EFFICIENCY OF MALAYSIAN PUBLIC UNIVERSITIES: A DATA ENVELOPMENT ANALYSIS (DEA)

By

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ABSTRACT

The importance of higher education as an engine of growth is highly recognised by the Malaysian government and thus huge amounts of money are allocated to this sector. Due to large amount of money invested, it is imperative that certain analyses are to be carried out to ascertain the impact of this investment. Efficiency analysis is vital for higher education institutions as it measures how efficiently educational resources are being allocated and utilized. Against this backdrop, this study aims to evaluate the relative efficiency of 12 selected Malaysian public universities for the period of 2008-2012. A non-parametric method, known as the Data Envelopment Analysis (DEA) is applied in this study. By using different combination of input and output variables, this study applies the output oriented DEA model to assess the teaching and research performances for each university. The result shows that, on average, the pure technical efficiency for teaching and research activities appear to be high. Three universities are found to be technically efficient in teaching while three other universities are technically efficient in research. The result reveals that the average pure technical efficiency score is higher for teaching as compared to research. For the scale efficiency, there are two universities that consistently operated on the optimal scale size for the whole examined period. In addition, majority of universities are operating under decreasing returns to scale in teaching while most universities are operating under increasing returns to scale in research.

Keywords: Data Envelopment Analysis; Universities; Pure technical efficiency; Scale efficiency; Teaching efficiency; Research efficiency.

ABSTRAK

Kepentingan pendidikan tinggi sebagai penjana pertumbuhan diiktiraf oleh kerajaan Malaysia di mana peruntukan yang besar telah disalurkan untuk membangunkan sektor pendidikan tinggi Malaysia. Dengan penyaluran peruntukan yang banyak dalam sektor ini, maka kajian perlu dijalankan untuk menilai impak pelaburan yang dibuat. Analisis kecekapan ke atas institusi pendidikan tinggi adalah penting kerana ianya dapat menilai sejauhmana kecekapan sumber-sumber untuk pendidikan tinggi dialokasi dan digunakan. Berdasarkan kepada kenyataan tersebut, kajian ini dilaksanakan bertujuan untuk menilai kecekapn relatif bagi 12 buah universiti awam di Malaysia bagi tempoh antara tahun 2008 hingga 2012. Metod 'non-parametric' yang dikenali sebagai 'Data Envelopment Analysis' digunakan dalam kajian ini. Kajian ini telah menilai prestasi setiap universiti dari segi pengajaran dan penyelidikan dengan menggunakan kombinasi input dan output yang berbeza. Keputusan kajian mendapati bahawa skor purata kecekapan teknikal tulen bagi aktiviti pangajaran dan penyelidikan adalah tinggi. Selain itu, terdapat tiga universiti yang menunjukkan prestasi yang cekap dari segi pengajaran manakala tiga universiti yang berlainan didapati berprestasi cekap dalam penyelidikan. Skor purata kecekapan teknikal tulen bagi pengajaran adalah lebih tinggi daripada penyelidikan. Dari segi kecekapan skala, terdapat dua universiti yang beroperasi dalam saiz skala yang optimum sepanjang tempoh kajian. Di samping itu, keputusan kajian ini mendapati kebanyakan universiti beroperasi dalam pulangan ikut skala yang menyusut bagi pengajaran. Sebaliknya, banyak universiti yang beroperasi dalam pulangan ikut skala yang meningkat bagi penyelidikan.

Kata kunci: Data Envelopment Analysis; Universiti; Kecekapan teknikal tulen; Kecekapan skala; Kecekapan dalam pengajaran; Kecekapan dalam penyelidikan.

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LIST OF ABBREVIATION

MOE	Ministry of Education Malaysia
MOHE	Ministry of Higher Education Malaysia
UNESCO	United Nations Educational, Scientific and Cultural Organization
OECD	Organization for Economic Co-operation and Development
GDP	Gross domestic product
DEA	Data envelopment analysis
SFA	Stochastic frontier analysis
DMU	Decision making unit
MPSS	Most productive scale size
IRS	Increasing returns to scale
DRS	Decreasing returns to scale
CRS	Constant returns to scale
VRS	Variable returns to scale
PTE	Pure technical efficiency
DEAP	Distributed Evolutionary Algorithms in Python

CHAPTER 1

INTRODUCTION

1.1 Introduction

Human capital is recognized as an important component in accelerating the speed of economic growth of a country. Education plays a significant role as it provides people with the appropriate knowledge and skills needed in performing their work (Katharaki & Katharakis, 2010). If the citizens of a country are all acquiring higher level of education, the labour productivity will also increase. Besides, education is one of the effective ways to reduce the level of poverty of a country. It can restore the existing inequality between different social classes and genders by creating opportunities for the poor and women to have a better job and stable life. In addition to that, education also benefits a country in various aspects such as improve the healthiness of people and create a harmony and peaceful society.

In many parts of the world, education is being subsidized by the government due to the positive externalities that it contributes to people and country. However, the global economic crisis and limited government revenues had forced the government to reduce the budget for universities in most of the countries. The problem is further deteriorated as enrolment and the cost of higher education continues to increase over time. Consequently, higher education institutions are forced to search for other funding sources to cover the excessive spending. Most of the countries around the world have shifted their higher education financing practices from a free system to a cost-sharing system. Sanyal and Johnstone (2011) defined cost-sharing as a system where the costs of higher education are being shared by the government and students. The loss of funding from one source is being covered by the other sources.

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REFERENCES

Abbott, M., & Doucouliagos, C. (2003). The efficiency of Australian universities: a data envelopment analysis. *Economics of Education review*,*22*(1), 89-97. doi: 10.1016/S0272-7757(01)00068-1

Ahn, T., Charnes, A., & Cooper, W. 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. doi: 10.1016/0038-0121(88)90008-0

Astin, A. W. (1984). Student involvement: A developmental theory for higher education. *Journal of college student personnel*, *25*(4), 297-308.

Athanassopoulos, A. D., & Shale, E. (1997). Assessing the comparative efficiency of higher education institutions in the UK by the means of data envelopment analysis. *Education Economics*, *5*(2), 117-134. doi: 10.1080/09645299700000011

Avkiran, N. K. (2001). Investigating technical and scale efficiencies of Australian universities through data envelopment analysis. *Socio-Economic Planning Sciences*, *35*(1), 57-80. doi: 10.1016/S0038-0121(00)00010-0

Aziz, N. A. A., Janor, R. M., & Mahadi, R. (2013). Comparative departmental efficiency analysis within a university: a DEA approach. *Procedia-Social and Behavioral Sciences*, *90*, 540-548. doi: 10.1016/j.sbspro.2013.07.124

Banker, R. D., Charnes, A., & Cooper, W. W. (1984). Some models for estimating technical and scale inefficiencies in data envelopment analysis. *Management science*, *30*(9), 1078-1092.

Beasley, J. E. (1990). Comparing university departments. *Omega*, *18*(2), 171-183. doi: 10.1016/0305-0483(90)90064-G

Beasley, J. E. (1995). Determining teaching and research efficiencies. *Journal of the operational research society*, 441-452. Retrieved from http://www.jstor.org/stable/2584592

Caballero, R., Galache, T., Gómez, T., Molina, J., & Torrico, A. (2004). Budgetary allocations and efficiency in the human resources policy of a university following multiple criteria. *Economics of Education Review*, *23*(1), 67-74. doi: 10.1016/S0272-7757(03)00049-9

Charnes, A., Cooper, W. W., & Rhodes, E. (1978). Measuring the efficiency of decision making units. *European journal of operational research*, *2*(6), 429-444.

Çokgezen, M. (2009). Technical efficiencies of faculties of economics in Turkey. *Education Economics*, *17*(1), 81-94. doi: 10.1080/09645290701761354

de Guzman, M. C. G. N., & Cabanda, E. (2011). Selected Private Higher Educational Institutions In Metro Manila: A DEA Efficiency Measurement. *American Journal of Business Education (AJBE), 2*(6). Retrieved from http://www.cluteinstitute.com/ojs/index.php/AJBE/article/download/4092/4146

de Lancer Julnes, P. (2000). Decision-making tools for public productivity improvement: A comparison of DEA to cost-benefit and regression analyses. *Journal of Public Budgeting, Accounting and Financial Management, 12*(4), 625. Retrieved from http://pracademics.com/attachments/article/1119/Julnes.pdf

Flegg, A. T., Allen, D. O., Field, K., & Thurlow, T. W. (2004). Measuring the efficiency of British universities: a multi-period data envelopment analysis. *Education Economics*, *12*(3), 231-249. doi: 10.1080/0904529042000258590

Golany, B., & Roll, Y. (1989). An application procedure for DEA. *Omega*, *17*(3), 237-250. doi: 10.1016/0305-0483(89)90029-7

Hanke, M., & Leopoldseder, T. (1998). Comparing the efficiency of Austrian universities: A data envelopment analysis application. *Tertiary Education & Management*, *4*(3), 191-197. doi: 10.1080/13583883.1998.9966962

Ismail, I., Ramalingam, S., Azahan, A. H., & Khezrimotlagh, D. (2014). Relative Efficiency of Public Universities in Malaysia. *Scholars Journal of Economics, Business and Management, 1*(11), 606-612. Retrieved from http://saspjournals.com/wp-content/uploads/2014/12/SJEBM-111606-612.pdf

Johnes, J. (2006). Data envelopment analysis and its application to the measurement of efficiency in higher education. *Economics of Education Review*, *25*(3), 273-288. doi: 10.1016/j.econedurev.2005.02.005

Johnes, J., & Li, Y. U. (2008). Measuring the research performance of Chinese higher education institutions using data envelopment analysis. *China Economic Review*, *19*(4), 679-696. doi: 10.1016/j.chieco.2008.08.004

Kantabutra, S., & Tang, J. C. (2010). Efficiency analysis of public universities in Thailand. *Tertiary Education and Management*, *16*(1), 15-33. doi: 10.1080/13583881003629798

Katharaki, M., & Katharakis, G. (2010). A comparative assessment of Greek universities' efficiency using quantitative analysis. *International journal of educational research*, *49*(4), 115-128. doi: 10.1016/j.ijer.2010.11.001

Kipesha, E. F., & Msigwa, R. (2013). Efficiency of Higher Learning Institutions: Evidences from Public Universities in Tanzania. *Journal of Education and Practice*, *4*(7), 63-72. Retrieved from http://iiste.org/Journals/index.php/JEP/article/download/5274/5282

Kuah, C. T., & Wong, K. Y. (2011). Efficiency assessment of universities through data envelopment analysis. *Procedia Computer Science*, *3*, 499-506. doi: 10.1016/j.procs.2010.12.084

Lee, M. N. (2006). Centralized decentralization in Malaysian education. In *Educational Decentralization* (pp. 149-158). Springer Netherlands. doi: 10.1007/978-1-4020-4358-1_10

Ministry of Education Malaysia (MOE). Malaysia Education Blueprint 2015-2025 (Higher Education). Retrieved from http://hea.uitm.edu.my/v1/index.php?option=com_content&view=article&id=246&Itemid=242

Ministry of Higher Education Malaysia (MOHE). MOHE Graduate Tracer Study. http://graduan.mohe.gov.my/skpg-report/Penerbitan/Terbitan.aspx

Ng, K. W., & Ahmad, R. (2012). Data Envelopment Analysis on Technical and Scale Efficiencies of Academic Departments at Universiti Teknologi Malaysia. *MATEMATIKA, 28*, 63-76. doi: http://dx.doi.org/10.11113/matematika.v28.n.316

OECD (2014). OECD Education Database. http://www.oecd.org/els/soc/PF1_2_Public_expenditure_education_Sep2014.pdf

Powell, B. A., Gilleland, D. S., & Pearson, L. C. (2012). Expenditures, efficiency, and effectiveness in US undergraduate higher education: A national benchmark model. *The Journal of Higher Education*, *83*(1), 102-127. Retrieved from http://203.217.177.120/portal/images/utama/doc/artikel/2012/07/expenditure.pdf

Robst, J. (2001). Cost efficiency in public higher education institutions. *Journal of Higher Education*, 730-750. Retrieved from http://www.jstor.org/stable/2672901

Rogers, D. C. (1971). Financing Higher Education in Less Developed Countries. *Comparative Education Review*, 20-27. Retrieved from http://www.jstor.org/stable/1186627

Sanyal, B. C., & Johnstone, D. B. (2011). International trends in the public and private financing of higher education. *Prospects, 41*(1), 157-175. doi: 10.1007/s11125-011-9180-z

Shah, K. R. (2008). Traditional Sources of Financing Higher Education. *Economic and Political Weekly*, 74-76. Retrieved from http://www.jstor.org/stable/40277615

Tilak, J. B. (1993). Financing higher education in India: principles, practice, and policy issues. *Higher Education, 26*(1), 43-67. doi: 10.1007/BF01575106

UM to reduce intakes of undergraduates (2009, June 19). *BERNAMA.* Retrieved from http://education.bernama.com/index.php?sid=news_content&id=419346.

UNESCO Institute for Statistics. http://data.uis.unesco.org/#