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Efficiency of Higher Learning Institutions: Evidences from Public Universities in Tanzania

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Abstract
The aim of the study was to evaluate the efficiency of public universities in Tanzania, in their use of human resources to produce output measured by the internal revenue generated and number of degrees conferred. The study used data envelopment analysis (DEA) for estimation of efficiency scores of 7 public universities operating in the country.
The findings of the study show that public universities in Tanzania are on average efficient in the use of human resources to produce output measured by the number of undergraduate and postgraduate graduates' students. This indicates that public universities fulfill their primary goal of transforming knowledge to the society for the country development. On the other hand, we found that public universities are inefficient in the income generation activities. They do not use efficiently the human resources available in the generation of income from consultancies, research, fees and investments. The study recommends that public universities should improve their internal revenue generation as the way to reduce their dependence on government and donors. The improvement in revenue generation will facilitate the growth of institutions as well as increased quality of outputs due to increased investments in technology.
Keywords: Higher Learning Institutions, Public Universities, Efficiency, Data Envelopment Analysis

1. Introduction

Higher learning institutions are knowledge based organizations which are concerned with generation, acquisition and transfer of knowledge to society at different levels. These institutions provide appropriate skills and knowledge to the people necessary for country economic development through technology innovations and development of new ideas (Katharaki & Katharakis, 2010). The institutions are also involved in the provision of advice to business firms, storage and preservation of knowledge as well as generation of new knowledge and solutions through research and consultancies (Thanassoulis et al, 2009). As the main producers of human capital knowledge, they support economic development by providing appropriate knowledge and skills required by the workforce in the global market (Daghbashyan, 2009, Katharaki & Katharakis, 2010). In accomplishing their primary activities of knowledge creation through teaching and research activities, public universities use public funds whose sources are the government, community or development institutions (Johnes, 2006). Public funds are scarce and need to be allocated efficiently among social activities such use education and health as well as in development activities of the countries. Recently they have been raising debate among policy makers around the global on whether these institutions efficiently use the scarce public funds allocated to them (Katharaki & Katharakis, 2010). The governments and other stakeholders have also become more demanding on the evidences of the impact and relevance of the work of higher education sector nationally, regionally and globally (OECD 2006). They have been increases in the budget allocation for public universities due to increase in enrollments leading to higher development and operating expenditures. Expectation from the policy makers, the government and other stakeholders are that the increase in expenditure is at the end accompanied by increased output as well as increased quality on the products produced (Robst, 2001).
In Tanzania, higher leaning institutions are regulated by the Ministry of Education and Vocational Training together with Tanzania Commission for universities (TCU). According to the statistics they have been a rapid increase in the number of higher learning institutions from 2 institutions in 1991 to more than 35 institutions in 2012 (TCU, 2013). Among them, 11 institutions are public universities which depend on the public funds from the government for financing their operations. On the other hand, there have been increases in the student's enrollments in public higher learning institutions and colleges from 19,505 in 2006/07 to 92,997 in 2010/11 which is more than 79% increase in the five years period. Although statistics show that the ratio of budget allocated to the education sector to the total budget fall from 22.1% in 2001/02 to 17.6% 2010/11, the ratio of the education budget allocated to technical and higher learning institutions have increasing from 17.6% in 2001/02

to 26.5% in 2010/11 (NBS, 2010). With such increasing consumptions in public funds, there is a need to ensure that such funds are effectively, economically and efficiently utilized in order to boost country economic development, increase the output as well as quality of knowledge, skills and research outputs. This paper aims at evaluating the efficiency of public universities in Tanzania which are mainly financed by government and other development grants. The papers seek to evaluate the efficiency at which public universities use human resources in the production of output measured by the number of undergraduate and postgraduate degree offered. The study also seeks to evaluate the efficiency at which institutions use the available human resources in the generation of output measured by total internal revenues mobilized.

2. Literature Review

Efficiency in higher learning institutions refers to the extent to which institutions allocate efficiently the inputs available to generate the given level of output. Unlike economic efficiency which is measured through the combination of several inputs with one output, higher learning institution's efficiency involves the combination of multiple inputs to produce multiple outputs (Johnes, 2006, Daghbashyan, 2009). This is due to the fact that these institutions produce multiple outputs such as the educational output and research outputs from the combination of multiple inputs such as labor input (academic and nonacademic staffs), government funds and noncurrent assets held by the institutions. Efficiency measures can be divided into four aspects, technical efficiency, allocative efficiency, scale of efficiency and dynamic efficiency. Technical efficiency refers to the firm's cost of production in short run production span. In higher learning institutions, it indicates the physical relationship between the resources used and some education outcome (Worthington 2001), especially on the use of productive resources in the most technologically efficient manner (Katharaki & Katharakis, 2010). Allocative efficiency is concerned with whether the resources available are actually allocated and used to produce the output needed to meet the need and wants. It shows the best possible utilization or distribution of the available limited resources for maximizing usefulness (GVH, 2007). In higher learning institution, allocative efficiency measures the extent to which inefficiency occurs because an institution is using incorrect combination of input given what they cost to purchase (Katharaki & Katharakis 2010). Dynamic efficiency on the other hand, focuses on the changes in the amount of consumer choice available in markets together with the quality of goods and services available. This is the perspective efficiency which determines innovation, the renewal and adaptation ability of the organization (GVH, 2007). Dynamic efficiency occurs when institution successful increases in the improvement of existing outputs and also develops new outputs (Coelli, 1998). Scale efficiency, on the other hand, measures the extent at which institutions are operating at increasing or decreasing return to scale which also help to determine the optimal size of institutions (Katharaki & Katharakis, 2010).

Public higher learning institutions are budget maximizes, with their high operational autonomy they enjoy greater freedom, which sometimes results into pursuing their own objectives at the expense of conventional objectives (Khumbhakar 2000). The activities of higher learning institutions are driven by the pursuit of excellence and prestige maximization, which does not necessarily imply economic efficiency traditionally assumed for profit maximizing business establishments. As indicated by OECD (2006), investment in higher education and research has a positive effect on economic growth and regional competitiveness, but when countries allocate budget to these institutions there not only interested in excellence and prestige but also in the efficient utilization of such resources (Dahgbashyan 2009). Due to budget restrictions and the demand for a more rational management of the public funds, they have been an increasing need for new performance indicators that can be used as a tool for decision making regarding funding and distribution of resources. This resulted into increasing discussion on the importance of efficiency measures in higher learning institutions a part of their performance measures (OECD, 2006). According to Avkiran, (2009), education institution which fails to make efficiency measures as their standard performance measurement would certainly face inefficient allocation of educational resources. Efficiency as one of the performance indicator in higher learning institution should comply with the mission of the institution, be specific, quantifiable and standardized, be simple and consistent with the activities of which they will be a reference for decision and acceptable and true (Costa 2006). Such indicator should be problem oriented and policy relevant so that decisions made basing on them can improve overall university education (Cave et al, 1991).

Empirical studies of on efficiency of higher learning institutions have provided different results, some of them indicating high efficiency among the institutions studied while other indicating inefficiency in some institutions. The study by Salerno (2002) evaluated technical and allocative efficiency of Pennsylvania state university. The study reported the findings to be consistent with economic theories of university behavior, Ahn et al (1988) found out that public university in USA achieved greater efficiency than private universities while Abbot et al (2003) studied technical efficiency scale of Australian university and found it to be very high. On the other hand, Stevens (2001) estimated efficiency of the group of English and Welsh universities using stochastic frontier

analysis. The study found inefficiency among higher learning institutions. Afonso & Santos (2005) estimated efficiency of public high universities in Portugal and found that the mean efficiencies were 55.3% and 67.8% in the two facilities studied. Balloni (2001) studied productive efficiency in 33 Brazilian federal universities using DEA and found that only 6 of them were technically efficient, Joumady & Ris (2005) using DEA measured the efficiency of 210 education institutions from 8 European countries and found that efficiency varied according to the models used. Likewise, the study by Daghbashyan (2011) on efficiency of Swedish higher education revealed that higher learning institutions are not identical in their economic efficiency. The study concluded that although the average efficiency was high among the higher learning institutions, the efficiency of individual universities varied significantly.

In Tanzania studies on efficiency of higher learning institutions have not been conducted yet. Most of the studies in the country have focused on other aspects relating to the higher learning institutions. The study conducted by Abel (2010) on higher education and development in the country reported that, most of the public universities have outdated infrastructure, learning and teaching materials and other facilities. The study also reported that, most of public universities in the country experiences higher operating costs which force them to raise student's fees as the easy way to increase revenue. The study by Mgaya & Lokina (2010) assessed the critical factors in higher education finance and planning in Tanzania. The study presented various financing sources available for public higher learning institution operating in the country. The study by Ishengoma (2011) on the other hand, presented a documentary review on strengthening higher education in Africa taking public universities in Tanzania as the case study. So far we did not find any study in the country which examines the efficiency use resources in public universities. Since the public universities in the county uses the public funds, there is a need to evaluate and monitor their performances especially on the extent to which they use efficiently the resources allocated to them. This will create awareness among the stakeholders and policy makers and contributes on the possible ways of improving efficiency and overall performance of public universities in the country.

3. Methodology and Data

The measurement of efficiency in higher learning institutions has been dominated by three approaches, efficiency measurement using indicators (Chalmers, 2008, OECD 2007, 2002, Ward 2007), data envelopment analysis (Casu and Thanassoulis 2006, Salerno 2006, Stevens 2001, Worthington 2001, Johnes 2006, Abbot et al 2003, Coelli 1996, Avkiran 2001, Ahn et al 1988, Salerno 2002) and stochastic frontier analysis (SFA) used by Robst 2001, Stevens, 2001 and Izadi et al, 2002. DEA and SFA are both frontier measure with SFA using parametric approach to measure efficiency while DEA use nonparametric approach. Among the two, DEA is the most preferable method in the measurement of efficiency of higher learning institutions. The preference of DEA to SFA is due to advantages that DEA possess as compared to SFA. DEA does not require the assumption about the functional form, it compute the maximal performance measure for each decision making unit (DMU) relative to all other decision making units and allows the model with multiple output which is hardly accomplished by SFR (Daghbashyan 2009). This makes DEA model an appropriate tool for multi output production of educational establishments (Johnes 2005, Abbot et al, 2003). The shortfalls of DEA includes the assumption that all deviations from the efferent frontier are due to inefficiency, hence does not make any allowance for the possibility of random error. DEA also measures relative efficiency of one institution as compared to other institutions operating under the same industry, using the same type of input and producing the type of output, instead of absolute efficiency (Daghbashyan 2011, Salerno, 2006). Unlike SFA, DEA also assumes all DMU attempt to accomplish the same goal while there is some goal diversity (Kao and Liu, 2000) and does not distinguish between the changes in relative efficiency due to movements towards or away from the efficient frontier in a given year and shifts in the frontier over time (Flegg et al 2004). Although DEA posses the above limitations still it remain as one of powerful deterministic nonparametric model for measurements of efficiency in higher learning institutions (Chan, 2006; Breu & Raab, 1994).

Considering the advantages of DEA for efficiency estimations of nonprofit institutions, this study also use data envelopment analysis (DEA) for estimation of efficiency of higher learning institutions operating in Tanzania. There two major DEA approaches used for estimation of efficiency of decision making units, the CCR model by Charnels et al (1978) and the BCC model by Banker et al (1984). The difference between the two is that, the latter takes into account of variable return to scale by decomposing technical efficiency into pure technical efficiency and scale efficiency. According to Banker et al (1984) CCR model is appropriate when all institutions studied are operating at the optimum scale. Since the institutions reviewed operate at different scales, with difference experiences, location, size and environment we adopt BCC model to capture for pure and scale efficiencies. The estimation of efficiency using DEA also depends on the extent to which institutions studied have the control to inputs or outputs they produce. The orientations include input and output orientation. Input oriented is used when the decision making units have higher control over inputs compared to outputs. The output

oriented is used when the decision making units have control over output as compared to the inputs (Coelli 1998). In public universities it is easy to control the input resources which include assets, personnel, capital and operating expenses incurred. The output in higher learning institutions is a function of many factors some of which are beyond the control of the institutions. We therefore adopt the input oriented efficiency estimation to evaluate the extent to which public institutions use the input resources in the production of outputs. In order to formulate a DEA model for efficiency estimation, we assume to have n public universities using m input resources to produce s output. The DEA input oriented BCC model of such institutions can be presented as;

$$MinTE = \delta_0 - \rho\left(\sum_{i=1}^{m} S_i^- + \sum_{r=1}^{s} S_r^+\right) \quad (1)$$

$$SubjectTo = \sum_{j=1}^{n} v_{ij}\lambda_j + S_i^- = \delta\chi_{io} \quad (2)$$

$$\sum y_{rj}\lambda_j - S_r^+ = y_{r0} \quad (3)$$

$$\lambda_j, S_r^+, S_i^- \geq 0, i = 1....., m, j = 1....., n, r = 1....., s$$

Where: TE is the technical efficiency ratio of the MFIo, m is the number of inputs variables, s is the number of output variables, n is the of MFIs, X_{io} and y_{ro} are values of input i and output r for MFIo. *p* is a non Archimedean quantity which is smaller than any positive real number, δo is the proportion of MFIo input which is needed to produce a quantity of output equivalent to the best performer MFIs **λ**j, Si^- and Sr^+ are input and output slack variables respectively, **λ**j is a (nx1) column vector of constants indicating benchmarked MFIs for MFIo.

The study uses data from 7 universities among the 11 public universities operating in Tanzania. Among the four public universities not included in this study, two were new universities with less than two years of operation and other two were left due to data availability problem. The data used were collected from three major sources, the National Bureau of Statistics (NBS), the Ministry of Education and Vocational Training Tanzania and annual statements and websites of the respective universities. Among the major problem in the estimation of efficiency of higher learning institutions, is the selection of input and output variables for the model. There no standard variables for efficiency estimations rather it depends on data availability. The study by Katharaki & Katharakis (2010) used the number of academic staff with teaching and research activity, number of non academic staff, number of active registered students and operating expenses other than labor expenses as input variables. The output variables used includes the number of undergraduate graduates, number of graduates and postgraduate degrees and research income or total economic resources flowing into the university. Daghbashyan (2009) on the other hand, used the number of professors, research staff, PhD students, technical administrative staffs as input variables. The output variables included teaching output in terms of performance in undergraduate and postgraduate, research in terms of the number of journal papers, review paper, conference paper and authored books. Different variables have also been used in other recent studies such as capital expenditure, total operating expenses, number of the faculty member, total assets as proxies for input variables (Guzman & Cabanda, 2009; Kempkes & Pohl 2006, Flegg et al 2003, Salerno 2003, Ampit & Cruz 2007). The output variables used includes total students, total graduate students, total revenue and research income (Thanassoulis et al 2009; Flegg et al 2003; Kempkes & Pohl 2006; Warthington at al 2008).

In this study, we estimate efficiency of public higher learning institutions in three different models of efficiency. We first estimate efficiency using total enrollments, total academic staffs, total non academic staff and the total staffs as input variables and number of undergraduate graduates, postgraduate graduates and total graduates' as the output variable. This model seeks to examine the efficiency in allocation and use of human resources in the production of undergraduate and postgraduate degree among the public universities in Tanzania. The second model uses the same input variables and internal fund generated as the only output variable. This model seeks to examine the efficiency use of available human resources in the generation of income. This measures the extent to

which public university can generate extra income from fees, consultancies, research and other investment apart from funds received from the government and other grants received. The third efficiency model uses the same input variables but combines the output variables from the first two models. This model seeks to assess the efficient use of human resource in public universities in the production of output measured by the number of undergraduate graduates, number of postgraduate graduates, number of total graduates and total internal funds generated in a year.

4. Results

The technical efficiency results from the first model shows that 2, 4, 4, 3 and 2 universities were relatively efficient among the 7 institutions in 2007/08 to 2011/12 respectively. This model used total enrollments, number of academic staff, number of nonacademic staff and total staffs as the input variables in the production of undergraduate and postgraduate degrees. The results show average technical efficiency scores of 0.640, 0.855, 0.801, 0.750 and 0.570 for the five years respectively. This indicates that on average public universities in Tanzania use well human resources in the production of graduates. It also indicates high efficiency in the conversion of enrollments to completed degrees among the universities. The trend of technical efficiency indicated declining efficiency trend in the five years period. In average institutions were required to reduce 36%, 14.5%, 19.9%, 25% and 43% of their input resources while maintaining output level in order to reach efficient frontier line in average terms. This indicates that there still a possibility of increasing output among the public universities using the same level of available human resources. The results under pure technical efficiency were higher than results under technical efficiency. The pure technical scores indicated that public universities only needed 96.8%, 92.2%, 89.2%, 93% and 92.7% of the input resources used to produce the current level of output produced for the five years respectively. The average results on scale efficiency were on average lower than pure technical efficiency in most years of review, this indicates that most of the inefficiencies observed in public universities reviewed were due to managerial issues and were not related to pure technical efficiency (Table 1).

Table 1: Technical Efficiency Results summary (Model 1)

Model 1	2007/08	2008/09	2009/10	2010/11	2011/12
No. of Universities	6	6	7	7	7
No. of Efficient Universities	2	4	4	3	2
% IRS	75%	50%	100%	75%	80%
%DRS	25%	50%	0	25%	20%
Avg. Tech. Efficiency (CRS)	0.640	0.855	0.801	0.750	0.570
Avg. Pure Tech. Efficiency (VRS)	0.968	0.922	0.892	0.930	0.927
Avg. Scale Efficiency	0.656	0.932	0.897	0.812	0.618

The second model of the study estimated the efficiency of the public universities in the generation of internal revenues using the available human resources. The results from the model show that 2, 1, 2, 3 and 2 institutions were at the efficient frontier line while others were relatively inefficient. The average technical efficiencies were low in most of the five years of review. The efficiency scores under constant return to scale were 0.589, 0.526, 0.588, 0.711 and 0.552 for the five years respectively. This indicates that on average public universities reviewed only needed 58.9%, 52.6%, 58.8%, 71.1% and 55.2% of the input used to produce the same level of output. This indicates a high level of inefficiency among the institutions reviewed, it show that 41.1%, 47.2%, 41.2%, 28.9% and 44.8% the average input used was wasted in the production of output. The results indicate low ability in the revenue generation among the public universities reviewed using the available human resources. The results on pure technical efficiency were higher than the results of scale efficiency, this also indicating that the sources of inefficiencies were managerial in nature (Table 2).

Table 2: Technical Efficiency Results Summary (Model 2)

Model 2	2007/08	2008/09	2009/10	2010/11	2011/12
No. of Universities	6	6	7	7	7
No. of Efficient Universities	2	1	2	3	2
% IRS	75%	80%	80%	50%	80%
%DRS	25%	20%	20%	50%	20%
Avg. Tech. Efficiency (CRS)	0.589	0.526	0.588	0.711	0.552
Avg. Pure Tech. Efficiency (VRS)	0.889	0.918	0.936	0.871	0.824
Avg. Scale Efficiency	0.657	0.582	0.633	0.830	0.671

The third efficiency model measured the efficiency of public universities in the production of degree output as well as internal revenue using human resources and enrollments. The results of the model show that 2, 4, 5, 3 and 2 institutions were relatively efficient for the five years period. The results on technical efficiency constant return to scale showed that, on average institutions reviewed only needed 64.7%, 85.5%, 86.7%, 78% and 60.6% of the input resources to produce the output produced. This indicates high ability of the institution in the use of staff and students enrolled to produce revenue as well as completed degrees output. Although the relative efficiency levels were high in most of the years, the trend shows declining efficiency levels, which indicates possibility efficiency fall in the future. Like in the first two models, the average values of pure technical efficiency were higher than values of scale efficiency indicating that sources of inefficiencies were caused by scale inefficiency (Table 3).

Table 3: Technical Efficiency Results Summary (Model 3)

Model 3	2007/08	2008/09	2009/10	2010/11	2011/12
No. of Universities	6	6	7	7	7
No. of Efficient Universities	2	4	5	3	2
% IRS	75%	50%	100%	50%	80%
%DRS	25%	50%	0	50%	20%
Avg. Tech. Efficiency (CRS)	0.647	0.855	0.867	0.780	0.606
Avg. Pure Tech. Efficiency (VRS)	0.968	0.922	0.936	0.954	0.934
Avg. Scale Efficiency	0.664	0.932	0.925	0.792	0.661

The results on economies of scale show that, most inefficiency firms were operating at increasing return to scale (IRS) while few were operating at decreasing return to scale (DRS). The results indicate that most of the inefficiency firms experiences high proportional increases in the output levels given a proportional change in the input levels. Under such situations there possibility of improved efficiency levels especially for the firms which operate under increasing return to scale. The results on individual public universities show that Mzumbe University was in the efficient frontier for the entire five years in all three models. The Open University of Tanzania and Muhimbili University of Health and Allied Sciences were at the efficiency frontier three times in model 1 and 3. The result on model two shows that most of the institutions were not at the efficient frontier. This indicates that most of the public universities have low ability in the generation of internal revenue funds. Among the institutions reviewed, Ardhi university was found to have low efficiency scores and was not able to attain the efficiency frontier line in any the five years in all three models.

5. Discussion and Conclusion

The aim of the study was to evaluate the efficiency of public universities in Tanzania, in the use of human resources to produce output measured by the internal revenue generated and number of degrees offered. The study used a sample of 7 public universities out of 11 public universities operating in the country. The study used data envelopment analysis (DEA) input oriented under production efficiency.

The finding of the study shows that public university reviewed were on average efficient when number of undergraduate and post graduate degrees were used as output variables. The results of the study were consistent to a number of previous studies such as Ahn et al (1988), Abbot et al (2003) and Joumady & Ris (2005) which all report high efficiency among the higher learning institutions reviewed. The findings on the efficiency of the public universities in generation of internal revenue using available human resources were on average low. The results show that institutions reviewed were under utilizing the human resources available in the production of income using consultancy services, enrollment fees, research and other investments. These results were consistent with the empirical results by Katharaki & Katharakis (2010), which indicate high inefficiency among universities in Greece in the use of human resources to generate income.

From the findings of the study, we concludes that, public universities in Tanzania are generally efficient in the use of human resources to produce output measured by the number of undergraduate and postgraduate graduates student. This indicates that they fulfill their primary goal of transforming knowledge to the society for the country development. On the other hand, we conclude that public universities are inefficient in the income generation. They do not use efficiently the human resources available in the generation of income from consultancies, research, fees and investments. The study recommends that public universities should improve their internal revenue generation as the way to reduce their dependence on government and donors. The improvement in revenue generation will facilitate the growth of institutions as well as increased quality of output due to increased investments in technology.

References

Abbot, M., & Doucouliagos, C. (2003). The efficiency of Australian universities: a data envelopment analysis. *Economics of Education Review* 22 (1), 89–97.

Abeli, W. (2010). Higher Education and Development: A Critical Nexus. *SARUA Leadership Dialogue*, 2(2), 9-18.

Afonso, A., & Santos, M. (2005). *Students and Teachers A DEA Approach to the Relative Efficiency of Portuguese Public Universities*. Technical University of Lisbon, series Working Papers No. 2005/07.

Ahn, T., Charnes, A., & Cooper, W. (1988). Some statistical and DEA evaluations of relative efficiencies of public and private institutions of higher learning. *Socio-economic Planning Sciences*, 22(6), :259-269.

Ampit, C. R., and Agustina Tan-Cruz. (2007). *Cost Efficiency Estimation of State Universities and Colleges in Region XI.* Paper presented in the 10th National Convention on Statistics (NCS), EDSA Shangri-La Hotel, October 1-2.

Avrikan, N. (2001). Investigating technical and scale efficiencies of Australian Universities through data envelopment analysis. *Socio-Economic Planning Sciences* 35, 57-80.

Banker, R., Charnes, A., & Cooper, W. (1984). Some Models for Estimating Technical and scale inefficiencies in DEA. *Management Science*, 32, 1613-1627.

Belloni, J. (2001). *A Methodology for Assessment of Productive Efficiency of Brazilian Federal Universities.* Graduate Program in Production Engineering, Federal University of Santa Catarina, Florianópolis, SC, Brazil.

Breu, T., & Raab, R. (1994). Efficiency and perceived quality of the nations Top 25 national universities and national liberal arts colleges: An application of data envelopment analysis to higher education. *Socio-Economic Planning Sciences* 28(1), 33-45.

Casu, B., & Thanassoulis, E. (2006). Evaluating cost efficiency in central administrative services in UK universities. *Omega* 34, 417–426.

Cave, M., Hanney, S., & Kogan, M. (1991). *The Use of performance indicators in higher education: A critical analysis of developing practice*. London: Jessica Kingsley Publishers.

Chalmers, D. (2008). *Teaching and Learning Quality Indicators in Australian Universities* IMHE/OECD conference. Paris: The quality, relevance and impact of higher education. Retrieved June 18, 2012 from http://www.oecd.org/dataoecd/4/40/41216416.pdf.

Charnes, A., Cooper, W., & Rhodes, E. (1978). Measuring the efficiency of decision making units. *European Journal of Operational Research* 2, 429-444.

Coelli, T. (1996). *Assessing the performance of Australian universities using data envelopment analysis*. Centre for science and productivity analysis. NSW: University of New England.

Coelli, T., Rao, D., & Battese, G. (1998). *An Introduction to Efficiency and Productivity Analysis*. Kluwer Academic, Norwell, MA.

Costa, M. (2006). The *role of the key performance indicators to improve the university management.* IRMA International Conference. Washington, DC. USA.

Daghbashyan, Z. (2009). *Do university units differ in the efficiency of resource utilization*? Working Paper Series in Economics and Institutions of Innovation, No, 176, Royal Institute of Technology, CESIS.

Daghbashyan, Z. (2011). *The Economic Efficiency of Swedish Higher Education Institutions*. CESIS Electronic Working Paper Series Paper No. 245, Division of Economics, CESIS, KTH: The Royal Institute of technology Centre of Excellence for Science and Innovation Studies (CESIS).

Flegg, A., Allen, K., Field, K., & Thurlow, T. (2004). Measuring the efficiency of British universities: A multi-period data envelopment analysis. *Education Economics* 12, 231-249.

Guzman, M., & Cabanda, E. (2009). Selected Private Higher Educational Institutions In Metro Manila: A DEA Efficiency Measurement. *American Journal of Business Education*, 2(6), 97-108.

GVH (2007), *Competition and productivity: literature review* http://www.gvh.hu/gvh/alpha?do=2&st=2&pg=96&m19_act=4.

Ishengoma, J. (2011). *Strengthening Higher Education Space in Africa through North-South Partnerships and Links: Myths and Realities from Tanzania Public Universities*. Paper presented at Conference of Rectors, Vice Chancellors and Presidents (COREVIP) Stellenbosch, South Africa, May 30th-June 3, .

Izadi, H., Johnes, G., Oskrochi, R., & Crouchley, R. (2002). Stochastic frontier estimation of a CES cost function: the case of higher education in Britain. *Economic of Education Review* 21, 61-71.

Johnes, J. (2006). Data Envelopment Analysis and its applications to the measurement of efficiency in higher education. *Economics of Education Review*, 25.

Johnes, J. (2006). Measuring teaching efficiency in higher education:An application of data envelopment analysis to economics graduates from UK Universities 1993. *European Journal of Operational Research*, 174, 43–456.

Joumady, O., & Ris, C. (2005). Performance in European Higher Education: A Non – Parametric Production Frontier Approach. *Education Economics*, 13(2), 189-205.

Kao, C., & Liu, S. (2000). Data envelopment analysis with missing data: an application to university libraries in Taiwan. *Journal of the Operational Research Society* 51, 897–905.

Katharaki, M., & Katharakis, G. (2010). A comparative assessment of Greek universities' efficiency using quantitative analysis. *International Journal of Educational Research* 49, 115–128.

Kempkes, G., & Pohl, G. (2006). *The Efficiency of German Universities – Some Evidence from Non-Parametric and Parametric Models*: Ifo Working Paper No. 36. CESifo Economic Studies.

Kumbhakar, S., & Lovell, K. (2000). *Stochastic Frontier Analysis*: Cambridge University Press.

Mgaya, Y., & Lokina, R. (2010). Critical Factors in Higher Learning Education Finance and Planning: An Institutional Perspective. *Sarua Leadership Dialogue*, 2(2), 53-64.

NBS. (2010), *Tanzania in Figures*. Dar-es-salaam: National Bureau of Statistics, Tanzania.

OECD. (2006). *Chair's Summary (Summary by the Chair, Marietta Giannakou, Minister of National Education and Religious Affairs, Greece); Meeting of OECD Education Min*isters: Higher Education: Quality, Equity and Efficiency, Athens, Greece, June, 27-28.

OECD. (2007), *Education at a glance*. Retrieved June 16, 2012 from: http://www.oecd.org/document/30/0,3343,en_2649_39263238_39251550_1_1_1_1,00.Html.

OECD. (2007). *No more failures: Ten steps to equity in education*. http://213.253.134.43/oecd/pdfs/browseit/9107041E.PDF.

Robst, J. (2001). Cost efficiency in public higher education institutions. *Journal of Higher Education* 72(6).

Salerno, C. (2002). *On the Technical and Allocative Efficiency of Research-Intensive Higher Education Institutions.* The Pennsylvania State University: University Park, PA, pp. 1-11.

Salerno, C. (2006), Using data envelopment analysis to improve estimates of higher education institution's per student education costs, *Education Economics*, Vol. 14 (3), pp 281-295.

Stevens, P. (2001). *The determinants of economic efficiency in English and Welsh universities*. National Institute of Economic and Social Research, London. Discussion paper N 185.

Thanassoulis, & Others. (2009). *Costs and Efficiency of Higher Education Institutions in England: A DEA Analysis*, Working Paper 2009-008, Lancaster University Management School. Lancaster, United Kingdom.

Ward, D. (2007), Academic values, institutional management, and public policies, Higher *Education Management and Policy*, 19(2), 1-12.

Worthington, A. (2001), An empirical survey of frontier efficiency measurement techniques in education, *Education Economics* 9, 245-268.

Worthington, A., & Lee, B. (2008). Efficiency, technology and productivity change in Australian universities, 1998-2003. *Economics of Education Review* 27, 285-298.

Appendices

Appendix 1: Efficiency Results (Model 1)

	2007/08				2008/09				2009/10			
DMU	CRS	VRS	Scale	RTS	CRS	VRS	Scale	RTS	CRS	VRS	Scale	RTS
ARDHI	0.356	1	0.356	irs	0.598	1	0.598	irs	0.519	1	0.519	irs
MUHAS	0.419	0.811	0.517	irs	1	1	1	crs	1	1	1	crs
MU	1	1	1	crs	1	1	1	crs	1	1	1	crs
OUT	1	1	1	crs	1	1	1	crs	1	1	1	crs
SUA	0.506	1	0.506	irs	0.532	0.534	0.996	drs	0.494	0.534	0.924	irs
UDSM	0.559	1	0.559	drs	1	1	1	crs	1	1	1	crs
UDOM									0.596	0.713	0.836	irs
Mean	0.640	0.968	0.656		0.855	0.922	0.932		0.801	0.892	0.897	
	2010/11				2011/12							
DMU	CRS	VRS	Scale	RTS	CRS	VRS	Scale	RTS				
ARDHI	0.442	1	0.442	irs	0.218	1	0.218	irs				
MUHAS	1	1	1	crs	0.378	1	0.378	irs				
MU	1	1	1	crs	1	1	1	crs				
OUT	0.617	1	0.617	irs	0.647	1	0.647	irs				
SUA	0.450	0.507	0.887	irs	0.316	0.488	0.648	irs				
UDSM	0.740	1	0.740	drs	0.432	1	0.432	drs				
UDOM	1	1	1	crs	1	1	1	crs				
Mean	0.750	0.930	0.812		0.570	0.927	0.618					

Appendix 2: Efficiency Results (Model 2)

	2007/08				2008/09				2009/10			
DMU	CRS	VRS	Scale	RTS	CRS	VRS	Scale	RTS	CRS	VRS	Scale	RTS
ARDHI	0.400	1	0.400	irs	0.380	1	0.380	irs	0.385	1	0.385	irs
MUHAS	0.398	0.789	0.504	irs	0.427	1	0.427	irs	0.406	1	0.406	irs
MU	1	1	1	crs	1	1	1	crs	1	1	1	crs
OPEN	1	1	1	crs	0.558	1	0.558	irs	0.459	1	0.459	irs
SUA	0.366	0.545	0.672	irs	0.343	0.509	0.674	irs	0.391	0.552	0.708	irs
UDSM	0.369	1	0.369	drs	0.450	1	0.450	drs	0.472	1	0.472	drs
UDOM									1	1	1	crs
Mean	0.589	0.889	0.657		0.526	0.918	0.582		0.588	0.936	0.633	
	2010/11				2011/12							
DMU	CRS	VRS	Scale	RTS	CRS	VRS	Scale	RTS				
ARDHI	0.514	1	0.514	irs	0.340	1	0.340	irs				
MUHAS	1	1	1	crs	0.354	1	0.354	irs				
MU	1	1	1	crs	1	1	1	crs				
OPEN	0.419	1	0.419	irs	0.367	0.633	0.580	irs				
SUA	0.678	0.576	1.177	drs	0.447	0.540	0.828	irs				
UDSM	0.365	0.524	0.698	drs	0.358	0.598	0.598	drs				
UDOM	1	1	1	crs	1	1	1	crs				
Mean	0.711	0.871	0.830		0.552	0.824	0.671					

Appendix 3: Efficiency Results (Model 3)

	2007/08				2008/09				2009/10			
DMU	CRS	VRS	Scale	RTS	CRS	VRS	Scale	RTS	CRS	VRS	Scale	RTS
ARDHI	0.400	1	0.400	irs	0.598	1	0.598	irs	0.569	1	0.569	irs
MUHAS	0.419	0.811	0.517	irs	1	1	1	crs	1	1	1	crs
MU	1	1	1	crs	1	1	1	crs	1	1	1	crs
OUT	1	1	1	crs	1	1	1	crs	1	1	1	crs
SUA	0.506	1	0.506	irs	0.532	0.534	0.996	drs	0.500	0.552	0.905	irs
UDSM	0.559	1	0.559	drs	1	1	1	crs	1	1	1	crs
UDOM									1	1	1	crs
Mean	0.647	0.968	0.664		0.855	0.922	0.932		0.867	0.936	0.925	

	2010/11				2011/12			
DMU	CRS	VRS	Scale	RTS	CRS	VRS	Scale	RTS
ARDHI	0.524	1	0.524	irs	0.340	1	0.340	irs
MUHAS	1	1	1	crs	0.378	1	0.378	irs
MU	1	1	1	crs	1	1	1	crs
OUT	0.617	1	0.617	irs	0.647	1	0.647	irs
SUA	0.576	0.678	0.662	drs	0.447	0.540	0.828	irs
UDSM	0.740	1	0.740	drs	0.432	1	0.432	drs
UDOM	1	1	1	crs	1	1	1	crs
Mean	0.780	0.954	0.792		0.606	0.934	0.661	

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