MEASURING THE EFFICIENCY OF PUBLIC UNIVERSITIES IN MALAYSIA: AN APPLICATION OF DATA ENVELOPMENT ANALYSIS

MUZALWANA ABDUL TALIB
EGE 030017

SUBMITTED TO THE FACULTY OF ECONOMICS AND ADMINISTRATION UNIVERSITY OF MALAYA, IN PARTIAL FULFILMENT OF THE REQUIREMENT FOR MASTERS IN APPLIED STATISTICS
APRIL 2005
Acknowledgement

The writing of this thesis has been an interesting and prolonged experience. I could nonetheless, not have written this thesis without the care and help of family, many wonderful friends and colleagues. It is a great privilege for me to express my gratitude to the many individuals who have made this study a success.

To my supervisor, Dr Susila Munisamy, who sparked the idea for me to conduct a study on the efficiency of Malaysian public universities. Her understanding belief and support has been miraculous. Little would have been possible without her insight and invaluable contribution which really helped me acquire the ‘taste’ of DEA.

To Encik Ali Sulaiman and Encik Ikram Shah of the Ministry of Higher Education; Puan Anita and Encik Ruslee of MASTIC, Ministry of Science, Technology and Environment, for their kind help in extracting the data for the Malaysian public universities. Mr Lee Keng You of IRPA, for his invaluable opinions.

To Christina Yeoh, for adding to the final polish to this thesis, my superior Encik Shaukany for his moral support, advice and time.

Finally, and most importantly, to my husband Mohd Amir, who has always been an unwavering beacon of hope, calm and support, my children Muhammad, Abdur-rahman, Muaz and Aina. I acknowledge your sacrifice, patience, love, understanding, continuous support and rare forbearance in overlooking my absences, preoccupations and frustration. To my parents, sisters and brother, thank you for their endless support. May Allah s.w.t shower all of us with His blessings.

All these people have contributed to this thesis in some way, either by giving their time or knowledge, or simply allowing me to research. This thesis’s merits are due to them, whatever shortfalls it might contain are mine.
Contents

Acknowledgement i
Contents ii
Tables v
Figures & Appendices vi
Abstract vii

Chapter 1 : INTRODUCTION

1.1. Background of the Study 2
1.2. Significance of the Study 8
1.3. Research Problem 9
1.4. Objectives of the Research 9
1.5. Research design 10
1.5.1. Data 13
1.5.2 Methodology 13
1.6. Organization of Chapters 13

Chapter 2 : A CRITICAL REVIEW OF CONCEPTS, METHODS
AND STUDIES RELATED TO EFFICIENCY

2.1. Introduction 16
2.2. The Concept and Measurement of Efficiency 16
2.3. Main methods of Efficiency Measurement 21
2.4. Data Envelopment Analysis (DEA) 22
2.4.1. The Basic DEA Models 23
2.4.1.1. Charnes, Cooper, and Rhodes (CCR) Version 23
2.4.1.2. Banker, Charnes, and Cooper (BCC) Version 27
2.5. The Empirical Studies Concerning Efficiency Measurement of Universities 31
2.6. Conclusion 36
Chapter 3 : DEVELOPING DEA MODELS FOR THE EVALUATION OF EFFICIENCY IN MALAYSIAN UNIVERSITIES

3.1. Introduction 38
3.2. Some Underlying Issues 38
3.3. Modeling of the university 40
  3.3.1 Input Variables 41
  3.3.2 Output Variables 43
    3.3.2.1. Teaching Output 43
    3.3.2.2 Research Output 45
  3.3.3 DEA Models Employed 46
  3.3.4. Model Orientation and Scale Assumption 48
3.4. Conclusion 49

Chapter 4 : EVALUATING THE EFFICIENCY OF MALAYSIAN UNIVERSITIES

4.1. Introduction 51
4.2. Data 51
4.3. DEA Empirical Results 55
  4.3.1. Understanding the DEA Results 56
  4.3.2. Results by Model Specification 58
    4.3.2.1. DEA1 58
    4.3.2.2. DEA2 61
    4.3.2.3. DEA3 64
    4.3.2.4. DEA4 66
4.4. Conclusion 72

iii
Chapter 5 : CONCLUSION

5.1. Summary 76

5.2. Implication and Recommendations 77
   5.2.1. Potential Cost Reduction 77
   5.2.2. Other Areas of Improvements 79
   5.2.3. Policy Implications

5.3. Perspectives on the current issues 81

5.4. Contributions of the study 83

5.5. Future Direction 84
     84

References 88

Appendices 96
Tables

Table 2.1.  Definitions of the Variables  
Table 2.2.  The CCR Input Orientation Model  
Table 2.3.  The CCR Output Orientation Model  
Table 2.4.  The BCC Input Orientation Model  
Table 2.5.  The BCC Output Orientation Model  
Table 3.1.  Input and Output Data for the DEA Models  
Table 4.1  Descriptive Statistics of Inputs and Outputs for the universities (2001/2002)  
Table 4.2.  Pearson Correlation Matrix of the Input and Output Data  
Table 4.2.  EMS Results of Efficiency, Weights and Benchmarks of DEA1  
Table 4.3.  EMS Results of Efficiency, Weights and Benchmarks of DEA2  
Table 4.4.  EMS Results of Efficiency, Weights and Benchmarks of DEA3  
Table 4.5.  EMS Results of Efficiency, Weights and Benchmarks of DEA4  
Table 4.6.  DEA Efficiency Scores of 15 Malaysian Public Universities  
Table 4.7.  Benchmarks of the Fully-efficient Universities (DEA1-DEA4)  
Table 4.8.  Output Weights Allocation of the Comprehensive Model - DEA3  
Table 5.1.  Potential Percentage of Operating Cost Reduction for the inefficient universities  
Table 5.2.  Reviewed EMS results on the Teaching and Research outputs of the universities
Figures

Figure 1.2. Number of Student Enrolments in Public Universities (1997-2001) 4
Figure 2.1 Technical and Allocative Efficiency 18
Figure 2.2. DEA Graphic Potrayal of Efficiency Modeling 30

Appendices

Appendix 1.1. Public Universities in Malaysia and the Year of Establishment 96
Appendix 1.2. Some Examples of Private Higher Education Institution (PHEI) in Malaysia established in the three generations 97
Appendix 2.1. Data Envelopment Analysis (DEA) Efficiency Measurement applied to Higher Institutions of Learning 98
Abstract

The call for a uniform ranking or rating of all universities in Malaysia has been made quite recently. This is mainly due to growing public concern that universities should be accountable and that the services they provide must have some measure of integrity and quality. Consumer satisfaction is paramount. To address this concern, recommendations for performance measurement and benchmarking for all levels of higher education have been made. Many policy-makers of higher education advocate a formulaic approach. The Ministry of Higher Education has yet to come out with one. This paper describes an attempt to develop an efficiency performance model for a group of public universities in Malaysia by employing a leading-edge method of performance measurement called Data Envelopment Analysis (DEA). DEA is a linear programming based technique that measures the relative efficiency of several homogenous organizational units in their use of multiple inputs to produce multiple outputs. DEA is particularly suited in evaluating universities' efficiency because it can easily handle multiple inputs-outputs of the universities without requiring the attachment of any prior information or weights for aggregating the multiple inputs and outputs. The beauty of DEA also lies in the fact that it enshrines the efficiency levels of each university under evaluation. Universities also can access their standing relative to their peers from the results generated.

The key findings indicate that there is a huge potential for cost reduction, on average, among the set of universities and the existence of wide dispersion of efficiency scores across the universities. The study provides some insights into the efficiency of the universities, the areas for improvement and policy implications.