



## A Comparative Study on Efficiency Assessment between Public and Private Universities: Evidence from Tanzania

Yustin Ignas Bangi

Assistant Lecturer

Department of Management Sciences

Institute of Finance Management, Shaaban Robert Street

P.O. Box 3918, Dar es Salaam, Tanzania

E-mail: [ybangi67@gmail.com](mailto:ybangi67@gmail.com)

### ABSTRACT

Our study builds on a two-stage Data Envelopment Analysis to examine and compare the efficiency of public and private universities in Tanzania in 2008-2012. First, we use data envelopment analysis to measure the technical and scale efficiency of universities. Secondly, we examine factors that influence efficiency through Tobit regression model for both public and private Universities. The findings from the model affirm that the efficiency of the two University categories varies significantly. However, public University average efficiency is observed to be higher than that of private Universities. Whereas public Universities are inefficient in research and publications, private universities efficiency is determined by enrolment, academics staff and consultancy services. Given the contemporary significance of University education to social and individual development, we plead to the government University agency (TCU) to review the entire quality assurance process to improve Universities efficiency.

**Key words:** Universities; Efficiency; Public Universities; Private Universities; DEA mode.



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## 1.0 INTRODUCTION

University education has now become a cornerstone and precedence of all countries regardless of their development levels. It is from Universities where skilled man power derives and supply labour to different organizations both public and private sectors. As pervasive actors, Universities provide competitive advantage to countries in the international arena, as well as high income to individuals. In this regard, University efficiency measurement is indispensable, so that they remain competitive by meeting stakeholders' demand. Through efficiency measurement. Organizations get to know if they are spending the resources invested inexpensively (El-Demerdash et al, 2013).

In Tanzania, Universities refers to a post secondary education leading to the award of Advanced diploma, Bachelor degree, Masters, Postgraduate Diploma and PhD degrees. Public Universities on the one hand are established, operated and maintained by the government. On the other hand, private Universities are established and operated by private organizations or individuals. However, both public and private Universities are controlled by the government (URT, 1999). Thus, public and private Universities operate in partnership bases.

Prior to financial crisis in 1980s, Tanzania had monopoly on policy, planning and provision of higher education. However, University education was not given priority as it was seen to provide no or little social returns compared to other preceding levels of education. Therefore, a focus was given to primary, secondary and vocational education. These were the ones considered to provide more social returns (Abel, 2010). Worse enough, higher education was not even recognised by gigantic national plans like "The National Stratage for Growth and Reduction of Poverty (NSGRP 2005), popularly known as MKUKUTA in Kiswahili acronym.

Like elsewhere in developing countries, Africa in particular, it took some years to realise the contribution of higher education in development. However, the benefits of University outputs are indisputable. For instance, it is from Universities where potential man power emanates. These include; teachers at all levels of education, decision makers in the government and related organizations, to name a few, are prepared in Universities. Above all, Universities disseminate knowledge, provide consultancy services and conduct research for development. Consequently, the government has now strengthened partnership with private Universities in education, which were legally permitted to operate in 1995. To emphasize more, in 2009, the government put in place a public private partnership (PPP) policy. It has been realised that PPP is a viable means of achieving both socio-economic good and social services by the government (URT, 2009).

These sister policies, have accelerated the increase of Universities in Tanzania, from one University in 1970 to more than 40 Universities in 2014 (TCU, 2014). Eventually, the increase of Universities has also raised the enrolment. Between 2010 and 2011, for instance, there was an increase of enrolment by 49%. Despite this tremendous change, the efficiency and quality of Universities remain sceptical. Nevertheless, evidence from stakeholders' complaints about performance of graduates is vibrant. The incapability of University graduates has been reported, that they are unable to demonstrate the desired skills at the work place. In this scenario, organizations have undermined the role of Universities, and they are reluctant to employ University graduates (Bastos, 2011). To emphasize more, Msolla (2000) pointed out the prevailing complaint from the society about poor education quality. It was suggested to redress the situation through linking expansion of higher education with quality assurance of the education being offered for.

In line with this allegation, Makulilo (2013) also avows that proliferation of private Universities in Tanzania has led to the decline of education quality. However, this contradicts to Liu (1992) who states, ownership of an enterprise is empirically not a significant factor of performance. It is also unreasonable to relay on only one empirical study to reach conclusion, rather the same can be added to a body of evidence for further evaluation. Therefore, still more evidences are required to justify if private Universities are the major cause of education decline. Furthermore, Materu (2007) support Makulilo's assertion that entrance of private sectors and international providers of University education has decelerated both quality and efficiency of education. Additionally, financial constraints and human resource incapability are identified as the major causes of this tragedy.

On the other hand, Ferguson and Ferguson (1994), contradicts the hypothesis that public institutions are inherently poor performers than private enterprises. The reason provided to defend this stance is deficit of information driving to such conclusion. Moreover, most public enterprises do not have a specific benchmark for which their performances can be measured. Furthermore, their social activities are explicitly than that of private sectors. Thus, it is difficult to compare these two enterprises due to their varied nature of performance environment.

In a similar way, Thomas and Xiaoying (2009), highlights the impact of ownership on higher education institutions on performance and efficiency due to different institutional setting, priorities, perceptions, experience and others. Likewise, public and private Universities differ in various aspects such as resource capability, orientations in terms of education delivery if it is for service or business, management styles and the like (Alam, 2009). As result of these variations, efficiency variability could also be possible. This can only be realised through efficiency measurement of both.

Studies elsewhere have also revealed incongruity concerning higher education efficiency and quality. In Greece, Panagiotakopoulos (2012), while studying employability skills found that higher education institutions have failed to integrate desired skills in their curriculum, as result graduates are not esteemed in the world of work. Implicitly, Universities and their regulators do not play their role accordingly, and the future of University graduates is not determined in case the situation is not redressed. Even though, the study is not bias on whether public or private Universities are the source of the problem.

Notwithstanding scepticism about Universities, the argument that Universities should prepare employable graduates has no objection. As Fallows and Steven (2000), Hall et al 92009) and Harvey and Knight (1996) state, graduates



employability skill competence, should be a paramount criteria which also need to be incorporated within a University curriculum.

Based on ongoing conflicting debate on whether public or private Universities are the source of the prevailing University education problem, this study examines the efficiency of both public and private University, and compares their efficiency. This paper is organized as following: In the second section, related literature review is provided, followed by methodological part in section three. Findings and discussions are provided in section four. Finally, section five presents conclusion and recommendations.

## 2.0 LITERATURE REVIEW

In economics term, efficiency is the ratio between the total output and total input. A firm is said to be efficient if it uses certain amount of input to produce more outputs, or spending less input resources to produce the same amount of outputs under given technology, as compared to other firms (Vincová, 2005). Therefore, University efficiency implies ability to use minimum education resources to produce desired outputs/outcomes such as research, consultancy services, and graduates, to name a few.

Measuring education efficiency has been very difficulty due to multiple inputs and outputs involved. In education the variable inputs are not directly related to outputs obtained. As result, efficiency assessment uses a proximal relationship between inputs and outputs. However, a non-parametric linear model, data envelopment analysis (DEA) has been in use for more than three decades in measuring the efficiency of various organizations, including education institutions. This is a linear programming paradigm which makes no prior assumption about variables (Aristovnik, 2013).

Toth (2009) implemented DEA in assessing the efficiency of higher education systems in European countries based on gross domestic product (GDP) per capital and parents' education through DEA. The findings indicate that there is a positive relationship between GDP per capital and education higher education achievement. Another study by Ying Chu Ng (2000); Worthington (2001); Warning (2004); employed similar model in assessing the efficiency of Universities. Results from these studies reveal that there is variability of efficient among Universities. Furthermore, it is affirmed that an institution being efficiency in one aspect however, does not guarantee efficiency on another. Obviously, the efficiency or inefficiency will only base on involved inputs and output variables of a particular unit. Thus, an institution being efficient or inefficient is not a permanent behaviour; it is determined by particular environment in which an institution operates.

Moreover, Collier (2012) assessed the effect of institutional arrangement on student achievement in schools, using a two stage regression model and DEA model. The findings obtained suggest that there is a positive influence of institutional setting to student achievement. However, a slight relationship between educations' input like salaries and teachers on school efficient was observed. The use of DEA model is also emphasized by Abdulkareem and Oyeiran (2011) that Universities need to provide services to their clients while focusing on the market needs. They suggest that this can only be realised through DEA approach by analysing their efficiency.

In contrast, Ghana has reported a brain drain crisis focusing on Medical professional graduates (Dovlo and Nyonor, 2005). Findings from the study conducted in Sub-Saharan countries to detect the deficiency of medical Doctors reveal that most of professional Doctors seek jobs to abroad to earn more returns. Arguably, there variations of efficiency among University schools and departments in terms of graduate qualities. So, similar case should be expected when comparing public and private Universities efficiency.

Despite the overwhelming demand of graduates in the world of work, Universities are blamed for not preparing graduates who possess desired skills (Sutherland, 2008). Surprisingly, studies indicate policy successes while leaving graduates unemployed as they enter into the market without qualifications. To support the same, Ordonez (2012) states that Universities should train graduates who can be easily sucked by the global market. This will meet their dreams of working abroad and earning higher income. These arguments imply the challenges Universities face in terms of efficiency, as they cannot meet the social expectations. This has become a hurdle to most graduates who graduate without acquiring market desired skills.

In the same way, the current competition in higher education calls for constant measurement activities of these institutions to improve their efficiency (Nkirila, 2009). It is further stated that both public and private higher education institution needs to comply with government mandates, if they are to improve their efficiency. Therefore, Universities need to strike the balance between their increase in number and efficiency, while focusing on the three core objectives namely; knowledge transmission, knowledge creation and knowledge sharing to the society.

Many studies done in Tanzania focuses on other higher education such as quality, access, equity and financing of higher education, to name a few. The aspect of University efficiency is scantily discussed; for instance Kapinga and Dunrong (2010), their study determined reasons for higher education privatization and revealed that government fiscal incapacitation and delayed meeting social demand triggered privatization of higher education. Ishengoma (2008) assessed the trend of cost sharing higher education and realised that there were more challenges than solutions to arrest. Uneven distribution of funds and low capacity of the government to provide sufficient loans were some of the identified hurdles. A study by Makulilo (2012) on the proliferation of private universities in Tanzania focused on private Universities public Universities affirmed that private Universities were the major cause of low quality of University graduates. However, an interesting study by Kipesha (2013), done on public Universities efficiency, provide an impetus to the current, as it did not assess the efficiency of both University categories (public and private). None of the studies has compared the efficiency of public and private Universities for concrete inference. Therefore, we conduct this study to examine and compare the efficiency of both public and private Universities in Tanzania.



### 3.0 METHODOLOGY

Data environment analysis (DEA) is powerful statistical tool which is broadly used to measure efficiency and performance of different decision making units (DMU). Usually, the investigated DMUs are characterized by multiple inputs and multiple outputs. Some of these variables are stochastic, making it difficult to execute other approaches than DEA model. Thus, with DEA model, DMUs transform multiple inputs into multiple outputs. The objective of DEA is to assess the efficiency of each comparable DMUs in relation to its peers. Additionally, DEA determines the sources of inefficiency and suggest solution for remedy.

The current study therefore, adopts an input oriented two stage DEA model. In stage one a technical efficiency and scale efficiency is obtained by performing two DEAs. The second stage uses Tobit regression to determine efficiency influencers. The first DEA, assumes that DMUs operates at constant return to scale (CRS), suggested by Charnes, Cooper and Rhodes (1978) CCR model. The second analysis is under assumption that the DMUs are operating at variable return to scale (VRS) as introduced by Barker et al (1984) namely; BCC model, modified from CCR model. Nevertheless, in real life optimal behaviour is unacceptable due to various factors such as, financial constraints, market competition, technological change and others (Cesaro, 2009). Thus, we prefer both CRS and VRS formulation due to the fact that public and private Universities relatively differ in terms of size, resources and orientations. This will facilitate to obtain the mean technical efficiency of both public and private Universities, and compare their means. Moreover, the decomposition of technical efficiency (TE) into scale efficiency (SE) is calculated given by:

$$SE = \frac{TE_{CRS}}{TE_{VRS}}$$

All CRS, VRS and SE can vary from zero and one. A score of one indicated by 100% implies a DMU is full efficient, whereas any score below that indicates inefficient of a DMUs.

#### 3.1 CCR Model (CRS)

The original model was proposed by Charnes et al (1978). CCR introduced the following fractional programming problem to obtain values for input weights and output weights. Basic CCR formulation is;

$$\max ho(u, v) = \frac{\sum_{r=1}^s u_r y_{ro}}{\sum_{i=1}^n v_i x_{io}} \tag{1}$$

Subject to:

$$\frac{\sum_{i=1}^n u_r y_{rj}}{\sum_{i=1}^m v_i x_{ij}} \leq 1 \quad j=1, 2, \dots, n \tag{2}$$

$$u_r \geq 0 \quad r=1, 2, \dots, s \tag{3}$$

$$v_i \geq 0 \quad i=1, 2, \dots, m \tag{4}$$

Where  $x_{ij}$  is the observed amount of input  $i$ th of the  $j$ th DMU ( $x_{ij} > 0, j = 1, 2 \dots n; i = 1, 2 \dots m$ ) and  $y_{ij}$  = observed amount of output of the  $r$ th type for the  $j$ th DMU ( $y_{ij} > 0, r = 1, 2 \dots s; j = 1, 2 \dots n$ )

#### 3.2 The BCC Model (VRS)

As aforementioned, the CRS DEA model assumes that the DMUs are operating at an optimal scale. So, the implication of this model is that technical efficiency of DMUs does not vary. However, in real life, it is impractical. To remedy this



situation, Banker, Charnes and Cooper (1984) have taken it on board, through extended DEA to the case. This model disentangles between pure technical efficiency (PTE) and scale efficiency (SE), identifying if increasing, decreasing or constant returns to scale are present. Therefore, the original CCR model has to change by finding its dual as following:

$$\min h_o(u, v) = \theta$$

Subject to:

$$\sum_{j=1}^n \lambda_j y_{rj} \geq y_{ro} \quad r = 1, 2, \dots, s \quad (5)$$

$$\theta_o x_{io} - \sum_{j=1}^n \lambda_j x_{ij} \geq 0 \quad i = 1, 2, \dots, m \quad (6)$$

$$\sum_{j=1}^n \lambda_j = 1 \quad (7)$$

$$\lambda_j \geq 0 \quad j = 1, 2, \dots, n \quad (8)$$

Where  $x_{ij}$  is the observed amount of input  $i$ th of the  $j$ th DMU ( $x_{ij} > 0, j = 1, 2, \dots, n, i = 1, 2, \dots, m$ ) and  $y_{ij}$  = observed amount of output of the  $r$ th type for the  $j$ th DMU ( $y_{ij} > 0, r = 1, 2, \dots, s, j = 1, 2, \dots, n$ )

### 3.3 Tobit regression Model

Tobit regression model is a statistical non-linear model proposed by James Tobin to describe the relationship between a non-negative dependent variable  $Y_i$  and an independent variable  $X_i$ . This model is used to examine the factors that influence efficiency for appropriate correction of inefficient DMUs (Foster, 2013). This is the second stage of efficiency analysis we implement a Tobit regression model. Therefore, Tobit regression equation created in this study has efficiency scores of each University as dependent variable and factors that are considered to influence the efficiency scores are independent variables. With Tobit regression results, a variable is considered significant if its P-value is ( $0.01 \leq P \leq 0.05$  or  $t\text{-value} \geq |1.96|$ ). We run two regressions to determine the factors influencing efficiency in public Universities as well as factors influencing efficiency in private Universities.

### 3.4 Data and variables

The Data employed in this study are both primary and secondary quantitative derived from multiple sources. Secondary data were derived from Tanzania Commission for Universities (TCU), National Bureau of Statistics (NBS) and Ministry of Education and Vocational Training (MoEVT), whereas primary data were obtained from 16 Universities in Tanzania those which were ready to provide data. The sample includes 8 public and 8 private Universities. However, we intended to use the entire population but unavailability of data is one of the limitations to this study.

We use a panel data for the period of 2008 to 2012. The selection of this period is based on two factors. First, this is the period when high enrolment was recorded in Tanzania Universities, resulting from massive increase of graduates in secondary schools and non-university colleges. The graduate increase in secondary schools was also accelerated by the secondary education development plan commenced in 2004-2009 (URT, 2004). Secondly, in 2010 MoEVT launched a higher education development plan (HEDP) to curb the increased enrolment in secondary schools, demanding for higher education (URT, 2010). Thus, it is worthwhile to assess the University efficiency to ascertain if the adapted plan is workable. So, we select inputs which are proximal to the selected output as shown in the table below due to complexity of educational variables.



**Table 1 Input and output variables for both public and private Universities**

Input Variables	Output Variables
Total enrolment (EN)	Number of Graduates (GR)
Number of academic staff (AS)	Number of research publications (RP)
Number of non-academic staff (NAS)	Number of consultancy services (CS)

## 4.0 RESULTS AND ANALYSIS

This section, provide results from the two DEA modelling, for public Universities and private Universities. From the results, the technical efficiency and scale efficiency scores are examined, and their average means of the two University categories are compared. Furthermore, results from Tobit regression model are presented to ascertain the determinants of technical efficiency in public Universities as well as in private Universities.

### 4.1 Technical efficiency DEA results

After performing a two DEA analysis, we obtain mean technical efficiency under CRS and VRS assumptions. Scale efficiency (SE) is obtained from the ratio of CRS and VRS. Detailed output by institution is shown in Appendices A and B. All score values for CRS, VRS and SE rows, varies from zero to one, where 100% implies technical efficient or scale efficient. Any efficiency scores less than 100%, indicates technical inefficient or scale inefficient of that DMU.

**Table 2 Mean Technical Efficiency DEA results (2008-2012)**

YEAR	Return to Scale	Public University	Private University	Difference
2008	CRS	96.06%	71.44%	24.63%
	VRS	96.06%	92.49%	3.58%
	SE	100.00%	76.39%	23.61%
2009	CRS	94.28%	83.53%	10.75%
	VRS	97.50%	92.38%	5.13%
	SE	96.62%	90.97%	5.65%
2010	CRS	94.33%	85.91%	8.41%
	VRS	97.38%	94.66%	2.71%
	SE	96.14%	90.97%	5.17%
2011	CRS	93.23%	81.63%	11.60%
	VRS	96.74%	93.73%	3.01%
	SE	96.31%	85.32%	10.99%
2012	CRS	94.28%	90.88%	3.40%
	VRS	96.64%	93.25%	3.39%
	SE	97.08%	96.48%	0.60%
<b>No. OF DMUS</b>		8	8	

Source: Research Data

From table 2 it is observed that when institutions are modelled under CRS in all the five years of review, public Universities and (private Universities) on average are operating at (96.06%)(71.44%), 94.28%(83.53%), 94.33%(85.91%), 93.23%(81.63%) and 94.28%(90.88%) technical efficiency in 2008, 2009, 2010, 2011 and 2013 respectively. Similarly, when institutions were modelled under VRS using five year panel data, public Universities and (private Universities) on average are operating at 96.06%(92.49%), 97.50%(92.38%), 97.38%(94.66%), 96.74%(81.63%) and 96.64%(93.25%) technical efficiency in 2008, 2009, 2010, 2011 and 2012 respectively. Turning to the third row of each examined year, the average scale efficiency indicates that on average, Universities public and (private) are operating at 100.00 % ( 76.39%), 96.62 % ( 90.97%), 96.14 % ( 90.97%), 96.31 % ( 85.32%) and 97.08 % ( 96.48%) scale efficient. Generally, results demonstrate that public Universities' mean average scores of technical efficiency and scale efficiency are higher than that of private Universities. Additionally, in 2008 all public Universities are observed to operate under 100% mean scale efficient.



On the other hand, private Universities are scale inefficient in all five years of review. It is further noted that the maximum percentage difference of their mean efficiency between public and private Universities is 24.63% (CRS) and the minimum is 0.60% (SE). That is to say, the Universities' efficiency varies largely when operated under CRS and there is scant difference on the scale efficiency, and their mean averages are high close to 100%.

**4.1.1 Average number of efficient Universities from 2008-2012**

This is intended to observe the average number of efficient Universities, both public and private in each year of review, and detect if there is any variation between them. Table 3 below indicates the average number of efficiency Universities in the five years of review. Details of the results are in Appendix C, which is also extracted from Appendices A and B, indicating University efficiency scores modelled under CRS, VRS and SE.

**Table 3 Average number of efficient Universities from 2008-2012**

EFFICIENCY	Efficient Public Universities	%	Efficient Private Universities	%
CRS	6	75.0%	5	62.5%
VRS	6	75.0%	6	75.0%
SE	4	50.0%	5	62.5%

Based on the results in table 3, it is noted that on average the number of efficient public (Private) Universities are 6(75.0%) 5(62.5%), 6(75.0%) 6(75.0%) and 4(50.0%) 5(62.5%) when Universities operate under CRS, VRS and SE respectively. Thus, while an average of 6 public Universities are technically efficient under CRS, 5 Universities are also efficient under the same behaviour. However, it is learned that both public and private Universities have an equal average number (75.0%) of efficient Universities when operate under VRS. Under such situation, it can be argued that both University categories are affected by similar factors which render them not to become efficient. Under scale efficiency, the average number of efficient public Universities is 4(50.0%) while that of private Universities is 5(62.5%). Arguably, most private Universities seem to be more scale efficient compared to public ones. From general observation, it can be argued that there is slightly difference in terms of average number of efficient Universities in the reviewed time.

**4.2 Result from Tobit Regression Model analysis**

**4.2.1 Tobit regression for public Universities**

We use Tobit regression model to examine the public University efficiency determining factors. The analysis is performed at 5% level of significance for both public and private Universities. In this case technical efficiencies modelled under VRS (Appendices A and B) are employed for both DEAs in public and private Universities.

Regression equation for public Universities is statically represented by;

$$\theta_{PUi} = \beta_0PUi + \beta_2ENPUi + \beta_2ASPUi + \beta_2NASPUi + \beta_2GRPUi + \beta_2RPPUi + \beta_2CSPUi + u_{PUi}$$

Where,

$\theta_{PUi}$  is the efficiency of public Universities  $i$ ,  $\beta_0PUi$  is the constant term,  $ENPUi$  total enrolment in public Universities,  $NASPUi$  is non-academic staff public Universities,  $GRPUi$  number of graduates public Universities,  $RPPUi$  research publication public Universities,  $CSPUi$  consultancy services public Universities,  $\beta_1PUi$ -  $\beta_6PUi$  are coefficient of variable from 1 to 6 public Universities and  $u_{PUi}$  is the error term in public Universities.

**Table 4 Tobit Regression Model Results - Public Universities**

Efficiency	Coefficient.	Std. Err.	t	P>t	[95% Conf.
Enrolment	3.21E-06	5.62E-06	0.57	0.571	-8.21E-06
Academic staff	-0.0005522	0.0003158	-1.75	0.089	-0.0011939
Non-academic staff	0.0002075	0.0001548	1.34	0.189	-0.0001072
Graduates	0.0000315	0.0000191	1.65	0.108	-7.22E-06



Research publication	-0.0002912*	0.0001145	-2.54	0.016	-0.000524
Consultancy services	0.0020029	0.0011699	1.71	0.096	-0.0003745

Source: Own Calculations

\* Significant variable

The result in table 4 show that only research publication (RP) is significant at 5% level of significance and its relationship with efficiency is negative. This signifies that public Universities could reduce their efficiency by any increase of 0.03% of research and publication. Similarly, inefficient public Universities could increase their efficiency scores to 100% through reduction of research publications by the same quantity of 0.03%. So far, other variables have indicated no statistical significance to the efficiency of public Universities. The implication to this is that public Universities are operating at high average of efficiency. This is also supported by an average TE and SE in Table 2.

#### 4.2.2 Tobit regression for private Universities

Regression equation for private Universities is statically represented by;

$$\delta PRU_i = \beta_0 PRU_i + \beta_2 ENPRU_i + \beta_2 ASPRU_i + \beta_2 NASPRU_i + \beta_2 GRPRU_i + \beta_2 RPPRU_i + \beta_2 CSPRU_i + uPRU_i$$

Where,

$\delta PRU_i$  is the efficiency of private Universities  $i$ ,  $\beta_0 PRU_i$  is the constant term,  $ENPRU_i$  total enrolment in private Universities,  $NASPRU_i$  is non-academic staff private Universities,  $GRPRU_i$  number of graduates public Universities,  $RPPRU_i$  research publication private Universities,  $CSPRU_i$  consultancy services private Universities,  $\beta_1 PU_i$ -  $\beta_6 PU_i$  are coefficient of variable from 1 to 6 private Universities and  $uPU_i$  is the error term in private Universities.

**Table 5 Tobit Regression Model Results - Private Universities**

Efficiency	Coefficient.	Std. Err.	t	P>t	[95% Conf.
Enrolment	-0.0000992*	4.77E-05	-2.08	0.045	-0.0002
Academic staff	0.0016181*	0.000685	2.36	0.024	0.000226
Non-Ac. Staff	0.0004274	0.000235	1.82	0.078	-0.00005
Graduates	0.000107	0.000157	0.68	0.499	-0.00021
Research & pub	-0.0045482	0.00339	-1.34	0.189	-0.01144
Consultancy services	0.016335*	0.00726	2.25	0.031	0.001582

Source: Own Calculations

\*Significance variable

Table 5 above show that enrolment (EN), academic staff (AS) and consultancy services (CS) are statistical significant to private Universities efficiency. Whereas enrolment shows negative relationship with efficiency indicated by a negative sign coefficient, academic staff and consultancy services are positively related with the University efficiency. In this regard, inefficient private Universities could reduce the number of student enrolment by 0.01%, at the same time increase the number of academic staff by (0.20%) and number of consultancy services by (1.63%), if they are to become efficient. It is learned from the results that private Universities enrol more students over and above their capacity in other resources like academic staff. Thus, a balance between inputs and outputs could raise the efficiency.

### 5.0 DISCUSSIONS AND CONCLUSION

It is clearly stated earlier that assessing Universities' efficiency is a pervasive role of any government aspiring to attain sustainable development. This paper examines the public and private Universities efficiency, whereby a comparison between the two University categories is also done. The overall findings suggest that there is statistical variation between mean technical and scale efficiency averages of public and private Universities in Tanzania. However, mean averages of public Universities are observed to be higher than that of private Universities, in all DEA modelling; CRS, VRS and SE. However, high variation is observed in CRS and a very low difference in SE. High variation in CRS results from the fact that CRS is not very practical due to variation factors hindering Universities not to operate under this assumption (Cesaro, 2009). Not only that but also, public Universities differs in terms of resources, experience, government support, management etc. All these, might have contributed to the observed results.

There is also an indication that public Universities have only one efficiency determinant to inefficient Universities, whereas there are three determinants for private Universities. Research publication in public Universities appear to be negatively related to efficiency. The implication to this is that inefficient Universities could reduce this factor by 0.03% to become efficient. Student enrolment is observed to be higher than the capability of the University to handle. Since tuition fee is the major source of running private Universities, it is clearly learned that raising fund through fees is paramount to private





Universities. In so doing, causes efficiency to decline. Contrary to that, academic staff and consultancy services are found to be positively significant to University efficiency, hence requiring them to increase these variables.

Both hiring academic staff and conducting consultancy services are investments which consume University funds. Implicitly, private Universities do not capitalize on hiring more academic staff; rather they employ few, so as to incur less cost and maximize profit. To bridge the gap of academic staff they mainly depend on part time lecturers who are also cheaply paid. Likewise, private Universities do not invest much on consultancy, they mainly focus on teaching. This is in line with Hirshleifer (1980), argues, "According to the classical formulation, the aim of the firm as a decision-making agent is to maximize (economic) profit" (p. 265). In this case, there is no doubt that the orientation of private is for profit making while that of public Universities is for service delivery. Therefore, private Universities could increase these variables so as to elevate their efficiency.

Conclusively, we affirm that the existing efficiency variations between public and private Universities, is very significant and has a policy implication. The government through its agency (TCU) need to review its entire process of quality assurance to ensure that efficiency assessment is frequently and thoroughly done. All University stakeholders such as academic staff, entrepreneurs, parents, students, and alumna to name a few, could be involved to provide inputs on how efficiency can be attained and maintained. Nevertheless, this study precluded other exogenous factors which might have contributed to this finding. Consequently, we suggest another study of the same by increasing the sample of Universities and other qualitative variables which could come up with different findings.

## 6.0 ACKNOWLEDGEMENT

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## APPENDICES

## Appendix A: Technical efficiency and Scale Efficiency Results (Public Universities)

DMU NAMES											
YEAR	RTS*	ARU	DUCE	MU	MUCE	MUHAS	OUT	SUA	UDSM	MEAN	DMUs
2008	CRS	1.000	0.685	1.000	1.000	1.000	1.000	1.000	1.000	0.961	8
	VRS	1.000	0.685	1.000	1.000	1.000	1.000	1.000	1.000	0.961	
	SE	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	
2009	CRS	1.000	0.833	1.000	1.000	1.000	1.000	0.709	1.000	0.943	8
	VRS	1.000	0.842	1.000	1.000	1.000	1.000	0.958	1.000	0.975	
	SE	1.000	0.989	1.000	1.000	1.000	1.000	0.740	1.000	0.966	
2010	CRS	1.000	0.546	1.000	1.000	1.000	1.000	1.000	1.000	0.943	8
	VRS	1.000	0.790	1.000	1.000	1.000	1.000	1.000	1.000	0.974	
	SE	1.000	0.691	1.000	1.000	1.000	1.000	1.000	1.000	0.961	
2011	CRS	1.000	0.792	1.000	0.935	1.000	0.858	0.873	1.000	0.932	8
	VRS	1.000	0.858	1.000	1.000	1.000	0.881	1.000	1.000	0.967	
	SE	1.000	0.923	1.000	0.935	1.000	0.974	0.873	1.000	0.963	
2012	CRS	1.000	0.957	1.000	1.000	1.000	0.964	0.621	1.000	0.943	8
	VRS	1.000	0.958	1.000	1.000	1.000	1.000	0.773	1.000	0.966	
	SE	1.000	0.999	1.000	1.000	1.000	0.964	0.803	1.000	0.971	

RTS\* is return to scale efficiency which can either be; CRS - constant return to scale; VRS - variable return to scale or SE - scale efficiency



## Appendix B

Technical efficiency and Scale Efficiency Results (Private Universities)

YEAR	RTS	AKU	HKMU	IMTU	MWUCE	SJUT	TUDARCO	TUMA	UoA	MEAN	DMUs
2008	CRS	1.000	1.000	1.000	0.432	0.293	1.000	0.627	0.363	<b>0.714</b>	8
	VRS	1.000	1.000	1.000	1.000	0.444	1.000	0.955	1.000	<b>0.925</b>	
	SE	1.000	1.000	1.000	0.432	0.660	1.000	0.657	0.363	<b>0.764</b>	
2009	CRS	1.000	1.000	0.663	0.326	0.693	1.000	1.000	1.000	<b>0.835</b>	
	VRS	1.000	1.000	0.673	1.000	0.717	1.000	1.000	1.000	<b>0.924</b>	8
	SE	1.000	1.000	0.985	0.326	0.967	1.000	1.000	1.000	<b>0.910</b>	
2010	CRS	0.840	1.000	0.778	0.874	0.543	1.000	1.000	0.838	<b>0.859</b>	
	VRS	1.000	1.000	1.000	1.000	0.573	1.000	1.000	1.000	<b>0.947</b>	8
	SE	0.840	1.000	0.778	0.874	0.948	1.000	1.000	0.838	<b>0.910</b>	
2011	CRS	1.000	1.000	0.797	1.000	0.550	1.000	1.000	0.183	<b>0.816</b>	
	VRS	1.000	1.000	0.990	1.000	0.690	1.000	1.000	0.818	<b>0.937</b>	8
	SE	1.000	1.000	0.805	1.000	0.797	1.000	1.000	0.224	<b>0.853</b>	
2012	CRS	1.000	1.000	0.775	1.000	1.000	1.000	1.000	0.495	<b>0.909</b>	
	VRS	1.000	1.000	0.814	1.000	1.000	1.000	1.000	0.646	<b>0.933</b>	8
	SE	1.000	1.000	0.952	1.000	1.000	1.000	1.000	0.766	<b>0.965</b>	

Source: Research data



## Appendix C

Number of Technical efficiency and Scale efficiency DMUs - (2008 -2012)

YEAR	RTS	EFFICIENT PUBLIC UNIVERSITIES	%	EFFICIENT PRIVATE UNIVERSITIES	%
2008	CRS	7	87.5%	4	50.0%
	VRS	7	87.5%	6	75.0%
	SE	8	100.0%	4	50.0%
2009	CRS	6	75.0%	5	62.5%
	VRS	6	75.0%	6	75.0%
	SE	6	75.0%	5	62.5%
2010	CRS	7	87.5%	3	37.5%
	VRS	7	87.5%	7	87.5%
	SE	7	87.5%	3	37.5%
2011	CRS	4	50.0%	5	62.5%
	VRS	6	75.0%	5	62.5%
	SE	4	50.0%	5	62.5%
2012	CRS	5	62.5%	6	75.0%
	VRS	6	75.0%	6	75.0%
	SE	6	75.0%	6	75.0%

## Appendix D

Reviewed Public Universities in 2008 - 2012

University Name	Acronym	Location
1. Ardhi University	ARU	Arusha
2. Dar es Salaam University College of Education	DUCE	Dar es Salaam
3. Mzumbe University	MU	Morogoro
4. Mkwawa University College of Education	MUCE	Iringa
5. Muhimbili University of Health and Allied Sciences	MUHAS	Dar es Salaam
6. The Open University of Tanzania	OUT	Dar es Salaam
7. Sokoine University of Agriculture	SUA	Morogoro
8. University of Dar es Salaam	UDSM	Dar es Salaam

Source: Adapted from TCU website (2014)

**Appendix E**

Reviewed Private Universities (2008 - 2012)

<b>University Name</b>	<b>Acronym</b>	<b>Location</b>
9. Agakhan University	AKU	Dar es Salaam
10. Hubert Kairuki Memorial University	HKMU	Dar es Salaam
11. International Medical & Technology University	IMTU	Dar es Salaam
12. Mwenge University College of Education	MWUCE	Kilimanjaro
13. St. John University of Tanzania	SJUT	Dodoma
14. Tumaini University Dar es Salaam College	TUDARCO	Dar es Salaam
15. Tumaini University Makumira Arusha	TUMA	Arusha
16. University of Arusha	UoA	Arusha

Source: Adapted from TCU website (2014)

