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Efficiency of State Universities and Colleges in the Philippines: a Data Envelopment Analysis

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Janet S. Cuenca

PHILIPPINE INSTITUTE FOR DEVELOPMENT STUDIES

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Table of Contents

List of Tables

List of Figure

List of Annex Tables

ABSTRACT

In view of the long-standing issues and concerns that beset the Philippine system of higher education, the study attempts to evaluate the performance of state universities and colleges (SUCs) in the period 2006-2009 using Data Envelopment Analysis. In particular, it estimates the efficiency of 78 SUCs based on available input data (i.e., expenditure data) and output data (i.e., number of enrolled students, number of graduates, and total revenue). Also, it examines productivity change in these institutions by applying the Malmquist approach on a four-year panel data set of 78 SUCs. The DEA results indicate that majority of the SUCs have efficiency score less than 1 and thus, they are considered inefficient. In addition, the target input and output levels derived from the DEA suggest potential cost savings for each of the SUCs. Further, productivity of about 62 percent of the SUCs has slightly improved in the period under review. The findings of the study points to a potential research in the future that would take a closer look on each of the SUCs identified as inefficient in this exercise with the end in view of identifying, understanding and hopefully, addressing the factors that affect their operation and performance.

Keywords: higher education, higher education institutions (HEIs), state universities and colleges (SUCs), efficiency, productivity, data envelopment analysis

EFFICIENCY OF STATE UNIVERSITIES AND COLLEGES IN THE PHILIPPINES: A DATA ENVELOPMENT ANALYSIS

Janet S. Cuenca[1]

I. INTRODUCTION

The assessment of performance of state universities and colleges (SUCs) in the Philippines is important in view of the long-standing issues and concerns that beset the country's system of higher education. In particular, the higher education subsector is haunted by issues of (i) limited and inequitable access to higher education; (ii) inequitable financing of public higher education; (iii) lack of overall vision, framework, and plan for higher education resulting in the proliferation of low quality higher education institutions (HEIs) and programs, oversubscribed and undersubscribed programs as well as skills and job mismatch; (iv) deteriorating quality of higher education due to inadequate faculty credentials and as indicated by the declining performance of graduates in professional licensure exams; (v) crowding out of private provision; and (vi) underdeveloped innovation system (Preddey and Nuqui 2001, Tan 2011, and Licuanan (undated)).

The Higher Education Development Fund (HEDF) was established under the Commission of Higher Education (CHED) in 1994 with the end in view of strengthening the higher education in the country. The thrusts, priority areas, and program areas of HEDF **(Table 1)** as identified by the CHED are meant to address the many issues and concerns surrounding the higher education system. To wit, the thrust on quality and excellence is in response to the issue on deteriorating quality of higher education while the thrust on access and equity is centered on providing special scholarship particularly to students in difficult/disadvantaged areas, thus making higher education accessible to the poor. On the other hand, the thrusts on efficiency and effectiveness, and relevance and responsiveness are expected to address the rest of the above-mentioned issues.

In addition to the national government funding, all HEIs (i.e., both public and private HEIs) can avail of grants from the HEDF provided that their proposed development projects are consistent with the HEDF thrusts. In particular, the HEDF is intended for faculty/staff development, facilities upgrading, promotion of Centers of Excellence (COE) and Centers of Development (COD) in all HEIs, research enhancement and capacity building, scholarship, and institutional development **(Table 1)**. To ensure the sustainability of the HEDF, it is financed from the income of an initial P500 million in seed capital, 40 percent of the proceeds from the travel tax, 30 percent of the total collections from the Professional Registration Fee of the Professional Regulations Commission (PRC), and one percent of gross sales of lotto operation of the Philippine Charity Sweepstakes Office (PCSO).

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Further, the CHED launched in 2003 the Higher Education Development Project which aimed to: (i) rationalize the higher education system; (ii) upgrade the quality of higher education; and (iii) enhance equity in higher education. **Figure 1** presents the specific activities that are essential in achieving the objectives of the HEDP. According to Garcia (2011), the activities that are most relevant in addressing the issues mentioned earlier are as follows:

- Implementation of rationalization policies: normative financing,[2] rationalization of the number, distribution and growth of SUCs;
- Strengthening of the HEDF developmental activities;
- Improvement of private access to credit;
- Improvement of quality of teaching through faculty development; and
- Strengthening of student assistance programs.

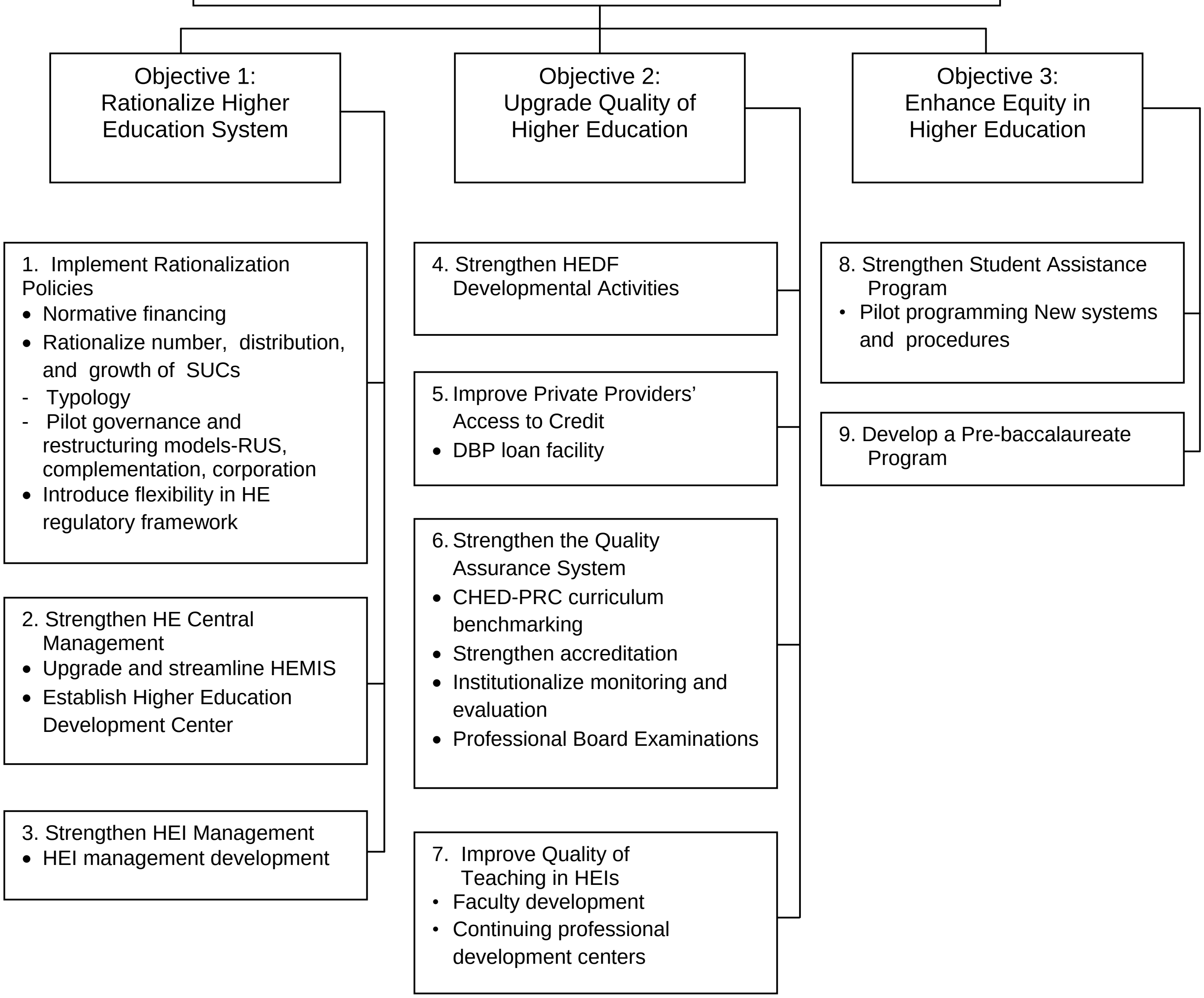
Table 1. HEDF Thrusts, Priority and Program Areas

Thrusts	Target Allocation	Priority Areas	Program Areas
Quality and Excellence	40%	- Capacity building - Higher education research	- Faculty/staff development - Facilities upgrading - Centers of Excellence and Development - Research enhancement and capacity building
Access and equity	25%	- Special scholarship	- Student grants for students in difficult/disadvantaged areas - Scholarship to programs important for national development
Efficiency and effectiveness	20%	- Administration and management of HEIs - Optimal use of limited resources	- Executive training programs - Performance audit and review of executives - Networking and linkages
Relevance and responsiveness	15%	- Review, analysis and implementation of higher education programs - Support for emerging disciplines	- Support programs on industrialization, information science, and sustainable development - Empowerment of HEIs to shape the future of local communities

Source: Johanson (2001), Table 1

[2] Defined as the application of a set of prescribed objective criteria and norms that are designed to promote and reward quality instruction, research and extension services, as well as financial prudence and responsibility in the Department of Budget and Management (DBM)'s policies and guidelines for the FY 2011 SUCs Budget

Figure 1. Overall Project Framework HEDP



Source: Garcia (2011)

Nevertheless, the expected outcomes of these initiatives remain to be seen. In particular, efficiency and productivity is hardly observed in many of the SUCs as will be shown in later. The efficiency and productivity of SUCs has become increasingly important in the light of tight public budget constraints. In contrast to private HEIs, SUCs draw fund from the national government coffer primarily because they are expected to cater to the needs of the poor. The proliferation of SUCs and expanding enrollment therein are expected to drain the national government funding allocated to these institutions, which in turn would affect the quality of higher education. Moreover, bulk of the budget given to higher education is used to finance personal services which have increased significantly in recent years due to the increase in teacher's pay as mandated by the Salary Standardization Law III.

Given scarce resources, it is critical to assess whether SUCs are using their resources efficiently and productively. In addition, information on the efficiency of SUCs is an important input in rationalizing the national government subsidies for these institutions considering the issue on the proliferation of inefficient SUCs that offer low quality higher education as pointed out in the literature (e.g., Preddey and Nuqui 2001 and Tan 2011).

Also, there is a pronounced need to free up more resources in favor of basic education due to a number of more pressing issues (e.g., deteriorating quality of basic education, low achievement rates for both elementary and secondary schools, high dropout rate, lack of resources (i.e., textbooks, classrooms, desks and chairs)) that affect the state of elementary and secondary education at present. It is believed that improving the condition of basic education will result in more students going to college. In addition, prioritization of basic education is justified on the grounds of equity. Results of the study done by Manasan et al in 2008 indicate that the distribution of education spending is progressive at the elementary and secondary level. On the contrary, it is regressive at the TVET and college levels, which could be attributed to the fact that the poor rarely reach higher education.

In other words, it is really the poor that benefit more from government subsidies in basic education particularly in elementary education. Thus, the more government invests in basic education, the greater gains that accrue to the poor. It should be noted, however, that increasing college subsidy in regions (e.g., ARMM, CAR, and CARAGA) where it is progressive can be justified. Nevertheless, with limited resources, the efficiency and productivity of SUCs in these regions are equally important factors that should determine the budget allocation and prioritization.

The importance of assessing the efficiency of SUCs cannot be overemphasized. Although existing studies (e.g., Preddey and Nuqui, 2001 and Tan, 2011) highlight the issue on the proliferation of inefficient SUCs, a measure of such inefficiency is lacking. Only few studies (e.g., Abon et al 2006, Ampit and Cruz 2007, Castano and Cabanda 2007) have presented estimates of efficiency scores of SUCs, which were obtained by employing data envelopment analysis and/or stochastic frontier analysis (SFA). Moreover, these studies did not cover all SUCs in the Philippines. In this regard, the paper aims to apply DEA on the existing SUCs in the country subject to the availability of data and provide empirical evidence on the efficiency/inefficiency of these institutions. In addition, the current exercise attempts to identify the SUCs with potentials for performance improvement.

The rest of the paper is organized as follows. Section II outlines the methodology involved in the DEA while Section III details the data used as well as their sources. Section IV presents the analysis of results. The paper ends with the concluding remarks in Section V.

II. METHODOLOGY[3]

Various tools have been developed to quantify the efficiency of decision making units (DMUs) such as industries and institutions (e.g., manufacturing firms/plants, banks, hospitals, transportation systems, and schools and universities). Coelli (1996) presented two measures of efficiency and provided a technique on how to calculate them relative to an efficient frontier, which may be derived either through data envelopment analysis (DEA) and stochastic frontiers analysis (SFA). The primary difference in these two methods lies in the approach employed. To wit, the DEA involves mathematical programming while the SFA uses econometric techniques.

According to Coelli (1996), the efficiency of a DMU is comprised of two components, namely, technical efficiency and allocative efficiency. Technical efficiency refers to the ability of the firm to produce maximum output using available inputs. Alternatively, it is the ability of DMUs to utilize the minimum quantity of inputs to produce a given output level. On the other hand, allocative efficiency is the ability of a DMU to use available inputs in optimal proportions with consideration on their respective prices. When combined, these two measures reflect the total economic efficiency of a DMU.

In the literature, data envelopment analysis (DEA) appears to be the most appropriate method to use when dealing with DMUs having multiple inputs and outputs (Talluri 2000, Flegg et al 2003, and Kempkes and Pohl 2006) such as schools and universities. DEA is a linear programming technique that measures the relative efficiency/inefficiency of homogenous set of DMUs. In particular, it constructs a non-parametric[4] envelopment frontier[5] over available input and output data and then it calculates the efficiency of DMUs relative to the frontier (Flegg et al 2003 and Coelli 1996). Based on existing studies (Talluri 2000, Flegg et al 2003, and Kempkes and Pohl 2006), the efficiency score of DMUs with multiple input and output factors is defined as:

$$\text{Efficiency} = \frac{\text{weighted sum of outputs}}{\text{weighted sum of inputs}} \qquad (2.1)$$

Given n DMUs with m inputs and s outputs and assuming constant returns to scale (CRS), the relative efficiency score of a DMU p can be calculated by solving the Charnes-Cooper-Rhodes (CCR) model (Talluri 2000) described as follows:

[3] Draws heavily from Coelli (1996) and Talluri (2000)
[4] No assumptions on the functional form of the efficient frontier
[5] An efficient frontier indicates the maximum quantity of outputs that can be produced using available inputs and also, the minimum quantity of inputs that should be used to produce a given level of output.

$$Max \frac{\sum_{k=1}^{s} v_k y_{kp}}{\sum_{j=1}^{m} u_j x_{jp}}$$

s.t.

$$\frac{\sum_{k=1}^{s} v_k y_{ki}}{\sum_{j=1}^{m} u_j x_{ji}} \leq 1 \qquad \forall i \ (i = 1,...,n) \qquad (2.2)$$

$$v_k, u_j \geq 0 \qquad \forall k, j \ (k = 1,...,s \ \& \ j = 1,...,m)$$

where

k – index for outputs (k = 1, …, s)
j – index for inputs (j = 1, …, m)
i – index for DMUs (i = 1, …, n)
y_{ki} – amount of output *k* produced by DMU *i*
x_{ji} – amount of input *j* utilized by DMU *i*
v_k – weight given to ouput *k*
u_j – weight given to input *j*

Equation (2.2) can be linearized by requiring the weighted sum of the inputs to take a value of 1. Such condition transforms Equation (2.2) into a linear programming model, wherein the objective function involves the maximization of the weighted sum of outputs (Vercellis 2009). The alternative optimization problem is given below.

$$Max \sum_{k=1}^{s} v_k y_{kp}$$

s.t.

$$\sum_{j=1}^{m} u_j x_{jp} = 1 \qquad (2.3)$$

$$\sum_{k=1}^{s} v_k y_{ki} - \sum_{j=1}^{m} u_j x_{ji} \leq 0 \qquad \forall i \ (i = 1,...,n)$$

$$v_k, u_j \geq 0 \qquad \forall k, j \ (k = 1,...,s \ \& \ j = 1,...,m)$$

Equation (2.3) is run *n* times to estimate the relative efficiency scores for all the DMUs. In each of the iterations, the DEA evaluates the efficiency of each unit through the system of weights. In particular, it identifies the input and output weights that maximize each

DMU's efficiency score. The resulting efficiency score lies in the interval [0,1]. The DMUs which have a value of 1 are said to be efficient. On the other hand, the DMUs which take a value below 1 are considered inefficient.

Using the concept of duality in linear programming, the equivalent envelopment form of the linear programming model expressed in Equation (2.3) is given below:

$$
\begin{aligned}
& Min \ \theta \\
& s.t. \\
& \sum_{i=1}^{n} \lambda_i x_{ji} - \theta x_{jp} \leq 0 \qquad \forall j \ \ (j = 1, \ldots, m) \\
& \sum_{i=1}^{n} \lambda_i y_{ki} - y_{kp} \geq 0 \qquad \forall k \ \ (k = 1, \ldots, s) \\
& \lambda_i \geq 0 \qquad \forall i \ \ (i = 1, \ldots, n)
\end{aligned}
\tag{2.1}
$$

Like Equation (2.3), Equation (2.4) is run *n* times, i.e., once for each DMU in the sample. In practical terms, a DMU in question, say DMU *p*, is inefficient if there exists a composite DMU (i.e., a linear combination of DMUs in the sample), which uses less input than DMU *p* while maintaining at least the same levels of output. The units that comprise such composite DMU are regarded as benchmarks or peers for improving the inefficient DMU in question (Talluri 2000).

Graphically, the efficiency scores are based on the distance of the DMUs from the frontier. The efficient units (i.e., units with efficiency score of 1) lie on the frontier while the inefficient ones (i.e., units with efficiency score less than 1) lie below the frontier and thus, are enveloped by it.

In general, a typical DEA model can be expressed as input-orientated model or output-orientated model. Assuming constant returns to scale (CRS), the efficiency measures for DMUs are the same regardless of the model orientation used. In contrast, these measures vary depending on the orientation adopted under the VRS framework. Nevertheless, the set of DMUs identified as inefficient under VRS will be the same regardless of the orientation adopted (Thanassoulis et al 2009). Mathematically, the output-oriented model and input-oriented model under the VRS framework is represented by Equation (2.5) and Equation (2.6), respectively, as shown in below.

Output-oriented (VRS)

$$
\begin{aligned}
& Max\phi_k \\
& s.t. \\
& \phi_k y_{rk} - \sum_{j=1}^{n} \lambda_j y_{rj} \le 0 \qquad r = 1,\ldots,s \qquad\qquad (2.5) \\
& x_{ik} - \sum_{j=1}^{n} \lambda_j x_{ij} \ge 0 \qquad i = 1,\ldots,m \\
& \sum_{h=1}^{n} \lambda_j = 1, \lambda_j \ge 0 \qquad \forall j = 1,\ldots,n
\end{aligned}
$$

Input-oriented (VRS)[6]

$$
\begin{aligned}
& Min\theta_k \\
& s.t. \\
& y_{rk} - \sum_{j=1}^{n} \lambda_j y_{rj} \le 0 \qquad r = 1,\ldots,s \qquad\qquad (2.6) \\
& \theta_k x_{ik} - \sum_{j=1}^{n} \lambda_j x_{ij} \ge 0 \qquad i = 1,\ldots,m \\
& \sum_{j=1}^{n} \lambda_j = 1, \lambda_j \ge 0 \qquad j = 1,\ldots,n
\end{aligned}
$$

In Thanassoulis et al (2009), the overall efficiency of DMU k is represented by the expression:

$$E_k = \frac{1}{\phi_k} \qquad (2.7)$$

in the output-oriented framework or

$$E_k = \theta_k \qquad (2.8)$$

[6] Similar to Equation (2.4)

in the input-oriented framework. On the other hand, scale efficiency of DMU *k* is given by the ratio:

$$SCE_k = \frac{E_{k,CRS}}{E_{k,VRS}} \qquad (2.9)$$

where $E_{k,CRS}$ and $E_{k,VRS}$ is the efficiency score obtained under CRS and VRS, respectively.

According to (Coelli 1996), the input-oriented model is concerned with the question: "By how much can input quantities be proportionally reduced without changing the output quantities produced?" On the other hand, the output-oriented model addresses the question: "By how much can output quantities be proportionally expanded without altering the input quantities used?"

The answers to these questions can be obtained by finding the solution for the *n* systems of weights by running the optimization model as described in Equation (2.3) *n* times. The task is easily done with the availability of the Data Envelopment Analysis Program (DEAP), a computer program that implements DEA estimation procedure for both input- and output-oriented models under the assumption of either constant returns to scale (CRS) or variable returns to scale (VRS) (Coelli 1996).

For the purpose of the paper, the DEAP was run to conduct a multi-stage DEA of 78 SUCs **(Annex Table 1)** using input-orientated model, i.e., to obtain the efficiency estimates of these institutions in the period 2006-2009. The analysis involved both the CRS and VRS specifications of the DEAP because it is uncertain whether the SUCs operate at optimal scale.[7]

Although the DEA is a powerful tool that combines multiple inputs and outputs into single summary measure of efficiency, it cannot distinguish between 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 2003). To capture the sources of changes in efficiency, the Malmquist approach, which is also automated in DEAP, was applied on a four-year panel data set of 78 SUCs.

In particular, the said technique examines whether there have been changes in technology during the assessment period by evaluating productivity changes and boundary shifts by year using DEA. More specifically, the DEA estimates separate efficient boundaries for different periods, and then it decomposes total factor productivity change into efficiency catch-up and boundary shift, which measure the extent to which productivity changes are due to changes in efficiency and technology, respectively (Thanassoulis et al 2009).

[7] Coelli (1996) pointed out that the CRS specification is aptly used when all DMUs are operating at the optimal scale. The use of VRS specification is recommended otherwise to ensure that measures of technical efficiency is not confounded by scale efficiencies.

The input-oriented Malmquist productivity index M_0 (Mohammadi and Ranaei 2011), which measures the productivity change of a particular DMU_0, $0 \in Q = [1,2,\ldots,n]$, in time t + 1 is given by:

$$M_0 = \sqrt{\frac{D_0^t(X_0^{t+1}, Y_0^{t+1})}{D_0^t(X_0^t, Y_0^t)} \bullet \frac{D_0^{t+1}(X_0^{t+1}, Y_0^{t+1})}{D_0^{t+1}(X_0^t, Y_0^t)}} \quad (2.10)$$

where

D_0	– distance function
(X^{t+1}, Y^{t+1})	– represents the production point of technology
(X^t, Y^t)	– relative production point of the productivity
t	– period of benchmark technology
t+1	– the next period of technology

The first component of Equation (2.10) measures the change in technical efficiency while the second one measures the technology frontier shift between time period *t* and *t+1*. If the derived value of M_0 is greater than 1, then there is productivity gain. If the value is less than 1, it implies there is productivity loss. Lastly, if value is equal to 1, it means there is no change in productivity from *t* to *t+1*.

As mentioned earlier, the Malmquist technique is also automated in the DEAP and thus, the solution to Equation (2.10) can easily be obtained. The Malmquist DEAP results include five Malmquist indices: (i) technical efficiency change (i.e., SUCs getting closer to or further away from the efficient frontier) relative to a CRS technology; (ii) technological change (i.e, shifts in the efficient frontier); (iii) pure technical efficiency change relative to a VRS technology; (iv) scale efficiency change; and (v) TFP change.

III. DATA AND SOURCES

The choice of input and output data in a number of studies (Thanassoulis et al 2009, Flegg et al 2003, Kempkes and Pohl 2006, Daghbasyan 2011, and Salerno 2003) that evaluate the efficiency of higher education institutions (HEIs) such as universities and colleges in different countries does not vary much because HEIs are in general assumed to accomplish two major duties or provide two main services, namely, teaching and research and development. Thanassoulis et al (2009) mentioned about the third mission of HEIs, i.e, the provision of advice and other services to business, provision of a source of independent comment on public issues, and storage and preservation of knowledge. Nevertheless, due to lack of data or absence of a good measure or at least, proxy variable, the said output is often ignored in assessment exercises.

Only three outputs are normally considered in the literature and they include undergraduate teaching, postgraduate teaching, and research and development (Thanassoulis et al 2009, Flegg et al 2003). Because universities and colleges are expected to build human capital, the number of undergraduate and postgraduate degrees awarded is regarded as an approximation of the teaching output (Kempkes and Pohl 2006 and Flegg et al 2003). It should be noted, however, that this proxy fails to factor in the quality of the degrees awarded. In addition, Salerno **(**2003**)** mentioned that the number of degrees awarded does not fully capture the production of education as it fails to take into account the number of students receiving a year's worth of education at any given time. In other studies (Daghbashyan 2011 and Salerno 2003), the number of full-time equivalent students is used as proxy for the teaching output. Nonetheless, the use of physical headcounts per se masks the effort exerted by HEIs in educating students (Salerno 2003).

In terms of research and development, universities and colleges are expected to collaborate with private companies in conducting applied research and also, do independent fundamental research for knowledge formation. In addition to the benefits the society derives from research endeavors, universities and colleges also gain income out of the research grants.[8] Thus, the income generated from research undertakings can be used as proxy for the value of output produced. Nevertheless, as Kempkes and Pohl (2006) pointed out, research income is subject to a faculty bias as some departments (e.g., medicine or engineering) tend to get earnings from research grants unlike other departments (e.g., languages). However, use of research income as proxy for research output is acceptable in the absence of annual data for alternative variables such as research ratings and consultancy income (Flegg et al 2003).

With regard to input data, the usual variables that are used in DEA studies (Kempkes and Pohl 2006), Flegg et al 2003, Salerno 2003**,** and Ampit and Cruz 2007) include the number of personnel (teaching, non-teaching, and research personnel), the number of undergraduate and postgraduate students (i.e., full-time equivalent student load), and total expenditures (e.g., salaries and wages, maintenance and other operating expenses, and capital outlay expenses). However, Salerno **(**2003**)** raised two measurement problems related to input data that may distort estimates of efficiency and they include: 1) accounting practices vary across institutions and thus, institutions may have different way of classifying their expenditures; and 2) lack of practical way to index input quality.

For the purpose of the paper, the selection of input and output data follows that of Ampit and Cruz (2007) and Castano and Cabanda (2007). In particular, the DEA of the 78 state universities and colleges (SUCs) in the Philippines (**Annex Table 1**) for the period 2006-2009 includes actual expenditure data (Ampit and Cruz 2007),[9] which approximates the input factors that SUCs utilized to produce expected outputs and also, data on the total number of enrolled students, total number of graduates, and total revenue (i.e., internally

[8] Market price that gives information on the quality and quantity of research output (Kempkes and Pohl 2006)

[9] In contrast, Castano and Cabanda (2007) used the number of faculty members; property, plant, and equipment (i.e., tangible assets); and operating expenses to proxy for input factors.

generated income), which are all output measures[10] (Castano and Cabanda 2007). In particular, SUCs expenditures[11] are classified into three (3) expense items, namely:

- *Personal services (PS)* - provisions for the payment of salaries, wages, and other compensation (e.g., merit, salary increase, cost-of-living allowances, honoraria and commutable allowances) of permanent, temporary, contractual, and casual employees of the government;

- *Maintenance and other operating expenses (MOOE)* – refer to expenditures to support the operations of government agencies such as expenses for supplies and materials; transportation and travel; utilities (water, power, etc) and the repairs, etc; and

- *Capital outlays (CO)* – also known as capital expenditures; refer to appropriations for the purchase of goods and services, the benefits of which extend beyond the fiscal year and which add to the assets of the Government, including investments in the capital stock of government-owned and controlled corporations and their subsidiaries.

These expense items form part of the total expenditures of SUCs. It is should be noted that SUCs' total expenditures are financed through (i) government appropriations, which is regarded as the largest source of financing of SUCs; and (ii) internally generated income (IGI), which include all income generated from tuition fees, income generating projects (IGPs), and other charges as well as trust legacies, gifts and donations as specified in RA 8292, otherwise known as the Higher Modernization Act of 1997 (Laya Mananghaya & Co. 2004). Thus, expenditure data can be classified by source of financing. Such detailed expenditure data were provided by the Department of Budget and Management (DBM).

On the other hand, the total number of enrolled students includes all students enrolled under the pre-baccalaureate, baccalaureate, post-baccalaureate, masteral, and doctoral programs. On the one hand, the total number of graduates refers to the combined number of undergraduate and postgraduate degrees awarded. These data were gathered from the Commission on Higher Education (CHED). With regard to the third output, total revenue refers to SUCs' internally generated income which was also provided by the DBM.

IV. ANALYSIS OF RESULTS

Table 2 presents the technical efficiency scores of state universities and colleges (SUCs) under the CRS and VRS assumption. In either case, the preponderance of value less than 1 indicates that majority of the SUCs are not operating efficiently. On the average, about 85 percent and 65 percent of the SUCs are considered inefficient during the assessment period using CRS and VRS framework, respectively. Apparently, the number of efficient

[10] Ampit and Cruz (2007) used only one output measure, i.e., total number of graduates.
[11] Glossary of Terms, Department of Budget and Management

SUCs dropped from 18 in 2007 to only 8 in 2009 under the assumption of CRS. In contrast, it declined from 32 in 2007 to only 21 in 2009 under the VRS assumption. The decreasing trend is alarming considering that there are only very view efficient SUCs based on the DEA results **(Tables 3a and 3b)**.

Table 2. SUCs' Technical Efficiency Scores Under CRS and VRS Assumption

	CRS				VRS			
SUCs	2006	2007	2008	2009	2006	2007	2008	2009
1	0.604	0.565	0.416	0.456	0.707	0.693	0.614	0.524
2	0.529	1	0.519	0.941	0.547	1	0.526	0.949
3	0.731	0.693	0.62	0.716	0.759	0.7	0.635	0.763
4	0.651	0.929	0.619	0.837	0.713	0.936	0.657	0.883
5	0.615	0.751	0.619	0.491	1	1	1	0.493
6	0.88	0.795	1	1	0.922	0.882	1	1
7	0.667	0.651	0.537	0.601	1	1	0.705	0.775
8	0.457	0.418	0.346	0.441	0.546	0.44	0.364	0.444
9	0.585	0.626	0.291	0.61	0.595	0.642	0.382	0.669
10	0.74	1	0.598	0.659	0.873	1	0.737	0.66
11	0.883	0.697	0.535	0.623	1	1	0.798	0.631
12	1	1	0.659	0.892	1	1	0.849	0.98
13	1	0.803	0.742	0.957	1	0.974	0.87	1
14	0.583	0.614	0.27	0.484	0.588	0.616	0.271	0.486
15	0.812	1	0.74	0.746	0.825	1	0.811	0.748
16	0.936	0.539	0.363	0.493	1	0.945	1	1
17	0.766	0.768	0.798	0.803	1	1	1	1
18	0.647	0.653	0.329	0.448	0.865	0.881	0.828	0.813
19	0.577	0.545	0.317	0.451	0.808	0.843	0.845	1
20	0.699	0.958	0.587	0.618	0.834	1	0.855	0.624
21	0.88	0.646	0.367	0.615	0.952	0.648	0.512	0.663
22	1	1	1	0.934	1	1	1	1
23	1	1	0.583	1	1	1	0.602	1
24	0.97	0.898	0.649	0.9	1	0.913	0.651	0.937
25	0.709	0.679	0.796	0.538	0.784	0.793	0.986	0.569
26	0.784	1	0.625	0.929	0.79	1	0.928	0.996
27	0.672	0.971	0.682	0.681	1	1	1	1
28	0.668	0.639	0.37	0.399	0.677	0.684	0.37	0.411
29	0.704	0.559	0.451	0.591	1	0.795	0.649	0.967
30	0.571	0.969	0.615	0.754	1	1	1	0.916
31	0.904	1	0.622	0.592	0.94	1	1	0.595
32	0.582	0.485	0.43	0.475	0.721	0.689	0.677	0.759
33	1	1	0.807	0.86	1	1	1	1
34	0.611	0.613	0.288	0.339	0.611	0.625	0.295	0.348
35	0.676	0.621	0.635	0.846	0.715	0.636	0.635	0.868
36	0.908	1	0.917	0.804	0.933	1	1	0.848
37	0.528	0.614	0.44	0.459	0.596	0.794	0.668	0.671
38	0.455	0.437	0.217	0.332	0.509	0.524	0.369	0.372
39	1	0.951	0.764	0.88	1	1	1	1

Table 2 cont.

	CRS				VRS			
SUCs	2006	2007	2008	2009	2006	2007	2008	2009
40	0.903	1	0.544	1	1	1	0.817	1
41	1	0.904	0.757	1	1	0.943	1	1
42	1	0.918	0.675	0.744	1	1	1	0.749
43	1	0.902	0.98	0.693	1	1	1	0.698
44	0.631	0.645	0.626	0.683	0.714	0.672	0.648	0.807
45	0.642	0.725	0.631	0.7	0.718	0.815	0.73	0.777
46	1	0.723	0.57	0.646	1	0.756	0.574	0.677
47	1	1	0.771	0.961	1	1	1	1
48	0.604	0.82	0.436	0.445	0.654	0.821	0.464	0.56
49	0.694	0.591	0.539	0.743	1	1	1	1
50	0.657	0.663	0.693	0.632	0.671	0.672	0.693	0.67
51	1	1	1	1	1	1	1	1
52	0.589	0.527	0.371	0.428	0.589	0.532	0.372	0.678
53	0.862	0.808	0.445	0.442	0.867	0.83	0.448	0.463
54	0.919	0.701	0.603	0.521	1	1	1	1
55	0.599	0.452	0.44	0.465	0.631	0.471	0.455	0.496
56	0.78	0.727	0.686	0.784	0.791	0.739	0.686	0.845
57	0.771	0.656	0.628	0.724	0.813	0.665	0.813	0.736
58	0.758	0.802	0.613	0.755	0.797	0.817	0.65	0.768
59	0.561	0.388	0.378	0.36	0.653	0.451	0.413	0.722
60	0.874	0.774	1	0.837	1	1	1	0.91
61	0.77	1	0.628	0.731	0.794	1	0.636	0.765
62	0.882	0.723	0.957	0.961	1	1	1	1
63	0.848	0.675	0.622	0.78	0.861	0.785	0.812	0.784
64	0.924	1	1	1	0.932	1	1	1
65	1	0.981	0.495	0.901	1	0.982	0.823	1
66	0.627	0.621	0.521	0.346	0.661	0.652	0.564	0.375
67	0.769	0.622	0.574	0.642	1	0.682	0.861	0.654
68	1	1	0.818	0.844	1	1	0.823	0.858
69	0.605	0.412	0.221	0.319	0.615	0.415	0.225	0.338
70	0.843	0.6	0.382	0.399	0.889	0.676	0.473	0.515
71	0.53	0.662	0.336	0.496	0.582	0.716	0.396	0.584
72	0.668	0.782	0.375	0.498	0.7	0.789	0.436	0.521
73	0.899	0.89	0.871	0.794	0.915	0.923	0.919	0.881
74	1	1	1	1	1	1	1	1
75	1	0.623	0.333	0.468	1	0.634	0.375	0.48
76	0.925	1	0.548	1	0.926	1	1	1
77	0.636	0.77	0.499	0.518	0.753	0.987	0.668	0.721
78	0.867	0.606	0.834	0.475	1	0.812	1	0.798
Mean	0.777	0.766	0.597	0.679	0.85	0.845	0.742	0.772

Table 3a. Efficient SUCs based on DEA results Under CRS Assumption

Year		SUCs
2006	1	Bukidnon State College
	2	Camiguin Polytechnic State College
	3	University of Southern Mindanao
	4	Northern Mindanao State Institute of Science and Technology
	5	Bulacan State University
	6	Batangas State University
	7	Laguna State Polytechnic College
	8	Southern Luzon Polytechnic College
	9	University of Rizal System
	10	Occidental Mindoro National College
	11	Palawan State University
	12	Camarines Sur Polytechnic Colleges
	13	Cebu State College of Science and Technology
	14	Leyte Normal University
	15	J. H. Cerilles State College
	16	Jose Rizal Memorial State College
2007	1	Ifugao State College of Agriculture and Forestry
	2	Pangasinan State University
	3	Bukidnon State College
	4	Mindanao Polytechnic State College
	5	University of Southern Mindanao
	6	Northern Mindanao State Institute of Science and Technology
	7	Cagayan State University
	8	Bataan Polytechnic State College
	9	Bulacan State University
	10	Nueva Ecija University of Science and Technology
	11	Cavite State University
	12	Palawan State University
	13	Camarines Sur Polytechnic Colleges
	14	Northern Iloilo Polytechnic State College
	15	Cebu Normal University
	16	Leyte Normal University
	17	J. H. Cerilles State College
	18	Western Mindanao State University
2008	1	Philippine State College of Aeronautics
	2	University of Southern Mindanao
	3	Camarines Sur Polytechnic Colleges
	4	Negros State College of Agriculture
	5	Cebu Normal University
	6	J. H. Cerilles State College
2009	1	Philippine State College of Aeronautics
	2	Northern Mindanao State Institute of Science and Technology
	3	Cavite State University
	4	Laguna State Polytechnic College
	5	Camarines Sur Polytechnic Colleges
	6	Cebu Normal University
	7	J. H. Cerilles State College
	8	Western Mindanao State University

Table 3b. Efficient SUCs based on DEA results Under VRS Assumption

Year	SUCs
2006	1 Philippine Normal University
	2 Technological University of the Philippines
	3 University of Northern Philippines
	4 Bukidnon State College
	5 Camiguin Polytechnic State College
	6 Misamis Oriental State College of Agric. & Technology
	7 Northwestern Mindanao State College of Science & Technology
	8 University of Southern Mindanao
	9 Northern Mindanao State Institute of Science and Technology
	10 Surigao del Sur Polytechnic State College
	11 Isabela State University
	12 Quirino State College
	13 Aurora State College of Technology
	14 Bulacan State University
	15 Batangas State University
	16 Cavite State University
	17 Laguna State Polytechnic College
	18 Southern Luzon Polytechnic College
	19 University of Rizal System
	20 Occidental Mindoro National College
	21 Palawan State University
	22 Bicol University
	23 Camarines Sur Polytechnic Colleges
	24 Dr. Emilio B. Espinosa, Sr. Memorial State
	25 Negros State College of Agriculture
	26 Northern Negros State College of Science and Technology
	27 Cebu State College of Science and Technology
	28 Eastern Visayas State University/ Leyte Institute of Technology
	29 Leyte Normal University
	30 J. H. Cerilles State College
	31 Jose Rizal Memorial State College
	32 Zamboanga State College of Marine Sciences and Technology
2007	1 Ifugao State College of Agriculture and Forestry
	2 Philippine Normal University
	3 Technological University of the Philippines
	4 Pangasinan State University
	5 University of Northern Philippines
	6 Bukidnon State College
	7 Mindanao Polytechnic State College
	8 Northwestern Mindanao State College of Science & Technology
	9 University of Southeastern Philippines
	10 University of Southern Mindanao
	11 Northern Mindanao State Institute of Science and Technology
	12 Cagayan State University
	13 Isabela State University
	14 Aurora State College of Technology
	15 Bataan Polytechnic State College
	16 Bulacan State University
	17 Nueva Ecija University of Science and Technology
	18 Batangas State University
	19 Cavite State University
	20 Southern Luzon Polytechnic College
	21 University of Rizal System
	22 Palawan State University
	23 Bicol University
	24 Camarines Sur Polytechnic Colleges
	25 Dr. Emilio B. Espinosa, Sr. Memorial State
	26 Negros State College of Agriculture
	27 Northern Iloilo Polytechnic State College
	28 Northern Negros State College of Science and Technology
	29 Cebu Normal University
	30 Leyte Normal University
	31 J. H. Cerilles State College
	32 Western Mindanao State University

Table 3b cont.

Year	SUCs
2008	1 Philippine Normal University
	2 Philippine State College of Aeronautics
	3 Misamis Oriental State College of Agriculture & Technology
	4 Northwestern Mindanao State College of Science & Technology
	5 University of Southern Mindanao
	6 Isabela State University
	7 Aurora State College of Technology
	8 Bataan Polytechnic State College
	9 Bulacan State University
	10 Nueva Ecija University of Science and Technology
	11 Batangas State University
	12 Laguna State Polytechnic College
	13 Southern Luzon Polytechnic College
	14 University of Rizal System
	15 Palawan State University
	16 Bicol University
	17 Camarines Sur Polytechnic Colleges
	18 Dr. Emilio B. Espinosa, Sr. Memorial State
	19 Negros State College of Agriculture
	20 Northern Negros State College of Science and Technology
	21 Cebu Normal University
	22 J. H. Cerilles State College
	23 Western Mindanao State University
	24 Zamboanga State College of Marine Sciences and Technology
2009	1 Philippine State College of Aeronautics
	2 Camiguin Polytechnic State College
	3 Misamis Oriental State College of Agric. & Technology
	4 Northwestern Mindanao State College of Science & Technology
	5 Southern Philippines Agri-Business and Marine
	6 University of Southern Mindanao
	7 Northern Mindanao State Institute of Science and Technology
	8 Isabela State University
	9 Bulacan State University
	10 Batangas State University
	11 Cavite State University
	12 Laguna State Polytechnic College
	13 Palawan State University
	14 Bicol University
	15 Camarines Sur Polytechnic Colleges
	16 Dr. Emilio B. Espinosa, Sr. Memorial State
	17 Northern Negros State College of Science and Technology
	18 Cebu Normal University
	19 Cebu State College of Science and Technology
	20 J. H. Cerilles State College
	21 Western Mindanao State University

Moreover, the year-on-year average efficiency score of all SUCs is considerably low in 2006-2009. To wit, it was 0.77 in 2006 and 2007; 0.60 in 2008; and 0.68 in 2009 using the CRS specification. On the other hand, it was 0.85 in 2006 and 2007; 0.74 in 2008; and 0.77 in 2009 using the VRS specification. It should be noted that the efficiency score indicates the amount of all inputs SUCs could have saved if they had been operating at the level of the benchmark SUCs or identified peers. To elucidate, the SUCs could have reduced consumption of all inputs by 32 percent under the CRS framework and 23 percent under the VRS framework, on the average, if they had been efficient in 2009.

Further, it can be gleaned from **Table 2** that a big proportion (i.e., 50 percent and 47 percent, on the average) of the SUCs is way below the year-on-year average efficiency score. This implies bigger reduction in consumption of all inputs in these SUCs in the period under review. For example, consider SUC #38, under the CRS framework, which obtained an efficiency score of 0.455 (i.e., lowest in 2006) and 0.217 (i.e., lowest in 2008). The reduction in consumption of all inputs of SUC #38 without changing the level of output could go as high as 55 percent in 2006 and 78 percent in 2008 if it had been operating at the level of its peers (i.e., SUCs #12, #43, #74, and #65 in 2006 and SUCs #51, #74, and #64 in 2008) [**Annex Table 2 and Annex Table 3**].

The DEAP derived the target/projected values for outputs and inputs of all SUCs that could have placed them to the efficient frontier. More specifically, the target inputs indicate the minimum cost at which the SUCs could have operated to produce at least the actual level of output during the study period. The summary of results is presented in **Annex Table 4** and **Annex Table 5**.

As discussed earlier [Equation (2.4)], the target inputs and outputs of any SUC in question are estimated relative to the other SUCs, which serve as benchmark of improvement or peers for the SUC in question. **Table 4** displays the summary of peer count, which indicates the number of times each firm is a peer for another. Expectedly, the SUCs that serve as peer for another in any particular year/s are the efficient ones listed in **Table 3a** and **Table 3b**. It is noteworthy that among the efficient SUCs identified in the current exercise, University of Southeastern Philippines and Southern Philippines Agri-Business and Marine and Aquatic School of Technology were also found to be efficient by Ampit and Cruz (2007) in at least one year between 1997 and 2005.

Further, Cebu Normal University, Western Mindanao State University, and J.H. Jerilles State College registered the most number of times they become a peer for another SUC in both scenarios. On the other hand, Southern Luzon Polytechnic College, Camarines Sur Polytechnic Colleges, Leyte Normal University, and Batangas State University also serve as benchmark for another SUC a number of times but not as frequent as the ones mentioned earlier.

With regard to changes in productivity in 2006-2009, **Table 5** shows the results of the Malmquist approach when applied on a panel data set of 78 SUCs. The said approach assumes that the "technology" of production has changed significantly during the study period. This is in contrast with the preceding assessments wherein the four years from 2006 up to 2009 is treated as a single cross-section and that "technology" of production was assumed to be unchanged across the years.

Table 4. Peer Count Summary*
Under CRS and VRS Assumption

SUCs	CRS 2006	CRS 2007	CRS 2008	CRS 2009	VRS 2006	VRS 2007	VRS 2008	VRS 2009
Philippine Normal University	0	0	0	0	0	0	2	0
Philippine State College of Aeronautics	0	0	1	3	0	0	1	3
Technological University of the Philippines	0	0	0	0	0	1	0	0
Pangasinan State University	0	7	0	0	0	1	0	0
University of Northern Philippines	0	0	0	0	1	0	0	0
Bukidnon State College	25	10	0	0	11	13	0	0
Camiguin Polytechnic State College	0	0	0	0	3	0	0	5
Mindanao Polytechnic State College	0	3	0	0	0	1	0	0
Misamis Oriental State College of Agric. and Tech.	0	0	0	0	3	0	0	9
Northwestern Mindanao State College Science and Technology	0	0	0	0	20	13	23	33
Southern Philippines Agri-Business and Marine and Aquatic School of Technology	0	0	0	0	0	0	0	8
University of Southern Mindanao	5	1	1	0	2	3	2	0
Northern Mindanao State Institute of Science and Technology	10	11	0	3	6	8	0	17
Cagayan State University	0	1	0	0	0	3	0	0
Isabela State University	0	0	0	0	0	5	3	0
Aurora State College of Technology	0	0	0	0	0	3	7	0
Bataan Polytechnic State College	0	5	0	0	0	2	2	0
Bulacan State University	16	10	0	0	15	7	6	3
Nueva Ecija University of Science and Technology	0	12	0	0	0	12	6	0
Batangas State University	21	0	0	0	21	0	5	7
Cavite State University	0	21	0	2	0	14	0	5
Laguna State Polytechnic College	10	0	0	18	4	0	1	8
Southern Luzon Polytechnic College	27	0	0	0	16	1	2	0
University of Rizal System	13	0	0	0	4	7	6	0
Occidental Mindoro National College	17	0	0	0	14	0	0	0
Palawan State University	4	10	0	0	7	7	1	1
Bicol University	0	0	0	0	0	0	2	0
Camarines Sur Polytechnic Colleges	8	24	46	8	10	12	24	5
Dr. Emilio B. Espinosa, Sr. Memorial State College of Agriculture and Technology	0	0	0	0	9	3	4	0
Negros State College of Agriculture	0	0	32	0	3	0	14	0
Northern Iloilo Polytechnic State College	0	1	0	0	0	1	0	0
Northern Negros State College of Science and Technology	0	0	0	0	4	4	2	9
Cebu Normal University	0	20	65	45	0	11	44	38
Cebu State College of Science and Technology	15	0	0	0	13	0	0	3
Leyte Normal University	20	25	0	0	11	18	0	0
J. H. Cerilles State College	29	40	37	0	21	32	19	3
Jose Rizal Memorial State College	23	0	0	0	12	0	0	0
Western Mindanao State University	0	14	0	64	0	13	6	49
Zamboanga State College of Marine Sciences and Technology	0	0	0	0	2	0	15	0

* - number of times each SUC is a peer (i.e., benchmark) for another

Note: The table excludes the SUCs with value equals to zero for all years.

Based on results of DEA-based Malmquist approach, the average productivity index (i.e., total factor productivity change) for all SUCs is only a little over than 1, i.e., 1.037 which indicates very minimal productivity gains. The source of growth can be attributed more to the shift in efficient frontier as evidenced by the derived value for technological change (techch), i.e., 1.095. Notably, change in efficiency (effch) is way below 1, which suggests that the SUCs, taken as a whole sector, have moved further away from the efficient frontier in the assessment period, 2006-2009. When viewed individually, only 27 percent of the SUCs appear to have performed well in the period under review.

As regards individual total factor productivity change, about 62 percent of the SUCs have shown improving productivity during the assessment period. In 83 percent of these SUCs, productivity appears to have been driven by technological change. On the other hand, productivity in the remaining proportion (i.e., 17%) is attributed to change in efficiency.

Table 5. Malmquist Index

SUCs	effch	techch	pech	sech	tfpch
1	0.911	1.227	0.905	1.006	1.118
2	1.211	1	1.202	1.008	1.211
3	0.993	0.969	1.002	0.991	0.962
4	1.088	0.94	1.074	1.013	1.023
5	0.928	1.006	0.79	1.175	0.933
6	1.044	1.27	1.027	1.016	1.326
7	0.966	1.101	0.918	1.051	1.063
8	0.988	1.185	0.934	1.058	1.171
9	1.014	1.249	1.04	0.975	1.266
10	0.962	0.87	0.911	1.056	0.837
11	0.89	1.08	0.858	1.038	0.961
12	0.963	1.24	0.993	0.969	1.193
13	0.985	0.964	1	0.985	0.95
14	0.94	1.283	0.938	1.002	1.206
15	0.972	1.244	0.968	1.004	1.209
16	0.807	1.19	1	0.807	0.961
17	1.016	1.009	1	1.016	1.025
18	0.884	0.981	0.98	0.903	0.868
19	0.921	1.026	1.074	0.858	0.944
20	0.96	0.949	0.908	1.057	0.911
21	0.887	0.988	0.886	1.001	0.877
22	0.977	1.123	1	0.977	1.098
23	1	1.107	1	1	1.107
24	0.975	1.156	0.979	0.996	1.127
25	0.912	1.282	0.899	1.015	1.169
26	1.058	0.961	1.08	0.979	1.017
27	1.004	1.069	1	1.004	1.074
28	0.842	1.119	0.847	0.994	0.942
29	0.943	1.077	0.989	0.954	1.016
30	1.097	0.917	0.971	1.13	1.007
31	0.868	1.112	0.858	1.012	0.966
32	0.935	1.098	1.018	0.918	1.026
33	0.951	1.122	1	0.951	1.067
34	0.821	1.141	0.829	0.991	0.937
35	1.078	1.026	1.066	1.011	1.105
36	0.96	1.095	0.969	0.991	1.052
37	0.954	1.246	1.041	0.917	1.19
38	0.9	1.244	0.901	1	1.12
39	0.958	1.276	1	0.958	1.223

Table 5. cont.

SUCs	effch	techch	pech	sech	tfpch
40	1.035	1.56	1	1.035	1.613
41	1	1.018	1	1	1.018
42	0.906	0.992	0.908	0.998	0.899
43	0.885	1.106	0.887	0.998	0.979
44	1.026	0.973	1.041	0.986	0.999
45	1.029	1.188	1.027	1.002	1.223
46	0.865	1.017	0.878	0.985	0.88
47	0.987	1.027	1	0.987	1.014
48	0.903	1.205	0.949	0.951	1.089
49	1.023	1.002	1	1.023	1.025
50	0.987	1.165	0.999	0.988	1.15
51	1	0.968	1	1	0.968
52	0.899	1.173	1.048	0.858	1.055
53	0.8	1.09	0.811	0.987	0.872
54	0.827	1.018	1	0.827	0.842
55	0.919	1.028	0.923	0.996	0.944
56	1.002	1.05	1.022	0.98	1.052
57	0.979	1.05	0.967	1.012	1.028
58	0.998	1.009	0.988	1.011	1.007
59	0.863	1.1	1.034	0.835	0.949
60	0.986	0.989	0.969	1.018	0.975
61	0.983	1.086	0.987	0.995	1.067
62	1.029	0.986	1	1.029	1.015
63	0.972	0.976	0.969	1.003	0.948
64	1.027	1.208	1.024	1.003	1.24
65	0.966	1.075	1	0.966	1.039
66	0.82	0.981	0.828	0.991	0.805
67	0.941	1.048	0.868	1.084	0.986
68	0.945	1.187	0.95	0.994	1.121
69	0.808	1.37	0.819	0.987	1.107
70	0.779	1.244	0.834	0.935	0.969
71	0.978	1.179	1.001	0.977	1.153
72	0.907	1.117	0.906	1.001	1.013
73	0.96	1.072	0.987	0.972	1.029
74	1	0.835	1	1	0.835
75	0.777	0.978	0.783	0.992	0.759
76	1.026	1.498	1.026	1	1.537
77	0.934	1.293	0.986	0.948	1.208
78	0.818	1.158	0.928	0.882	0.948
Mean	0.947	1.095	0.961	0.986	1.037

V. CONCLUDING REMARKS

The data envelopment analysis (DEA) conducted on a data set of 78 state universities and colleges (SUCs) provides empirical evidence on the inefficiency of the majority of the SUCs in the country. With only very view efficient SUCs as indicated by the efficiency scores, it is very alarming to note the declining trend in the number of efficient SUCs between 2007 and 2009. Moreover, the year-on-year average efficiency score of all SUCs is considerably low, which indicates a substantial amount of inputs that could have been saved if only the SUCs had operated efficiently. Furthermore, productivity gains among the SUCs are found to be very minimal and they are attributed more with technological change than efficiency change.

Given limited government resources, it is only appropriate to ensure that they are used efficiently to achieve their intended purpose. Nevertheless, wastage of scarce resources is inevitable especially when institutions such as SUCs fail to perform as expected. Thus, it is critical to identify, understand and address the factors affecting the performance of SUCs. This calls for an in-depth study that takes a closer look on each of the SUCs that are deemed inefficient based on DEA standards.

Moreover, it is imperative to address the issues and concerns that challenge the country's system of higher education for so long. A number of good studies (Johanson 2001, Preddey and Nuqui 2001, Laya Mananghaya & Co. 2004, and Tan 2011) have already drawn useful (policy) recommendations on how to address them. To wit, Laya and Mananghaya & Co. (2004) pointed out the urgent need to rationalize the public higher education system in terms of (i) programs; (ii) locations; (iii) student costs; (iv) governance; and (v) government budgetary support. All these are geared towards reduction in the number of SUCs to ensure that the meager government budget is not spread thinly across all SUCs. It worth mentioning that CHED proposed the principle of having a maximum of one university in each region and one state college in each province but the highly politicized creation/conversion of SUCs may prove it unrealistic.

In addition, Tan (2011) recommended a reform package comprised of components with interdependent effects. The components include (i) change in viewing some popular notions that higher education is for all and that SUCs provide equitable access to higher education; (ii) development of an operational plan for creating a critical mass of science and engineering institutions that can produce a target number of graduates (i.e., BS, MS, and PhD) in specific priority fields in 5 to 10 years; (iii) improvement of libraries and laboratories in target higher education institutions (HEIs) in all fields by developing a financial support strategy; (iv) development of a massive scholarship system for graduate studies in all fields; (v) implementation by SUCs of full-cost tuition scheme complemented with a massive scholarship program; and (vi) increasing the demand for S&T graduates. In general, the reform package focuses on changing the method for subsidizing students and schools. According to the study, the subsidy should not be directed to selected institutions, programs, and students indiscriminately, inefficiently or in ad-hoc manner.

With a number of useful recommendations drawn up in earlier studies, it is now a matter of identifying a good mix of these recommendations (i.e., given scarce resources) or strategies that will definitely pin down the long-standing issues and concerns surrounding the Philippine system of higher education. In the end, however, a strong commitment to really implement what ought to be done matters much.

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ANNEX TABLES

Annex Table 1. State Universities and Colleges (SUCs) Under Review By Region

Region	SUCs
REG1	Don Mariano Marcos Memorial State University
REG1	Mariano Marcos State University
REG1	Pangasinan State University
REG1	University of Northern Philippines
REG2	Cagayan State University
REG2	Isabela State University
REG2	Nueva Viscaya State University
REG2	Quirino State College
REG3	Aurora State College of Technology
REG3	Bataan Polytechnic State College
REG3	Bulacan National Agriculture State College
REG3	Bulacan State University
REG3	Central Luzon State University
REG3	Don Honorio Ventura College of Arts and Trades
REG3	Nueva Ecija University of Science and Technology
REG3	Pampanga Agricultural College
REG3	Tarlac College of Agriculture
REG4A	Batangas State University
REG4A	Cavite State University
REG4A	Laguna State Polytechnic College
REG4A	Southern Luzon Polytechnic College
REG4A	University of Rizal System
REG4B	Marinduque State College
REG4B	Mindoro State College of Agriculture & Technology
REG4B	Occidental Mindoro National College
REG4B	Palawan State University
REG4B	Romblon State College
REG5	Bicol University
REG5	Camarines Norte State College
REG5	Camarines Sur Polytechnic Colleges
REG5	Camarines Sur State Agricultural College
REG5	Catanduanes State College
REG5	Dr. Emilio B. Espinosa, Sr. Memorial State College of Agriculture and Technology
REG5	Partido State University
REG5	Sorsogon State College
REG6	Aklan State University
REG6	Carlos C. Hilado Memorial State College
REG6	Iloilo State College of Fisheries
REG6	Negros State College of Agriculture

Annex Table 1 cont.

Region	SUCs
REG6	Northern Iloilo Polytechnic State College
REG6	Northern Negros State College of Science and Technology
REG6	Western Visayas College of Science & Technology
REG7	Cebu Normal University
REG7	Cebu State College of Science and Technology
REG8	Eastern Samar State University
REG8	Eastern Visayas State University/ Leyte Institute of Technology
REG8	Leyte Normal University
REG8	Leyte State University
REG8	Palompon Institute of Technology
REG8	Samar State University/ Samar State Polytechnic College
REG8	Southern Leyte State University
REG8	Tiburcio Tancinco Memorial Institute of Science and Technology
REG9	J. H. Cerilles State College
REG9	Jose Rizal Memorial State College
REG9	Western Mindanao State University
REG9	Zamboanga City State Polytechnic College
REG9	Zamboanga State College of Marine Sciences and Technology
REG10	Bukidnon State College
REG10	Camiguin Polytechnic State College
REG10	Central Mindanao University
REG10	Mindanao Polytechnic State College
REG10	Misamis Oriental State College of Agriculture and Technology
REG10	Northwestern Mindanao State College of Science and Technology
REG11	Davao del Norte State College
REG11	Southern Philippines Agri-Business and Marine and Aquatic School of Technology
REG11	University of Southeastern Philippines
REG12	Sultan Kudarat Polytechnic State College
REG12	University of Southern Mindanao
REG13	Northern Mindanao State Institute of Science and Technoogy
REG13	Surigao del Sur Polytechnic State College
REG13	Surigao State College of Technology
CAR	Benguet State University
CAR	Ifugao State College of Agriculture and Forestry
CAR	Kalinga - Apayao State College
CAR	Mountain Province State Polytechnic College
NCR	Philippine Normal University
NCR	Philippine State College of Aeronautics
NCR	Technological University of the Philippines

Annex Table 2. Summary of Peers, 2006
Under CRS Framework

SUCs			Peers		
1	75	42	43	74	12
2	41	12	74	68	33
3	23	74	33	75	
4	68	47	23		
5	42	74	68		
6	68	51	42		
7	74	33	46	12	41
8	39	74	65	12	75
9	42	43	12	74	
10	23	33	75	51	
11	75	51	39	33	41
12	12				
13	13				
14	12	42			
15	47	39	68		
16	68	42	22		
17	23	74	33	75	
18	74	42	12		
19	42	23	75	74	46
20	74	41	33	68	23
21	42	74			
22	22				
23	23				
24	42	12	43	74	
25	65	39			
26	33	65	46		
27	68	46	75	39	41
28	42	12	43	74	
29	39	51	68		
30	42	74	75	23	
31	42	39	46	12	68
32	74	75	43	42	12
33	33				
34	22	68	42	12	
35	47	39	68		
36	65	39	74	46	33
37	43	42	39	12	
38	12	43	74	65	
39	39				

Annex Table 2 cont.

SUCs	Peers				
40	42	12	22		
41	41				
42	42				
43	43				
44	41	75	46	68	23
45	33	39	75	46	65
46	46				
47	47				
48	39	65	75	46	33
49	33	43	51	65	
50	65	39	74	75	46
51	51				
52	65	39	74	75	46
53	75	46	65	74	
54	75	43	42		
55	46	42	75	12	39
56	41	33	68	12	74
57	23	68	51	41	
58	46	39	33	65	74
59	12	42			
60	68	39	47		
61	43	74	42	75	
62	22	68	42	12	
63	41	75	39	51	68
64	41	51	75	23	68
65	65				
66	33	46	65		
67	68	74	42		
68	68				
69	12	42	22		
70	42	43	74	12	
71	43	39	12		
72	33	65	75	39	46
73	46	12	74	75	42
74	74				
75	75				
76	39	12			
77	74	43	65	12	
78	42	74			

Annex Table 3. Summary of Peers, 2008
Under CRS Framework

SUCs		Peers		
1	64			
2	51	60		
3	51	60	64	74
4	64	60	74	51
5	64	51		
6	6			
7	51	60	64	74
8	51	74	64	
9	51	64	74	60
10	74	60	64	
11	64	74	51	
12	64			
13	51	60	74	
14	64	51		
15	64			
16	60	64		
17	51	74	60	
18	64	51		
19	51	74	64	
20	60	64		
21	64	51		
22	22			
23	60	64		
24	51	74	64	
25	64	6		
26	51	60	64	74
27	51	74	64	
28	64	74	60	
29	51	60		
30	64	60	51	
31	64	51		
32	74	60	64	
33	51	64	74	60
34	22	64		
35	51	60		
36	74	64		
37	64	74		
38	51	74	64	
39	64			

Annex Table 3 cont.

SUCs	Peers			
40	64			
41	51	60		
42	64	60	51	
43	51	64	74	
44	51	74	64	60
45	74	64		
46	64	60	51	
47	51	64	60	
48	74	64		
49	51	60	74	
50	64	74		
51	51			
52	60	64	74	
53	51	74	64	
54	51	74	64	
55	51	74	60	64
56	51	74	60	64
57	64	51		
58	51	64	60	
59	51	74	64	
60	60			
61	64	51		
62	64	51		
63	64	51		
64	64			
65	64	51		
66	60	64	74	
67	60	64		
68	64	51		
69	51	60	64	
70	74	64		
71	60	64	74	
72	64	51		
73	64	74		
74	74			
75	64	51		
76	64	51		
77	74	64		
78	64	74		

Annex Table 4. Summary of Output and Input: Original VS Targets, 2009
Under CRS Assumption

	Original Values						Targets/Projected Values					
SUCs	GRAD	ENR	RCPTIGI	TOTPS	TOTMOOE	TOTCO	GRAD	ENR	RCPTIGI	TOTPS	TOTMOOE	TOTCO
1	1,326	6,633	257,721	227,733	165,163	19,126	1,568	9,004	257,721	103,860	65,295	8,723
2	895	8,030	54,214	81,829	30,194	23,878	1,416	8,030	95,641	76,962	18,096	945
3	582	4,192	30,774	56,137	18,403	13,534	739	4,192	49,928	40,177	9,447	493
4	640	5,050	55,974	57,825	48,584	14,398	891	5,050	60,148	48,401	11,381	594
5	2,134	12,219	222,289	260,769	89,616	11,158	2,134	12,469	222,289	128,127	44,032	5,482
6	972	4,808	122,522	63,683	55,467	1,939	972	4,808	122,522	63,683	55,467	1,939
7	4,155	18,163	298,305	361,686	185,219	32,412	4,155	21,864	298,305	217,331	75,011	19,476
8	1,977	11,374	191,134	342,460	78,626	30,939	1,977	11,472	191,134	113,342	34,678	4,705
9	1,562	9,738	272,126	294,990	78,002	16,645	1,770	10,734	272,126	111,843	47,552	10,147
10	1,736	14,091	120,548	204,795	103,737	10,853	2,486	14,091	167,829	135,052	31,756	1,658
11	2,479	11,004	236,479	218,876	80,540	23,284	2,479	13,377	236,479	136,441	50,206	14,515
12	1,158	10,907	302,527	129,231	91,486	32,572	1,776	10,907	302,527	115,263	52,530	11,913
13	471	1,977	23,770	22,867	13,421	21,043	471	1,977	34,038	21,880	12,842	6,665
14	2,170	7,625	201,936	240,629	99,446	32,629	2,170	11,300	201,936	116,577	48,178	15,808
15	1,205	8,154	198,145	113,239	76,866	50,134	1,352	8,154	198,145	84,429	34,734	7,180
16	152	998	29,450	25,800	20,165	1,756	193	1,060	29,450	12,718	8,912	866
17	214	1,494	14,814	17,829	4,110	5,802	250	1,494	16,950	14,325	3,302	227
18	281	779	26,288	33,768	14,927	4,474	281	1,470	26,288	15,113	6,468	2,002
19	244	1,139	20,811	32,897	8,492	3,217	244	1,403	20,811	13,703	3,826	417
20	1,820	10,632	172,275	169,537	98,663	25,378	1,836	10,632	172,275	104,737	31,351	4,062
21	1,043	5,651	81,485	91,114	40,441	10,826	1,043	5,651	81,485	55,999	18,488	4,107
22	1,810	11,541	239,088	198,025	210,892	871	1,810	12,217	249,152	184,934	80,697	813
23	293	5,911	22,531	56,988	9,654	3,603	293	5,911	22,531	56,988	9,654	3,603
24	1,282	6,925	109,243	78,441	23,835	28,171	1,282	7,104	109,243	70,610	21,456	4,566
25	665	4,124	81,023	96,854	26,887	21,113	700	4,124	81,023	41,508	14,460	2,450
26	2,543	22,458	194,201	231,815	129,362	72,834	3,961	22,458	267,484	215,244	50,611	2,643
27	4,341	24,420	209,931	344,895	149,589	44,762	4,341	24,420	293,242	234,780	57,524	4,585
28	931	6,952	73,910	167,177	44,324	14,933	1,226	6,952	82,801	66,630	15,667	818
29	335	1,660	25,685	29,405	20,418	3,621	335	1,717	25,685	17,380	6,891	2,140
30	319	2,192	46,382	29,526	13,752	12,580	369	2,192	46,382	22,269	8,223	1,506
31	2,610	12,751	217,023	232,272	81,793	40,235	2,610	13,335	217,023	137,543	48,435	18,752
32	329	2,035	23,961	41,060	13,841	5,254	359	2,035	24,238	19,504	4,586	239
33	3,754	23,126	423,180	268,267	91,686	57,652	3,953	23,126	423,180	230,827	76,039	11,818
34	924	7,563	245,560	257,993	212,336	47,859	1,311	8,152	245,560	87,359	42,411	10,101
35	833	7,447	78,775	84,391	45,279	45,503	1,314	7,447	88,697	71,374	16,783	876
36	1,784	13,824	260,824	174,812	58,132	49,189	2,356	13,824	260,824	138,470	46,726	7,549
37	396	2,634	34,183	99,158	13,915	6,369	462	2,634	34,183	25,420	6,391	483
38	262	2,251	51,279	95,546	27,234	25,835	376	2,251	51,279	23,095	9,035	1,772
39	2,939	17,531	613,171	248,016	151,956	99,222	3,273	20,356	613,171	218,137	105,901	25,222
40	2,189	16,327	402,078	292,387	143,292	671	2,189	16,327	402,078	292,387	143,292	671
41	3,304	13,373	226,772	148,820	100,485	49,894	3,304	13,373	226,772	148,820	100,485	49,894
42	1,897	10,808	228,790	151,323	84,696	11,477	1,897	11,063	228,790	112,532	42,336	8,535
43	2,860	14,337	175,408	242,462	52,701	30,749	2,860	16,214	193,112	155,397	36,539	1,908
44	659	3,972	47,670	55,809	38,944	5,130	700	3,972	47,670	38,091	9,010	490
45	518	3,197	51,366	74,111	13,365	9,463	553	3,197	51,366	31,467	9,356	1,194
46	862	5,870	72,723	87,326	39,785	9,829	1,033	5,870	72,723	56,434	13,683	864
47	2,177	13,469	291,377	142,859	78,070	78,299	2,264	13,469	291,377	137,229	51,558	9,649
48	780	4,695	65,659	107,372	27,320	6,867	820	4,695	65,659	45,603	12,158	1,152
49	4,878	22,518	309,067	326,470	133,949	154,719	4,878	22,518	378,964	242,425	99,466	53,703
50	652	5,103	48,394	112,240	16,697	14,463	706	5,103	48,394	48,995	10,551	1,353
51	1,673	5,449	154,096	73,450	49,679	40,977	1,673	5,449	154,096	73,450	49,679	40,977
52	825	6,337	74,686	141,774	54,396	2,679	1,118	6,337	75,476	60,736	14,281	746
53	1,022	5,871	94,850	131,068	57,947	17,706	1,022	5,871	94,850	57,945	17,725	2,566
54	238	1,663	17,964	36,956	6,929	4,200	264	1,663	17,964	15,952	3,607	308
55	575	4,332	45,635	89,298	34,887	13,026	764	4,332	51,596	41,519	9,763	510
56	930	6,845	101,714	85,266	64,391	4,906	1,190	6,845	101,714	66,859	18,695	2,048
57	1,871	7,108	76,419	137,637	43,578	6,024	1,871	10,257	126,574	99,656	27,708	4,362
58	1,605	5,902	100,291	108,483	49,623	12,327	1,605	8,174	109,008	81,905	30,569	9,307
59	770	3,992	46,007	115,293	35,768	2,612	770	4,317	52,025	41,562	10,360	942
60	399	4,760	62,595	54,917	29,725	5,351	835	4,760	62,595	45,988	11,683	923
61	1,502	6,531	62,300	157,064	26,245	8,697	1,502	8,515	101,418	81,611	19,190	1,002
62	904	2,646	61,416	49,665	22,308	2,882	904	4,884	61,416	47,752	14,218	2,771
63	2,545	9,990	137,586	172,498	78,017	9,787	2,545	13,762	172,301	134,463	39,762	7,629
64	1,128	7,015	211,307	75,173	36,495	8,692	1,128	7,015	211,307	75,173	36,495	8,692
65	4,791	9,805	373,343	255,764	122,311	76,946	4,791	20,419	387,931	230,526	110,242	69,353
66	1,029	2,039	75,415	160,371	43,735	15,814	1,029	5,661	75,415	55,497	15,135	2,802
67	1,948	2,426	231,707	171,418	106,780	25,827	1,948	10,440	231,707	109,990	52,661	16,572
68	1,009	5,788	192,890	81,348	63,869	48,250	1,030	6,404	192,890	68,621	33,314	7,934
69	934	6,637	223,223	248,961	136,647	29,486	1,192	7,411	223,223	79,412	38,553	9,182
70	504	3,113	47,820	76,439	29,798	7,646	540	3,113	47,820	30,503	8,755	1,028
71	570	3,278	93,978	97,335	32,983	8,705	570	3,486	93,978	36,671	16,350	3,640
72	927	5,838	80,309	113,666	33,359	21,622	1,021	5,838	80,309	56,623	14,901	1,350
73	846	5,028	48,840	60,701	21,319	5,071	887	5,028	59,886	48,190	11,331	592
74	919	2,666	43,490	48,197	12,489	43,920	919	2,666	43,490	48,197	12,489	43,920
75	985	5,612	130,293	134,233	49,124	20,031	985	5,877	130,293	60,072	23,007	4,404
76	3,902	22,121	263,470	212,014	49,852	2,603	3,902	22,121	263,470	212,014	49,852	2,603
77	532	2,776	44,259	58,056	15,737	5,961	532	3,054	44,259	29,763	8,159	845
78	491	2,913	44,462	63,683	17,152	3,749	505	2,913	44,462	28,526	8,146	944

Annex Table 5. Summary of Output and Input: Original VS Targets, 2009
Under VRS Assumption

	Original Values						Targets/Projected Values					
SUCs	GRAD	ENR	RCPTIGI	TOTPS	TOTMOOE	TOTCO	GRAD	ENR	RCPTIGI	TOTPS	TOTMOOE	TOTCO
1	1,326	6,633	257,721	212,222	37,460	3,002	1,477	10,414	257,721	84,694	14,950	1,198
2	895	8,030	54,214	80,144	9,667	4,478	1,314	8,030	150,308	74,662	9,006	2,985
3	582	4,192	30,774	55,382	8,877	3,012	955	4,192	104,755	34,987	5,608	1,903
4	640	5,050	55,974	56,391	23,764	4,531	978	5,050	131,475	33,957	7,135	2,728
5	2,134	12,219	222,289	247,375	49,364	3,009	2,134	12,219	265,524	109,695	20,106	1,334
6	972	4,808	122,522	48,417	5,901	216	972	4,808	122,522	48,417	5,901	216
7	4,155	18,163	298,305	341,892	76,573	3,012	4,155	18,163	298,305	209,266	31,722	2,589
8	1,977	11,374	191,134	342,460	51,451	1,440	1,977	11,374	244,812	108,973	16,372	458
9	1,562	9,738	272,126	275,490	41,648	345	1,968	12,246	272,126	117,097	17,702	147
10	1,736	14,091	120,548	200,487	31,882	4,438	2,124	14,091	260,917	117,494	18,684	2,601
11	2,479	11,004	236,479	186,013	26,075	2,381	2,479	11,562	236,479	131,209	18,393	1,679
12	1,158	10,907	302,527	64,497	15,305	2,837	1,158	10,907	302,527	64,497	15,305	2,837
13	471	1,977	23,770	22,867	5,451	12,012	471	1,977	32,815	16,472	3,039	3,007
14	2,170	7,625	201,936	217,049	36,287	2,799	2,170	7,625	201,936	98,635	16,490	1,272
15	1,205	8,154	198,145	82,538	17,145	8,693	1,205	8,154	200,567	54,732	11,369	4,045
16	1,851	10,504	198,145	310,510	64,364	3,371	1,851	10,504	233,173	95,513	16,609	1,037
17	152	998	29,450	25,800	4,320	1,742	152	998	29,450	25,800	4,320	1,742
18	214	1,494	14,814	13,829	2,335	3,012	214	1,494	14,814	13,829	2,335	3,012
19	281	779	26,288	31,885	4,200	4,249	305	1,839	26,288	17,261	2,714	2,746
20	244	1,139	20,811	31,062	3,199	2,993	316	1,941	29,346	18,496	2,816	2,635
21	1,820	10,632	172,275	148,070	44,676	1,201	1,820	10,632	237,620	97,685	15,798	792
22	1,043	5,651	81,485	74,135	11,035	3,012	1,043	5,651	133,981	47,930	7,134	1,947
23	1,810	11,541	239,088	198,025	29,875	871	1,810	11,541	262,914	105,616	15,161	465
24	293	5,911	22,531	56,988	9,654	3,603	1,064	5,911	138,181	45,247	7,665	2,861
25	1,282	6,925	109,243	73,417	6,879	3,033	1,282	6,925	109,243	73,417	6,879	3,033
26	665	4,124	81,023	84,237	8,082	2,900	779	4,124	83,125	41,886	4,893	1,756
27	2,543	22,458	194,201	231,815	48,567	2,088	2,543	22,458	194,201	231,815	48,567	2,088
28	4,341	24,420	209,931	344,895	49,060	11,236	4,341	24,420	209,931	344,895	49,060	11,236
29	931	6,952	73,910	166,038	22,566	3,903	1,153	6,952	160,347	62,442	8,486	1,468
30	335	1,660	25,685	28,031	5,144	3,012	335	1,660	33,853	21,590	3,562	2,320
31	319	2,192	46,382	26,642	9,205	12,400	681	2,274	46,382	18,131	3,363	2,924
32	2,610	12,751	217,023	132,272	21,793	18,851	2,610	12,751	217,023	121,241	19,976	5,303
33	329	2,035	23,961	37,496	4,597	2,686	470	2,613	51,183	25,508	3,539	2,068
34	3,754	23,126	423,180	141,063	39,649	30,117	3,754	23,126	423,180	141,063	39,649	30,117
35	924	7,563	245,560	254,993	43,519	25,859	1,099	8,977	245,560	59,408	12,329	2,008
36	833	7,447	78,775	83,848	15,640	3,012	1,067	7,447	196,288	53,615	10,001	1,926
37	1,784	13,824	260,824	150,525	24,739	3,345	2,024	13,824	271,045	112,414	18,475	2,498
38	396	2,634	34,183	88,199	10,097	5,007	522	2,840	58,566	27,879	3,784	1,876
39	262	2,251	51,279	88,303	7,384	19,067	754	2,395	51,279	18,799	3,522	2,910
40	2,939	17,531	613,171	156,317	47,396	14,022	2,939	17,531	613,171	156,317	47,396	14,022
41	2,189	16,327	402,078	153,100	54,548	671	2,189	16,327	402,078	153,100	54,548	671
42	3,304	13,373	226,772	133,445	33,232	2,646	3,304	13,373	226,772	133,445	33,232	2,646
43	1,897	10,808	228,790	103,528	28,035	2,833	1,897	10,808	246,395	86,485	20,221	2,367
44	2,860	14,337	175,408	190,829	29,946	6,204	2,860	14,337	206,821	136,806	21,468	4,448
45	659	3,972	47,670	48,030	23,347	2,367	945	3,972	99,239	34,620	5,273	1,706
46	518	3,197	51,366	64,328	6,803	5,523	564	3,197	51,366	32,268	3,870	2,629
47	862	5,870	72,723	82,005	11,268	4,417	1,106	5,870	123,132	51,255	7,043	2,761
48	2,177	13,469	291,377	129,957	17,577	0	2,177	13,469	291,377	129,957	17,577	0
49	780	4,695	65,659	85,302	9,292	2,195	909	4,695	101,231	47,861	5,500	1,299
50	4,878	22,518	309,067	316,725	76,055	127,545	4,878	22,518	309,067	316,725	76,055	127,545
51	652	5,103	48,394	101,128	11,961	4,479	1,075	5,103	102,832	49,663	5,874	2,200
52	1,673	5,449	154,096	69,357	18,264	6,016	1,673	5,599	154,096	58,508	12,713	5,075
53	825	6,337	74,686	138,004	24,872	2,679	1,019	6,337	167,746	51,637	8,305	1,002
54	1,022	5,871	94,850	124,252	43,573	2,833	1,022	5,871	152,956	48,916	7,824	1,115
55	238	1,663	17,964	32,336	6,089	3,660	268	1,663	29,667	20,811	3,283	2,356
56	575	4,332	45,635	85,319	20,180	9,795	575	4,332	95,032	29,027	6,807	3,332
57	930	6,845	101,714	85,266	13,856	4,906	1,119	6,845	157,054	53,283	8,659	2,920
58	1,871	7,108	76,419	137,637	23,069	6,024	1,871	7,108	134,290	74,312	12,455	3,252
59	1,411	6,939	124,561	195,507	27,742	3,012	1,411	6,939	135,020	67,284	9,547	1,037
60	1,605	5,902	100,291	95,306	11,347	1,032	1,605	8,576	150,224	84,510	10,794	982
61	770	3,992	46,007	111,802	16,108	2,612	797	3,992	96,262	39,739	5,031	928
62	399	4,760	62,595	30,773	10,345	5,351	399	4,760	62,595	30,773	10,345	5,351
63	1,502	6,531	62,300	143,448	15,425	3,012	1,502	8,072	134,904	81,587	9,426	1,841
64	904	2,646	61,416	20,180	3,852	2,882	904	2,646	61,416	20,180	3,852	2,882
65	2,545	9,990	137,586	157,205	25,840	2,772	2,545	9,990	196,478	116,359	19,126	2,052
66	1,128	7,015	211,307	59,348	22,803	3,007	1,128	7,722	211,307	51,628	11,246	2,616
67	4,791	9,805	373,343	206,783	37,579	2,672	4,791	9,805	373,343	206,783	37,579	2,672
68	1,029	2,039	75,415	155,755	15,359	4,566	1,029	4,721	102,129	46,634	5,566	1,655
69	1,948	2,426	231,707	157,722	23,261	5,396	1,948	10,028	231,707	101,119	14,913	1,119
70	1,009	5,788	192,890	75,066	21,395	2,539	1,044	7,179	192,890	51,493	9,738	1,742
71	934	6,637	223,223	244,387	43,232	4,063	1,265	8,746	223,223	70,049	12,392	1,165
72	504	3,113	47,820	68,583	6,410	3,012	575	3,113	63,186	30,877	4,010	1,884
73	570	3,278	93,978	91,475	12,671	1,612	728	3,683	93,978	41,145	5,347	725
74	927	5,838	80,309	105,621	13,476	6,075	1,130	5,838	114,530	53,041	6,767	2,955
75	846	5,028	48,840	45,337	11,846	4,024	846	5,028	127,759	32,917	7,211	2,922
76	919	2,666	43,490	38,253	6,927	43,012	919	2,794	63,048	21,947	3,974	2,886
77	985	5,612	130,293	115,831	13,215	1,501	1,070	5,612	130,293	55,838	6,690	760
78	3,902	22,121	263,470	212,014	29,220	2,603	3,902	22,121	263,470	212,014	29,220	2,603