movement	Slack movement
Input	Student	61231	0	- 7852
	Lecture	1965	0	0
	Course	179	0	0
Output	GPA	3,27	0,03	0
	Publication Journal	140	5,27	0
	accredited courses A	56	1	0

The empirical results of this study show that non-service revenues variable proved to have a positive effect on the technical efficiency of PSA's HEI. These results reinforce the relationship between income and efficiency. Increased revenue will also increase the value of technical efficiency in converting inputs into outputs. The results of this study are supported by research conducted by Aubyn et al. (2009), Cunha & Rocha (2012) dan Wolszczak & Derlacz (2014) proving that the greater the revenue the higher the efficiency level of universities in Europe. Revenues proxied into non-service revenues in this study provide clear evidence that if the university is able to increase revenue, then the university has more flexibility over the source of its financial resources. University is able to finance the operational of educational services, repair facilities and infrastructure such as improving the quality and quantity of laboratory to support research and other facilities so that university can achieve maximum educational output.

The influence of service cost variable on technical efficiency after tested against the proposed hypothesis. The results of the study provide empirical evidence that service costs have a positive effect on the efficiency of PSA's HEI. This is contrary to research conducted by Volkwein (1986), dan Duan & Deng (2016) which states that expenditure has a negative relationship with the technical efficiency of higher education. Expenditures are identical to university expenditures that primarily relate to the entire service process. When university expenditures increase without the increase in university output it will have a direct impact on the decrease in efficiency. The results of this study are similar to those found by Cunha & Rocha (2012) where the cost of research has a positive influence on technical efficiency held by universities in Portugal. The amount of research costs has a direct relationship to the output of the university, so that when research costs are reduced it will affect the productivity of the research results that will directly impact the decrease in technical efficiency of the university.

In this study, service cost variable is the relation between total cost of service and the number of students that describes the average cost incurred by universities to finance the whole process of student learning service activities. The cost of services in which there is the element of technical costs is the most important expenditure of universities in funding all activities of the educational process that is not easy to be reduced. When service costs are reduced it will affect the decrease in the level of output or college productivity. Therefore, universities should be careful in reducing this type of cost.

Empirical findings on the variables of financial independence on technical efficiency proved to have a positive effect on technical efficiency. The results of this study are consistent with Flegg et al. (2004) dan Gamkhar & Oates (1996) who conducted research on the efficiency of universities in Europe. In the study proves that the allocation of countries in a positive and significant effect on the efficiency of a number of universities. Financial independence is defined as the level of dependence of university on the allocation of government funds. With the existence of

financial independence, universities will have more flexibility in managing and managing resources owned, improve service quality and manage operations to a more efficient direction. HEI's BLU can organize more flexible spending without having to wait for the allocation of funds and government approval. To increase the level of independence, universities are expected to explore the potentials of revenue both within the framework of service and outside the main service as an educational institution.

5. CONCLUSION

The purpose of this study is to measure the technical efficiency score of input orientation through the DEA approach and determine the rating of PSA's HEI based on the value of technical efficiency as well as to examine the effect of non service revenue, service cost and financial independence on the technical efficiency of universities. The sample used in this study was as much as 32 PSA's HEI using observation data for the period 2013-2015. The first stage evaluation result was known that the average of HEI observation period has not been efficient yet in every year the efficiency score of university has increased overall. Other evidence, efficient university also experienced an increase each year marked by the increase in the number of PSA's HEI which reached the score of 1 (efficient). The less efficient universities were technically known to use excessive resources, especially the number of students while the output did not improve. Therefore, PSA's HEI is less efficient is expected to reduce the number of students owned.

In the second phase, the results of the study proved that non-service revenue, service costs and financial independence can affect the technical efficiency at PSA's HEI. The determinants of non-service income level had a positive effect on the technical efficiency of PSA's HEI. Non-service revenues as a source of funds can be used directly for university operations so that the higher the income colleges will have a large allocation in improving the efficiency of services either through the addition of facilities or improving the quality of human resources and so forth. Then the cost factor proxied by service cost affect negatively the technical efficiency of PSA's HEI. The cost of services at universities is an important element of technical cost and directly affects the level of output or performance of higher education related to the tridharma of higher education. When the cost of this service is reduced it will have an impact on the decrease in the quantity and quality of the university output. Furthermore, determinant of financial independence influence positively to technical efficiency of PSA's HEI. High financial independence will make it easier for universities to have the flexibility to manage and manage their own resources, improve service quality and manage operations more efficiently without major government intervention.

The findings of this study provide theoretical implications for the concept of efficiency. Technical efficiency is obtained not necessarily by reducing all costs but must consider the cost of services that become technical costs that directly impact on the output or results achieved. Other findings in this study are to provide information and recommendations to PSA's HEI that have not been efficient to improve its technical efficiency by considering the number of students and study programs more proportional and increase the output of universities. In addition, the need for PSA's HEI is to increase financial independence by exploring other income potentials such as business income, third party cooperation, investment and others beyond the allocation of government funds without having to burden the students to achieve efficiency.

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