Sources Of Efficiency And Productivity Growth In The Philippine State Universities And Colleges: A Non-Parametric Approach

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ABSTRACT

This paper evaluates the efficiency and productivity growth of State Universities and Colleges (SUCs) in the Philippines. The SUCs performance is determined on the changes in total factor productivity (TFP), technological, and technical efficiency. We use two Data envelopment analysis (DEA) models for the first time in estimating the relative performance of SUCs. Firstly, the output-orientated DEA-Malmquist index is calculated from panel data of 59 SUCS over the period 1999-2003 or a total of 295 observations, and secondly, the DEA multi-stage model (input reduction) is estimated. The two DEA models are calculated using three educational outputs and three inputs. Using Malmquist Index model, findings reveal that 49 SUCs or 83 percent are efficient. The technological index shows that six (6) SUCs or 10.16 percent only shows a technological progress. In terms of total factor productivity, SUCs obtained an index score of 1.002, which implies a productivity growth. This means that 27 SUCs or 45.76 percent shows a remarkable productivity growth. The main source of productivity growth is due to technical efficiency than innovation. In general, SUCs shows a 5.2 percent technological regression over the study period. Lack of innovation in the Philippine higher institutions has a policy implication: the Philippine government should exert more efforts to provide modern teaching and learning facilities in every state school to improve its deteriorating technological performance. Furthermore, using multi-stage method, technical efficiency has an average of 95.4 percent (Constant-returns-to scale DEA) compared with 96.6 percent (Variable-returns-to scale DEA). Finally, the scale efficiency has a 98.7 percent rating. This implies that, in general, SUCs obtained a below frontier efficiency score. The new findings in this paper may give impetus to Commission on Higher Education, lawmakers or legislators, and the university administrators to adopt measures that would be beneficial to the improvement of State Universities and Colleges in terms of inefficiency and unproductive growth.

INTRODUCTION

Private and public institutions like colleges and universities need to be assessed. The demand for auditing is necessary to ensure financial accountability. Performance indicators in the public sector have often been criticized for being inadequate and not conducive to analyzing efficiency. The current political and economic climate in the Philippines including the funding restructure of universities and colleges make this study timely and important to the needs of decision makers. Highlighting the accountability of state universities and colleges to their providers and educational administrators' desire to utilize wisely scarce resources indicate that efficiency analysis will become more common among educational institutions. Conversely, failure to make efficiency analysis a standard practice would certainly lead to less than efficient allocation of educational resources.

In the Philippines, the higher education system is a key player in the educational and integral formation of professionally competent, service-oriented, principled and productive citizens. It has a tri-fold function of teaching, research and extension services. Through these, it becomes a prime mover to the nation's socio-economic growth and sustainable development.

The Commission on Higher Education (CHED) was created by virtue of the Republic Act 7722 also known as the Higher Education Act of 1994 and Republic Act 8292 also known as Higher Education Modernization Act of 1997. The Commission is independent and separate from the Department of Education (DepEd) and the Technical Education and Skills Development Authority (TESDA). It is attached to the Office of the President for Administrative purposes only. It covers both public and private institutions of higher education as well as degree-granting programs in all post-secondary public and private educational institutions.

Missions of the higher educational system are to educate and train Filipinos for enhanced labor productivity and responsible citizenship in an environment where educational access is equitable and to inculcate nationalism and patriotism in the hearts and minds of the students and graduates. Furthermore, the Commission on Higher Education is mandated to accelerate the development of high-level professionals ready to meet international competition and to serve as Centers for Research and Development.

The CHED recognizes the enormous contribution of higher education institutions in the growth, and prominence of tertiary education in the country and in the Asia- Pacific. The CHED is also cognizant of its consistent committed service through quality education, research, and extension work. It is responsible for formulating and implementing policies, plans and programs for the development and efficient operation of the system of higher education in the country. The delivery of higher education in the Philippines is provided by both private and public higher education institutions. There are 1,479 higher institutions in the country classified as State Universities and Colleges (SUCs), Local Universities and Colleges (LUCs), Private Institutions (Sectarian and Non-Sectarian) (*Higher Education System*, 2003). In the public sector, there are one hundred ten (110) state universities and colleges, with a total of almost 800,000 students enrolled in different programs.

The measurement of organizational performance and efficiency is an essential part of the reform for the general welfare of all groups as well as the country. By measuring efficiency, it is possible to evaluate the performance of an organization by comparing it with the standard of international best practice. In the existing literature, as to date, there is no study on Philippine educational institutions that addresses the efficiency and productivity performance of state universities and colleges, using a more accurate and reliable approach. This is an apparent gap in the literature that this present research attempts to fill in.

The paper is organized as follows: Section 2 provides a literature review. Section 3 describes the data and methodology. Section 4 presents the empirical findings and Section 5 provides the conclusions.

REVIEW OF LITERATURE

This paper presents a review of efficiency studies conducted in the past in several industries around the world (see Bessent 1980; Sherman 1981;Lewin, Morey Cook 1982; Clark, Cooper ,Golany, 1985; Thanassoulis, Dyson, Foster 1987; Sherman and Ladino, 1995). A vast majority of methods for efficiency and productivity measures has employed DEA and other efficiency and productivity approaches. Charnes, et al. (1978) first described the DEA method to measure efficiency frontiers, based on mathematical programming model with assumed constant returns to scale (CRS). That is, DEA estimates the production function of efficient DMUs using piecewise linear programming on the sample data instead of making restrictive assumptions about the underlying production technology. The importance of this feature here is that a university's efficiency can be assessed based on other observed performance. As an efficient frontier technique, DEA identifies the inefficiency in a particular DMU by comparing it to similar DMUs regarded as efficient, rather than trying to associate a DMU's performance with statistical averages that may not be applicable to that DMU.

DEA identifies a unit as either efficient or inefficient compared to other units in its reference set, where the reference set is comprised of efficient units most similar to that unit in their configuration of inputs and outputs. Knowing which efficient universities are most comparable to the inefficient university thus enables the educational administrator to better understand the relevant inefficiencies and subsequently re-allocate scarce resources to improve productivity.

An overview of difficulties with some of the performance indicators in higher education could be a primer to understanding the potential role of DEA in efficiency analysis. For example, Cave et al. (1991) described a performance indicator such as "degree results" as a quality-adjusted measure of output. This indicator is typical of the ambiguity found in education performance indicators in that high degree results may, for example, be due to high entry qualifications rather than effectiveness of teaching. Even the value added, productivity indicator, described as an input- and quality-adjusted output measure, relies on differences in qualifications that cannot be valued in monetary terms.

In education, it is difficult to use market mechanisms such as profits to determine the performance of a DMU (Anderson, Walberg 1997). A key advantage of DEA is that educational administrators or their nominated researchers can choose inputs and outputs to represent a particular perspective or approach. For example, key business drivers critical to success of the organization can be the outputs. Then, those variables that can be argued to manifest themselves as outputs become the inputs. A simple model of university efficiency might argue that when academic staff and buildings and grounds (inputs) are put together, they give rise to enrolments (output). Hence, a resource is classified as an input while anything that uses resources is classified as an output. DEA forces policy-makers to explicitly state the objectives of the organization. Ultimately, these objectives become the outputs in efficiency modeling and the resources needed become the inputs.

The application of DEA to universities is generally focused on the efficiency of university programs or departments. The seven key studies are by Bessent et al. (1993), Tomkins and Green (1988), Beasley (1995), Johnes and Johnes (1992, 1995), Stern et al. (1994), Beasley (1995).Bessent et al. [1983)] used DEA in measuring the relative efficiency of education programs in a community college. The authors demonstrated how DEA can be used in improving programs, terminating programs, initiating new programs, or discontinuing inefficient programs.

There are six notable studies that have used DEA to investigate the relative efficiency of universities (Ahn, Charnes and Cooper, 1989; Ahn, Charnes and Cooper, 1988; Ahn and Seiford 1993; Ahn, 1987; Breu and Raab 1994; Coeli and Rao 1998). Ahn (1988) looked at the efficiency of US universities through DEA and compared findings to observations made using managerial accounting measures and econometric approaches. In comparing the efficiency of public universities in Texas, Ahn used faculty salaries, state research funds, administrative overheads, and total investment in physical plants as the inputs to the efficiency model. Outputs were number of undergraduate enrolments, number of graduate enrolments, total semester credit hours, and federal and private research funds. Ahn listed state research funds as an input because the state government allocated such funds to assist in securing grants from the Federal Government and from

Ahn and Seiford (1993) examined public and private doctoral-granting US institutions to test the sensitivity of findings in four DEA and four performance models. This was achieved by testing for statistically significant differences between mean model scores rather than focusing on individual institutions. On the inputs side, they listed faculty salaries, physical investment, and overheads as common variables across all models. On the other side, undergraduate and graduate FTEs, degrees and grants comprised the mix of outputs. They inferred that relative efficiency results were consistent across the DEA models. However, aggregation of outputs resulted in lower efficiency scores. Furthermore, public institutions emerged as more efficient than private ones where closely monitored and high-profile outputs such as enrolments were used.

Coelli (1996) reported his attempts to gauge the performance of University of New England (UNE) relative to 35 other Australian universities. Three performance models were tested, namely, university as a whole, academic sections, and administrative sections. The university and academic models shared the same outputs in student numbers and publication index (weighted by type). In the administration model, total staff numbers replaced publication index. Total staff numbers also appeared as an input in the university model. Other inputs used across the three efficiency models were non-staff expenses, other expenses, other administration expenses, and administration staff. All models were set up as 2_2 (outputs_inputs). Conclusions of the study indicated that while UNE's overall performance compared favorably to that of other universities, there was scope for improving the performance of the administrative sector. No significant relationship was found between efficiency and percent of external enrolments or proportion of part-time enrolments. Furthermore, UNE was operating at optimal scale. Part of this study is also reported in Coelli et al. (1998).

The article by Breu and Raab (1994) used commonly available performance indicators to measure the relative efficiency of the top 25 US universities (as ranked by US News and World Report). Outputs used were graduation rate and freshman retention rate as measures of student satisfaction. Inputs included SAT/ACT average or midpoint, percentage of faculty with doctorates, faculty to student ratio, and educational and general expenditures per student. Their findings indicated that universities with high prestige and reputation did not necessarily produce higher student satisfaction. The authors concluded the study by proposing that universities spend less on enhancing perceived quality and spend more effort on raising efficiency.

It should be clear by now that there is no definitive study to guide the selection of inputs/outputs in educational applications of DEA. While outputs can be generally categorized into teaching, research, and service, it is very difficult to find true measures for these dimensions (Ahn and Seiford, 1993). In short, it is possible for the analyst to select a parsimonious set of desired outputs, provided they can be reasoned to be manifestations of inputs. There is thus a pressing need for the choice of inputs and outputs to reflect the industry or the setting examined. Accepted theories in different fields can also be employed to help select the inputs and outputs. In this paper, the production theory provides the starting point for efficiency modeling.

Production theory is concerned with relationships among the inputs and outputs of organizations (Johnnes, 1996). This approach requires the specification of inputs and outputs in quantitative terms. According to Lindsay (1992) and Johnes (1996), some of the generally agreed inputs of universities can be classified as human and physical capital, and outputs as arising from teaching and research activities. In selecting variables, controllable inputs and those outputs of particular interest to administrators are preferred. However, there is always the danger of excluding an important performance variable due to lack of suitable data or to limitations imposed by small sample sizes. Therefore, it is essential to develop a good understanding of the inputs and outputs before interpreting results of any efficiency model.

DATA AND METHODOLOGY

Data And Variables

The data for this study were taken from the Office of Policy, Department of Budget and Management, Planning, Research and Information of the Commission on Higher Education for the time period 1999 to 2003. There are 59 SUCS in our sample, which were analyzed from 1999-2003, with a total of 295 pooled data.

Input variables used are (1) number of faculty members, (2) property, plant and equipment, and (3) operating expenses. The educational institutions' outputs are (1) students enrolled, (2) graduates, (3) total revenue. The faculty members refer to the number of full-time faculty members of an institution. Property, Plant and Equipment are tangible assets that are held by an enterprise for use in production or supply of goods or services, for rental to others, or for administrative purposes, and are expected to be used during more than one period. Operating expenses are outflows or the using up of assets in providing products and services to customers. They represent gross decreases in assets and gross increases in liabilities, recognized and measured in conformity with Generally Accepted Accounting Principles that result from those types of profit directed activities that can change owners' equity. Students enrolled refer to a number of students enrolled in a given year. They are considered as outputs because they are resource users of educational institutions. Number of graduates refers to the total graduates per year of each school. Total revenues are inflows of assets including derived from tuition and fees. All these output-input variables are analyzed through the DEA models to derive the comparative efficiency of Philippine educational institutions.

DEA Models

DEA is a mathematical programming methodology that can be applied to assess the "relative efficiency of a variety of institutions, using a variety of input and output data (Quey, 1996). In general, the conditions required to use

DEA are that a number of decision making (DMUs) are attempting to accomplish roughly the same goals and there is some "goal diversity (Kao and Liu, 2000).

The output-oriented model, one can similarly ask, "by how much can output quantities be used" (Coelli, 1996). The total factor productivity (TFP) approach provides the most comprehensive summary of school's performance. The Malmquist productivity index typically measures the TFP growth change between two data points: period *t* technology (observation) and the other period *t + 1* technology.

Equation 1 shows the Malmquist productivity change index (Fare et. al 1994 p. 71) as stated:

$$M_o(x^{t+1}, y^{t+1}, x^t, y^t) = \frac{D_0^{t+1}(x^{t+1}, y^{t+1})}{D_0^{t}(x^t, y^t)} \text{ X} \left[\frac{D_0^{t}(x^{t+1}, y^{t+1})}{D_0^{t+1}(x^{t+1}, y^{t+1})} \times \frac{D_0^{t}(x^t, y^t)}{D_0^{t+1}(x^t, y^t)} \right]^{1/2} \tag{1}$$

Where:

M_o	=	Malmquist productivity Index
D_o	=	Distance function
(x^{t+1}, y^{t+1})	=	represents the production point of the productivity
(x^t, y^t)	=	relative production point of the productivity
t	=	period of benchmark technology
$t+1$	=	the next period of technology

Equation 1 presents the components of the Malmquist index. The first equation on the right represents the efficiency change, which is the distance function from period *t* technology to period *t+ 1* technology, using input and output quantities. The equation inside the bracket represents the technical change from period *t* to period *t+1*. The Malmquist index is composed of geometric means of two output-based Malmquist index from period *t* to period *t + 1*. Geometric means are used because DEA does not account for measurement noise. In the Malmquist index, all values are ranged from 0 to 1. DEA-Malmquist captures the performance relative to the best practice in a given sample of educational institutions, whose best-practice institutions are operating on the efficient frontier. A value greater than one (>1) using Malmquist index indicates a positive improvement while a value lesser than one (<1) indicates a decline in an institution's performance over the period or denotes deterioration in performance. A constant 1 value means no improvement in performance.

Equation 2 shows the Multi-stage model (input-oriented) as used in this paper. It shows the input vector *x* to be used to produce the output vector *y*. The objective is to measure the performance of each school relative to the best observed in the sample. Let *X* and *Y* be the corresponding matrices of inputs and outputs. Let a DMU use the input level x_0 to produce y_0. Its efficiency score, indicated by θ, is obtained by solving the following linear programming problem as follows:

$$\min_{\theta,\lambda} \theta$$

subject to

$$-y_0 + Y\lambda \geq 0$$
$$\theta x_0 - X\lambda \geq 0 \tag{2}$$
$$\lambda \geq 0$$

Where θ is scalar and λ a vector of constants. The technical efficiency score θ measures the deviation in performance from that of the best practice of DMU on the efficient frontier. The DEA linear programs are very extensive and have a large computational problem as in the case of 59 total Decision Making Units (DMUs) in our sample. To overcome this problem, this paper will not compute linear programs manually and also to ensure accuracy of results. Thus, a specialized computer software program known as Data Envelopment Analysis Program (DEAP) v2.1 (Coelli, 1996a) was used and utilized to derive empirical results for DEA models.

EMPIRICAL RESULTS

Malmquist Productivity

This section presents all findings on the relative productivity and efficiency of the Philippine State Universities and Colleges. DEA-Malmquist (output-orientated) method is employed to decompose the total factor productivity change (tfpch) into technological change (techch) and technical efficiency (effch). Technical efficiency is further decomposed into scale efficiency (sech) and pure efficiency change (pech). The period covered is five years from 1999-2003.

Table 1 shows the list of SUCs in alphabetical order with five Malmquist indices.

In general, it seems that SUCs are performing well in three efficiency indices, having values more than one. Thus, SUCs are technically efficient due to positive pure efficiency and scale effects. These findings contribute to the existing educational performance literature that SUCs efficiency gains are significant attributors of higher managerial growth or catching up effects.

A closer look at the table reveals that the mean SECH (1.002) of SUCs is slightly lower than the mean PECH (1.044), but both obtained values greater than one. This result indicates the presence of better management and also operations at optimal scale.

The TFPCH index of SUCs (1.002) decomposed into managerial or technical efficiency index (1.056) and technological change index (0.948). The positive result in TFPCH was brought about by an increase in managerial efficiency of 5. 6 percent per year. SUCs were able to maximize their outputs (Enrolment, Graduates and Total Revenue) with their given resources (number of Faculty, Property, Plant and Equipment, Total Operating Expenses). This is perhaps because SUCs have received subsidies from the government. In short, SUCs have managed efficiently their resources (inputs); although, technological innovation is a factor, which has to be improved further to reach the frontier of 1.0. The TFPCH of SUCs was achieved more due to the optimal use of given resources than innovations. On average, SUCs lack more technological innovation and need additional 5.2 percent to reach the technological frontier. The technological change shows that 6 out of 59 SUCS or 10.16 percent scored above the frontier level. The institution, which scored the highest is Polytechnic University of the Philippines (1.299).

There are 49 out of 59 SUCS, or 83 percent of the educational institutions are technically efficient (managerial) led by Cotobato City State Polytechnic College. This means that the majority of SUCs have managed their inputs (Faculty Members, Property, Plant and Equipment and Total Operating Expenses) efficiently and productively so that there is productive growth in their outputs (Enrolment, Graduates, Total Revenue). Most of the growth in the SUCs productivity during the period of study stemmed from catching up or best management practices rather than technological progress. Majority of the top ten efficient schools are located in Mindanao (the second largest island in the Philippines), perhaps, due to the minimal cost of standard of living as compared with some areas in the country.

The top ten SUCs in terms of managerial efficiency are: (1) Cotabato City State Polytechnic College (1.167), (2) Mindanao Polytechnic University (1.163), (3) Sultan Kudarat Polytechnic State College (1.154), (4) Surigao State College of Technology (1.135), (5) Agusan del Sur State College of Agriculture and Technology (1.130), (6) Mindanao State University(1.129), (7) Bataan State College (1.127), (8) Davao del Norte State College (1.126), (9) Leyte Institute of Technology (1.122), and (10) Partido State University (1.113) There are 27 institutions out of 59 SUCS or 45.76 percent that show a remarkable growth in productivity, scoring above the production frontier, which is driven mainly by technical efficiency change. The most productive school is the Polytechnic University of the Philippines. The remaining 32 or 54.23 percent fall below the production frontier of 1.0.

Table 1
State Universities and Colleges (SUCS)

DMU	School	effch	sech	pech	tfpch	techch
1	Agusan del Sur State College of Agriculture and Technology	1.130	1.043	1.084	1.064	0.941
2	Apayao State College	1.071	1.027	1.043	0.967	0.903
3	Bataan Polytechnic State College	1.030	1.001	1.029	1.013	0.983
4	Bataan State College	1.127	1.065	1.058	1.036	0.920
5	Batangas State University (formerly PBMIT)	1.089	1.002	1.086	1.008	0.926
6	Benguet State University	1.024	0.998	1.026	0.932	0.910
7	Bicol University	1.053	1.027	1.025	1.010	0.959
8	Bukidnon State College	0.979	0.999	0.981	0.977	0.998
9	Bulacan State University	1.054	1.019	1.034	0.982	0.932
10	Cagayan State University	1.075	1.016	1.058	0.981	0.912
11	Catanduanes State Colleges	1.090	1.000	1.090	1.025	0.940
12	Cavite State University	1.076	0.997	1.080	0.950	0.882
13	Cebu Normal University (Cebu State College)	1.104	1.014	1.089	1.059	0.960
14	Cebu State College of Science and Technology	1.077	1.021	1.054	0.979	0.909
15	Central Mindanao University	0.987	0.998	0.989	0.953	0.965
16	Cotabato City State Polytechnic College	1.167	1.009	1.156	1.109	0.950
17	Davao del Norte State College	1.126	1.034	1.089	1.015	0.901
18	Don Honorio Ventura College of Arts and Trades	1.112	0.998	1.114	1.023	0.921
19	Don Mariano Marcos Memorial State University	0.986	0.994	0.992	0.953	0.966
20	Eastern Samar State College	1.077	1.002	1.074	1.012	0.940
21	Ifugao State College of Agriculture and Forestry	0.991	0.996	0.995	0.965	0.974
22	Isabela State University	1.056	1.019	1.035	0.994	0.941
23	Jose Rizal Memorial State College	1.076	1.009	1.066	0.987	0.917
24	Kalinga Apayao State College	1.012	1.009	1.003	0.985	0.974
25	Laguna State University	1.000	1.000	1.000	0.888	0.888
26	Leyte Institute of Technology	1.122	1.008	1.113	1.022	0.911
27	Leyte Nornal University	1.052	1.003	1.049	1.026	0.975
28	Mariano Marcos State University	1.087	1.012	1.074	1.005	0.925
29	Marinduque State College	1.049	1.011	1.037	0.987	0.941
30	Mindanao Polytechnic University	1.163	1.008	1.154	1.064	0.915
31	Mindanao State University	1.129	1.087	1.038	1.210	1.071
32	Mindoro State College of Agriculture and Technology	1.036	1.011	1.025	0.946	0.913
33	Mountain Province State Polytechnic College	1.015	1.006	1.010	0.956	0.942
34	Naval Institute of Technology	0.980	1.002	0.978	0.928	0.947
35	Northern Negros State College of Science and Technology	1.016	1.016	1.000	0.939	0.924
36	Nueva Vizcaya State Institute of Technology	1.051	1.008	1.043	0.980	0.932
37	Palawan State University	1.066	1.027	1.038	0.974	0.913
38	Palompon Institute ofTechnology	0.979	0.997	0.982	0.933	0.953
39	Pangasinan State University	1.074	0.998	1.076	1.003	0.934
40	Partido State University (Partido State College)	1.113	1.019	1.092	0.994	0.893
41	Philippine Normal University	0.994	1.000	0.994	1.050	1.056
42	Philippine State College of Aeronautics	1.003	1.003	1.000	1.057	1.054
43	Polytechnic State College of Antique	1.064	1.001	1.063	0.984	0.925
44	Polytechnic University of the Philippines	1.000	1.000	1.000	1.299	1.299
45	Quirino State College	1.044	1.020	1.024	0.964	0.923
46	Rizal Technological University	0.982	0.994	0.987	0.954	0.972
47	Romblon State College	1.000	1.000	1.000	0.937	0.938
48	Samar State Polytechnic College	1.094	1.007	1.086	1.012	0.926
49	Southern Leyte State College of Science and Technology	1.024	1.010	1.014	0.938	0.916
50	SultanKudarat Polytechnic State College	1.154	1.008	1.145	0.986	0.854
51	Surigao State College of Technology	1.135	1.016	1.117	1.025	0.904
52	Tarlac State University	1.070	1.000	1.070	1.021	0.954
53	Technological University of the Philippines	1.089	1.050	1.038	1.131	1.039
54	Tiburcio Tancinco Memorial Institute of Science and Technology	1.072	1.002	1.069	0.996	0.930
55	University of Northern Philippines	1.038	1.003	1.034	0.996	0.960
56	University of the Philippines System	0.990	0.990	1.000	1.029	1.040
57	Universityof Eastern Philippines	1.097	1.008	1.089	1.016	0.927
58	Western Mindanao State University	0.994	0.999	0.995	0.967	0.973
59	Western Visayas Colleges of Science and Technology	1.050	1.058	0.992	1.014	0.965
	Geometric Mean	**1.056**	**1.002**	**1.044**	**1.002**	**0.948**

The top ten SUCs in terms of total factor productivity are: (1) Polytechnic University of the Philippines (1.299) , (2) Mindanao State University (1.210), (3) Technological University of the Philippines (1.131), (4) Cotabato City State Polytechnic College (1.109), (5) Agusan del Sur State College of Agriculture and Technology (1.064) and Mindanao Polytechnic University (1.064) , (6) Cebu Normal University (1.059), (7) Philippine State College of Aeronautics (1.057), (8) Philippine Normal University (1.050), (9) Bataan State College (1.036), (10) University of the Philippines System (1.029).

The University of the Philippines System is the national state university. University of the Philippines (UP), Diliman is the flagship university of UP System. It is the administrative seat of the system as well as an autonomous university in its own right. The budget of Philippine General Hospital (PGH) is incorporated into the UP System. It is known that UP-PGH caters to the medical needs of the indigents. Thus, the institution provides socialized medical services as its outreach program. The net effect to the budget of UP System is that the UP-PGH gets a lion share of the budget, which is detrimental to the UP System as a whole.

Multi-Stage Efficiency Summary

Fourteen (14) out of 59 SUCs are operating under the constant returns to scale (CRS). Twenty one (21) educational institutions are operating under increasing returns to scale (IRS) while 24 schools are showing decreasing returns to scale efficiency (DRS). Using multi-stage model (VRS), technical efficiency has an average of 95.4 percent (CRS), compared with 96.6 percent (VRS). Finally, the scale efficiency has a 98.7 percent rating. This implies that, in general SUCS obtained the below frontier efficiency score.

In Table 3, Leyte Institute of Technology has the highest peer count with 32. Polytechnic University of the Philippines ranks second with 29 peer counts. Two schools rank third with 17 peer counts each. This means that the above mentioned educational institutions are benchmarked by other peers. Agusan del Sur State College of Agriculture and Technology was benchmarked 12 times, Bataan Polytechnic State College eight (8) times, Leyte Normal University seven (7) times, Isabela State University, Laguna State University six (6) times, Mindanao Polytechnic University, Northern Negros State College of Science and Technology six (6) times, Mindanao State University and Tarlac State University four (4) times, Cotabato City State Polytechnic College three (3) times, Bulacan State University two times (2) and Bataan State College and Davao del Norte State College once only. These institutions are the most efficient, which serve as the benchmark peers for inefficient institutions in the sample. Therefore, inefficient institutions could improve their efficiency level by benchmarking efficient institutions.

Table 2: Efficiency Summary, 2003

DMU	crste	vrste	scale	RTS
1	0.954	1.000	0.954	irs
2	0.938	0.978	0.959	irs
3	1.000	1.000	1.000	-
4	1.000	1.000	1.000	-
5	1.000	1.000	1.000	-
6	0.909	0.923	0.985	drs
7	0.952	0.986	0.965	drs
8	0.920	0.923	0.997	drs
9	0.997	1.000	0.997	drs
10	0.897	0.927	0.968	drs
11	0.944	0.947	0.997	irs
12	0.924	0.951	0.972	drs
13	0.997	1.000	0.997	irs
14	0.937	0.963	0.972	drs
15	0.951	0.956	0.994	drs
16	1.000	1.000	1.000	-
17	0.993	1.000	0.993	irs
18	0.909	0.919	0.989	drs
19	0.945	0.966	0.978	drs
20	0.934	0.936	0.998	drs
21	0.966	0.981	0.984	irs
22	0.971	1.000	0.971	drs
23	0.899	0.902	0.997	drs
24	0.904	0.916	0.987	irs
25	1.000	1.000	1.000	-
26	1.000	1.000	1.000	-
27	1.000	1.000	1.000	-
28	0.939	0.950	0.988	drs
29	1.000	1.000	1.000	-
30	1.000	1.000	1.000	-
31	1.000	1.000	1.000	-
32	0.920	0.931	0.987	irs
33	0.928	0.937	0.991	irs
34	0.915	0.916	0.999	irs
35	0.958	1.000	0.958	irs
36	0.974	0.977	0.997	irs
37	0.937	0.967	0.968	drs
38	0.918	0.930	0.987	irs
39	0.895	0.926	0.967	drs
40	0.898	0.899	0.999	irs
41	0.977	0.978	0.999	irs
42	1.000	1.000	1.000	-
43	0.915	0.923	0.991	irs
44	1.000	1.000	1.000	-
45	0.901	0.984	0.916	irs
46	0.929	0.948	0.980	drs
47	0.999	1.000	0.999	drs
48	0.940	0.946	0.993	irs
49	0.919	0.919	1.000	-
50	0.952	0.955	0.998	irs
51	0.952	0.970	0.981	irs
52	1.000	1.000	1.000	-
53	0.938	0.962	0.974	drs
54	0.984	0.996	0.988	irs
55	0.910	0.950	0.957	drs
56	0.960	1.000	0.960	drs
57	0.920	0.933	0.986	drs
58	0.977	0.981	0.996	drs
59	0.964	0.965	0.999	drs
MEAN	**0.954**	**0.966**	**0.987**	

Note: RTS = returns to scale

Table 3: Peer Count Summary of SUCs

DMU	School	Peer Count
1	Leyte Institute of Technology	32
2	Polytechnic University of the Philippines	29
3	Batangas State University (formerly PBMIT)	17
4	Marinduque State College	17
5	Agusan del Sur State College of Agriculture and Technology	12
6	Bataan Polytechnic State College	8
7	Leyte Nornal University	7
8	Isabela State University	6
9	Laguna State University	6
10	Mindanao Polytechnic University	6
11	Northern Negros State College of Science and Technology	6
12	Mindanao State University	4
13	Tarlac State University	4
14	Cotabato City State Polytechnic College	3
15	Bulacan State University	2
16	Bataan State College	1
17	Davao del Norte State College	1
18	Apayao State College	0
19	Benguet State University	0
20	Bicol University	0
21	Bukidnon State College	0
22	Cagayan State University	0
23	Catanduanes State Colleges	0
24	Cavite State University	0
25	Cebu Normal University (Cebu State College)	0
26	Cebu State College of Science and Technology	0
27	Central Mindanao University	0
28	Don Honorio Ventura College of Arts and Trades	0
29	Don Mariano Marcos Memorial State University	0
30	Eastern Samar State College	0
31	Ifugao State College of Agriculture and Forestry	0
32	Jose Rizal Memorial State College	0
33	Kalinga Apayao State College	0
34	Mariano Marcos State University	0
35	Mindoro State College of Agriculture and Technology	0
36	Mountain Province State Polytechnic College	0
37	Naval Institute of Technology	0
38	Nueva Vizcaya State Institute of Technology	0
39	Palawan State University	0
40	Palompon Institute ofTechnology	0
41	Pangasinan State University	0
42	Partido State University (Partido State College)	0
43	Philippine Normal University	0
44	Philippine State College of Aeronautics	0
45	Polytechnic State College of Antique	0
46	Quirino State College	0
47	Rizal Technological University	0
48	Romblon State College	0
49	Samar State Polytechnic College	0
50	Southern Leyte State College of Science and Technology	0
51	SultanKudarat Polytechnic State College	0
52	Surigao State College of Technology	0
53	Technological University of the Philippines	0
54	Tiburcio Tancinco Memorial Institute of Science and Technology	0
55	University of Northern Philippines	0
56	University of the Philippines System	0
57	Universityof Eastern Philippines	0
58	Western Mindanao State University	0
59	Western Visayas Colleges of Science and Technology	0

CONCLUSIONS

This paper has assessed the extent of efficiency of 59 SUCS in the Philippines from 1999-2003, using DEA – Malmquist Productivity Model and Multi-stage model. The empirical results using DEA-Malmquist index show that SUCS rank high in managerial efficiency. The finding reveals that 49 out of 59 SUCs or 83 percent of the educational institutions are efficient.

It is alarming finding that six (6) out of 59 SUCs are showing technological progress and the rest are experiencing technological regression. This may call for the SUCs to give considerable attention to technological progress, the enhancement of existing applications and the development of more technology-oriented systems and procedures that will enable the educational institutions to remain effective and competitive. Lack of innovation in the Philippine higher institutions has a policy implication: the Philippine government should exert more efforts to provide modern teaching and learning facilities in every state school to improve its deteriorating technological performance. Thus, the new findings in this paper may give impetus to Commission on Higher Education, lawmakers or legislators, and the university administrators to adopt measures that would be beneficial to the improvement of State Universities and Colleges in terms of inefficiency and unproductive growth.

This study can provide a new way in the furtherance of another research that would be beneficial to the top management of Philippine educational institutions. In order to evaluate more the components that affect the operation of the Philippine educational system, similar study can be undertaken such as the Accreditation level of all the colleges with the same program throughout the country. Another possible field of research that can be explored is the efficiency in performance of all schools based on the passing of their graduates in all the Professional Regulations Commission board examination. Efficiency and productivity of a sectarian school against a non-sectarian school may be also a future research. The budget allocated for the extension service can be pursued by doing a separate survey regarding the details of this activity. These are acknowledged limitations of this paper that can be addressed properly in a future study.

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