Productivity in Higher Education

Research insights for universities and governments in Asia

First published in Japan by
Asian Productivity Organization
Leaf Square Hongo Building 2F
1-24-1 Hongo, Bunkyo-ku
Tokyo 113-0033, Japan
www.apo-tokyo.org

CONTENTS

LIST OF TABLES

LIST OF FIGURES

FOREWORD

Higher education has a significant role to play as Asia grows and develops. Through teaching and research, educational systems and institutions must build workforce capacity, create knowledge, engage with industry, and contribute to social prosperity. These are major, complex challenges. It is vital that they are addressed in the most effective ways.

Scientific research on higher education creates insights that can make a real difference to leadership in the sector and its social contributions. Improving productivity lies at the heart of any advances, and it is for this reason that that the APO commissioned research in this field. The APO expects this research to make a major global contribution, given the growing importance of the higher education sector and the relatively scarce research available on productivity in it. Building better scientific foundations for such study has enormous potential to improve policies and practices.

Planning for this research commenced in 2013 with a workshop involving 15 countries. In 2015, the APO launched its pioneering nine-country project to measure productivity in higher education. Those involved examined the concepts of productivity and its application to higher education, agreed on the key productivity indicators in assessing the productivity levels of academic institutions, and made proposals for enhancing the productivity of higher education in general. This report contains the outcomes of this research and offers foundations for subsequent development. The first chapter introduces and positions the research. The next nine chapters reveal insights into a series of technically aligned national studies of member countries Cambodia, Fiji, India, Indonesia, Malaysia, Pakistan, the Philippines, Sri Lanka, and Thailand. The final chapter synthesizes the insights and charts future steps. The APO is very grateful to Professor Hamish Coates of the Centre for the Study of Higher Education, University of Melbourne, Australia, who served as the chief expert for this volume.

The study makes six recommendations for the APO and member countries. These recommendations clarify the value of productivity research in higher education, the need for policy leadership, the requirements for technical development and managerial innovation, and, most importantly, the necessity of developing specialized experts and networks.

The APO is delighted to sponsor this work and looks forward to seeing it shape and impact the future of this new and expanding field. Transparent leadership in first-rate education and research on it are essential if higher education is to make much-needed economic and social contributions.

Dr. Santhi Kanoktanaporn
Secretary-General
Tokyo
October 2017

EXECUTIVE SUMMARY AND RECOMMENDATIONS

Nations across the globe increasingly recognize higher education as a key driver of economic competitiveness. The growing significance of higher education has spurred a heightened interest in the costs and returns of education and research. This amplifies interest in productivity, which stimulates substantial interest and debate in many areas of higher education.

Yet, surprisingly, little research has been conducted to develop methods and insights for understanding and improving higher education productivity in its various forms, including teaching and research. Most existing work has been funded for political, advocacy or commercial purposes, and it is common for research to misapply general productivity models to higher education, thereby hindering effective analysis and development of methods relevant to the roles of universities.

Building better scientific foundations for the study of higher education productivity carries the potential to improve policy and practice. So understanding and improving the productivity of higher education is of growing sectoral and broader relevance to Asia, given that higher education is playing an increasingly important role in the region. With the center of higher education gravity shifting eastward, Asia now has more higher education students and a growing research impact.

The Asian Productivity Organization (APO) has shown considerable leadership by building policy and research into the productivity of higher education. The APO members have shown foresight in spotting the growing significance of higher education for their economies and the need for productivity information and improvement in the sector. In 2013, the APO convened a workshop in Yogyakarta to train experts from 15 countries and to scope appetite and settings for research in this field. The workshop proved the value of the topic; helped map out areas for focus and development; established interest across member countries; and generated a momentum within the APO itself. Outcomes fueled the APO's plan to conduct further research on the topic.

In 2015, the APO launched a pioneering nine-country project to measure productivity in higher education. This research aimed to look into the concepts of productivity and its application in higher education; to agree on the key productivity indicators in assessing the productivity level of academic institutions; and to recommend proposals that would enhance the productivity outcome of the higher education sector in general. The project involved background planning, background research, a coordination launch meeting, in-country research, country visits, and synthesis and documentation.

Broadly, the research was designed, executed and delivered with the intention of spurring momentum as well as intellectual, institutional and political outcomes and impacts, including:

- Focusing the attention and energy of institution leaders and government policymakers on improving the productivity of higher education.
- Raising the prominence of this field of research, and of cross-national policy research on higher education in Asia.

- Laying foundations for this young field and identifying key areas for future development.
- Building a community of experts to sustain ongoing dialogue, research and development.

The key accomplishments are presented in this book-long report, which through its 11 chapters, documents what is arguably the largest international research yet on the phenomenon. This report charts productivity developments over the last decade; validates and deploys an econometric model to expose empirical trends and underpin future planning and research; and forecasts developments likely to spur further advancements in the next five years. The report reveals insights from each of the nine countries, and the final chapter takes stock of the research's progress and implications. The chapters furnish myriad insights into the past and future development of several fast-growing higher education systems. More importantly, they help clarify and position the questions and considerations that would frame what would appear to be a substantial and growing new field of work.

The research produced initial and hopefully formative insights into the technical validity and practical value of this work. Toward that end, six concrete recommendations are made for the APO and its member countries, as summarized below.

The research conducted for this study affirmed that the information generated through productivity modeling has the potential to be of practical value for national policymakers and institutional leaders alike. Even when data and reports don't exist, the ideas frame conversations, which are seen to be helpful to understand and advance national and sector-specific agendas. While there has been marked expansion in many of the systems analyzed in this study, there now seems value in directing greater energy and investment into the quality and impact of higher education and research. This must involve consultation with higher education stakeholders.

Recommendation 1: Asian countries should conduct research and development into higher education productivity.

The research seemed feasible politically. Governments and other political actors in Asia have demonstrated interest in engaging with the productivity agenda. Given the extent of international engagement in the current study, signs of increasing feasibility for continued research on higher education productivity are encouraging. The APO has scope to play a major role in steering future intergovernmental development.

Recommendation 2: The APO should progress its leadership of this growing field by sponsoring work that spurs political, technical, and practical development.

Technical feasibility can be affirmed via acceptance of the model and indicators among contributing experts. All participating experts affirmed the model used in this research and its underpinning assumptions and limitations. There remains substantial room for further development, ranging from actuarial work required in procuring and validating data, and econometric work in refining and embellishing the model, to broader analytical work regarding reporting and interpretation, and even broader governance work regarding quality control and monitoring implications.

Recommendation 3: Researchers should further develop and document methodologies, especially the production functions and indicators.

Technically, the greatest barrier remained the non-availability and non-specificity of data required to underpin the indicators, particularly when it comes to data on research and actual expenditures. It appears that only in a few instances sector-wide data was available in the existing databases. The specificity of data was also inadequate. Institutional funds used for research- or education-related expenditure are not always labeled separately. Implementing activity-based costing (ABC) has an important role to play in establishing new evidence-based management.

Recommendation 4: Governments and institutions should build infrastructure to measure, analyze and report the productivity of education, and of research, at departmental, institutional and national levels.

An important practical consideration regarding the feasibility pertains to the people available to lead and do the work. Given the continuing growth of higher education, the formation of relevant professional capability is an urgently priority. This implies an immediate need to train and engage experts.

Recommendation 5: Online training resources and regional platforms should be developed to train people and establish networks to boost capability in key areas such as institutional research, productivity evaluation, and benchmarking.

Of course, the assessment and reporting of productivity statistics is only the technical part of a much broader agenda to improve higher education. Policy and management reforms are critical. More than improving the efficiency of existing processes, it is important to change the ways in which education and research are produced. In many aspects, these activities are diverse and contextualized, as the chapters in this report would show. However, insights leading to reforms that are particularly effective and generalizable, cross-institutionally as well as internationally.

Recommendation 6: Key productivity initiatives, such as activity-based costing, course redesign, and student engagement, should be trialled at select flagship institutions.

This research has charted a large new field with many dynamic actors and moving parts. The important next steps are to build infrastructure;ignite a small suite of well-positioned and high-yielding initiatives;and, critically,build communities and networks. This work is highly multilevel and multilateral in nature, requiring work within departments, institutions, and countries. It also requires leveraging any opportunities of cross-national collaboration. Even with the most concerted progression, initiatives of this kind, scope and scale tend to take at least five years to find a sustainable momentum.

Professor Hamish Coates
Chief Expert

CHAPTER 1
DECIPHERING HIGHER EDUCATION PRODUCTIVITY

Kenneth Moore, Hamish Coates, Gwilym Croucher
University of Melbourne, Australia

EXECUTIVE SUMMARY

The APO launched a landmark project to develop research in the field of higher education productivity. The first section of this chapter defines the project's topic and associated concepts and contexts. The next section reviews the background to the project, which is documented in this report, and charts its focus and scope. This is followed by a discussion of the general analytical framework that shapes the inquiry, the research approach, and the structure of this report. Most broadly, the chapter demarcates key ideas and boundaries of the study, and highlights the value of progressing contextualized scientific studies of productivity in higher education.

INTRODUCTION

Countries across the world increasingly recognize higher education as a key driver of economic competitiveness. The OECD, in 2008, presented extensive evidence of higher education's direct benefits to the society. It asserted that, in aggregate, those benefits drove economic performances. The benefits include both monetary and non-monetary gains for individuals, as well as external public benefits. From a financial standpoint, empirical evidence [7] demonstrates that, both across countries and over time, individuals who graduate from higher education institutions (HEIs) earn more money post a graduation than the non-graduates [33].

A comprehensive study[21] of 14 nations, from 1982 to 2005, confirmed that the national GDP increased when larger shares of the workforce held tertiary degrees. This finding fitted well with the standard labor market theory and the human capital theory, as output per employee in the 14 countries also increased significantly with larger shares of the workforce holding tertiary degrees. Similar patterns emerged in a study of six European countries, where labor productivity also increased significantly with higher rates of tertiary degree attainment [15]. University education and research is playing an increasingly significant role in Asia, as is Asia in the field of higher education.

The growing significance of higher education spurs much greater interest in the costs and returns of education and research. This amplifies the interest in productivity, a matter that stimulates substantial interest and debate in many areas of higher education. Yet, surprisingly, little scholarly research has been conducted to develop methods and insights for understanding and improving higher education productivity in its various forms, including teaching and research. Most existing work has been funded for political, advocacy

or commercial purposes, which makes it is common for research to misapply general productivity models to higher education. This hinders effective analysis and development of methods relevant to the roles of universities. As charted in the pioneering work of Massy, which frames much of the design and delivery of this project [25], building better scientific foundations for the study of higher education productivity, carries the potential to improve policy and practice.

Understanding and improving the productivity of higher education is of growing sectoral as well as broader relevance to Asia and the world. Higher education is playing an increasingly important role in Asia. Between 1980 and 2050, the center of higher education gravity is being seen as shifting eastward, and Asia now has more higher education students and a growing research impact (Figure 1). In summary, there are a plethora of growing rationales to care about the productivity of higher education, such as:

- The higher education sector is growing in scale and significance in many economies.
- Most traditional academic approaches do not scale well, thus escalating costs and spurring a need for new education and associated business models.
- The growth in scale is creating affordability constraints for governments, and in many countries, more private forms of finance are being sought.
- Institutional leaders are examining pricing scenarios to maximize new revenues from tuition fees.
- Regulators are striving to understand the economies of higher education to prevent institutions from price gauging.
- Cross-subsidizations inherent in traditional university models are becoming harder to justify in more transparent contexts.

Country	1991	1999	2002	2004	2008
Indonesia	9		15	17	21
Malaysia	8	23	29	31	32
Thailand		32	38	41	45
Viet Nam	2	11	10	10	
China	3	6	13	18	23
India	6		11	12	13

Figure 1: Higher education gross enrollment ratios in selected Asian countries
Source: http://uis. unesco. org

Before discussing the research in more detail, it would be helpful to briefly state what is meant by productivity. In common parlance, productivity is about doing more, better, and faster, for less. Scientifically speaking, the basic idea is that productivity (P) involves increasing outputs (O) relative to inputs (I), by either increasing outputs or reducing inputs or both, which leads to the formulation P = O / I.

Although productivity studies seek to optimize output-input ratios, and expenditure is a common input factor, it is important to distinguish between optimizing productivity and minimizing costs only. In case of higher education, cost containment has become a politically

charged issue. That is why it is important to measure productivity in terms of alternative, non-monetary inputs as well.

The conventional assumption for productivity studies is to recognize a given, already constrained set of inputs for which the institution attempts to maximize its deliverables. Productivity makes an inherent reference to quality in the sense that productivity has little meaning without quality. The qualities of inputs and outputs must be taken into account for a comprehensive institutional productivity analysis, while noting that productivity can vary at different quality levels or in different contexts. This note regarding quality touches upon an important aspect of productivity which is addressed later; that while conclusions about productivity may or may not explicitly indicate quality, it is imperative not to fixate on productivity as an isolated, mathematical and decontextualized concept. Productivity indicators inherently reflect quality analyses, and vice versa.

This research was initiated by the APO. The APO members spotted the growing significance of higher education for their respective economies and acknowledged the need for productivity information and improvement in the sector. As the next section conveys, the APO then played a key role in engaging people from the member countries, particularly in selecting the national experts from the countries participating in this research. As the biographies of the chapter authors convey, the research has captured diverse perspectives including of those employed by the higher education providers; experts from education, industries or employment ministries; executives at apex bodies or non-governmental organizations; public policy researchers, and of course, those from national productivity organizations.

Drawing people from diverse organizations and roles is common in any reasonably new field of endeavor such as this. What unifies these people is a core interest in improving the productivity of higher education. As we chart in the concluding chapter, this sets the foundation for future research, roles and institutions.

THE BACKGROUND

All research and development (R&D) pertaining to productivity of higher education can be divided into two broad types. The first one is largely technical and typically econometric in nature, and focuses directly on productivity as the object of analysis. The second type of work focuses on productivity-related initiatives. These could be diverse, and range from international developments, national policy, institutional strategy, the nature of academic workforce and roles, and the ways in which students are engaged. The current state of research was shaped and positioned through decades of analyses and discussions of all types of productivity-related R&D. It was built upon prior studies in general productivity [31–32]; studies of higher education funding and outcomes [17, 25, 30]; innovations regarding tertiary performance [38]; and analyses of institution costing and reforms [24]. This broad analytical reach was adopted to ensure that the study made contributions of a technical, empirical and practical nature, which could improve future scholarship and work. This perspective affirms productivity as a matter that is everyone's business, not just a matter for an isolated group of technocratic analysts.

While the study and development of productivity is an ongoing business, the proximal foundations of the current research can be traced back to three years. During 7–11 October 2013, the APO, in collaboration with the Indonesian Ministry of Manpower and Transmigration convened a workshop in Yogyakarta on Raising Productivity in Higher Education. This workshop touched upon the concepts and approaches in measuring productivity in higher education; assessing institutional performances; the importance of higher education for the future socioeconomic development of the region; models and approaches in improving productivity in higher education; trends and issues facing higher education in Asia; and enhancing the relevance of higher education to job market requirements. The participants represented 15 countries, and contributions were made by experts from Australia, Indonesia, Philippines and the United States (Figure 2). The workshop proved the value of the topic, and helped map out areas for focus and development. It also established interest across the APO member countries while creating the momentum within the APO itself. The outcomes led to the APO planning to conduct further research on the topic.

Figure 2: Participants at the APO workshop, Yogyakarta, 2013

After a planning and consultation process, a pioneering project was launched in 2015 to conduct research on measuring productivity in higher education. As the following sections, and the subsequent chapters of this report detail, this project involved background planning, background research, a coordination launch meeting, in-country research, and synthesis and documentation. Building upon prior large-scale work done in Europe and the USA, this project has delivered what is arguably the largest-yet research on the phenomenon. This report details the research, and is drafted with the intention of making a baseline and formative contribution to this new field of research.

THE RESEARCH FOCUS AND SCOPE

Given the scarcity of prior work in this field, there is a need to carefully design the focus and scope of the research to ensure achievability and impact. As the above remarks convey, productivity is a very broad notion that potentially touches upon every facet of higher education, and without careful guidance, a research has the potential to wander aimlessly in interesting but unfruitful directions. For instance, a research might focus on the contribution made by the higher education sector to national productivity, or internationally to a particular industry or a profession. The focus might be directed at institutions or the disciplines within institutions, at departments, or at individual teachers, researchers or students. Given the rising stakes in higher education, making progress on all of these fronts is important but impossible to accommodate within the constraint of a single project. Accordingly, the APO, the Chief Expert (Prof. Hamish Coates) and the national experts made a series of decisions on how to focus and scope the project to ensure its achievability and maximize its contribution.

This was specified by the APO in its project notification [3]:

This research aimed to look into the concepts of productivity and its application to higher education, agree on the key productivity indicators in assessing the productivity level of academic institutions, and recommend proposals that will enhance the productivity outcome of the higher education sector in general.

Specific research objectives were clarified during the formative stages of the project to include:

- Development and testing of technical models of productivity for both education and research.
- Collection of insights from diverse institutions and countries, and different types of higher education institutions.
- Analyses of national and institutional correlates of productivity for both education and research.
- Distillation of suggestions for improving policy and practice, both at the local and global levels.

These objectives led to specification of research outputs, anticipated outcomes, and impacts. The interim and final outputs include:

- Development of background materials and a research framework.
- Coordination meeting in Bangkok from 23 to 27 November 2015 involving the APO, the Chief Expert, and the national experts.
- Provisioning of ongoing coordination and advice to the national experts.
- Reviews of draft country chapters.
- Preparation of the final APO report.

The research was designed, executed and delivered with the intention of spurring several major intellectual, institutional and political outcomes and impacts, including:

- Focusing the attention and energy of higher education institution (HEI) leaders and government policymakers on improving the productivity of higher education.
- Raising the prominence of this field of research, and of cross-national policy research in higher education in Asia.
- Laying the foundations for this new field of research and identifying key areas for future development.
- Building a community of experts to sustain ongoing dialogue, research and development.

As these specifications convey, the research concentrated on what may be characterized as the microeconomic facets of a broader productivity agenda. This treats the HEI as the primary focus of analysis, though other analytical frames may also be considered. Productivity is a phenomenon that calls for quantitative inquiry, but to have resonance with HEIs, it must touch upon many broader and non-quantitative internal and external matters.

Before turning to explicate the research designs and methods it is important to clarify a few matters which were explicitly deemed out of scope of this work. As it embraces core facets of higher education, a common criticism (typically from people/organizations with vested interests in current arrangements) is that the study of productivity should be deferred until comprehensive inquiry is possible. However, the pragmatic approach adopted for this study not only saw the dangers associated with stasis but also foresaw the value in taking concrete steps ahead, despite the limitations. Nonetheless, it was vital to be aware of the limitations. The general constraints are presented below, while the more specific ones constraints are noted in the respective country chapters.

A decision was made to focus on the academic functions of higher education rather than the broader macroeconomic dividends of higher education as a sector. There is a substantial amount of research that demonstrates the socioeconomic value of higher education [18], but not enough analysis exists on the nature and returns of academic productivity. A better understanding of the latter is essential to driving future performance.

Also, a decision was made not to focus on the external engagement or institutional service functions of higher education, as that would have led to technical complexities around data and modeling. There are varying arguments on how these functions are positioned alongside the core academic functions but those are not resolvable within the scope of this research.

The study also had limitations in terms of consultation and communication. The number of country visits, for instance, was limited. During the course of the research, the Chief Expert visited just three countries, Thailand, Indonesia and India. These visits were for national and international meetings and not intended to afford in-depth consultation or analysis. Similarly, there was a varied but overall limited consultation between the national experts and the HEIs, be it with the senior executives, the faculty or the students.

In terms of its outcomes, the study has not sought to procure or establish any kind of 'baseline figures' on the productivity of HEIs or national systems. The empirical findings do

shed light on the state of play in the represented HEIs and the countries, but it is important to emphasize that this study attempts to gauge feasibility rather than deliver conclusive baseline estimates. Other than advising the national experts along the way, there has been very little capacity to conduct quality assurance to ensure the integrity or comparability of data. Obviously, this would be required in any study which sought to establish a baseline data.

Technically too, the research was constrained in several ways. First and foremost, it is important to make it clear that the research did not engage with the full complexities of the HEIs. A pragmatic decision was made to adopt a parsimonious model, which provided robust foundations for analysis and also offered the potential for future elaboration. The model made several assumptions that are sketched in the next section. Several further technical limitations and complications were specified or acknowledged, such as the appropriateness of focusing on a subsector, a small number of institutions, or only a sample of the full basket of indicators where data was a problem.

ANALYTICAL FRAMEWORK

An analytical framework was built to guide the research. This characterized productivity as involving three inter-related dimensions, namely the contextual, the technical, and the managerial dimensions. The contextual dimension is concerned with matters external to HEIs such as the socioeconomic settings, and the political and policy developments. The technical dimension is econometric in nature and is focused on indicators, metrics, algorithms and reports. The managerial dimension is focused on international HEI strategies and practices. Only by embracing all these dimensions is it possible to get a sense of the drivers, stakeholders, interests and trends relevant to productivity.

The contextual and managerial dimensions of productivity include a broad range of social, governmental, commercial and institutional aspects. For instance, a brainstorming of potential factors at the Bangkok Coordination meeting in 2015 identified a wide range of topics. These include strategic planning, regulatory reform, funding reform, new technology, assessing outcomes, course redesign, private institutions, governance, value-added learning, activity-based costing, service improvement, admissions reform, education analytics, benchmarking, student engagement, transparency metrics, inclusiveness, retention, system architecture, PhD graduation, target setting, and workforce redesign. Particularly, an emphasis was placed on the important role of course redesign and activity-based costing [25]. While the higher education research and management literature is replete with examples, for the purpose of this research, the national experts were given an exploratory and open brief that invited them to review those matters of relevance to advancing productivity pertaining to the last decade, and the next five years.

The technical dimension required more precise specification. Theorists and practitioners have developed a number of approaches for studying productivity, which is about comparing a firm's or an industry's relative output to its input. Different industries and different firms, however, often produce unique outputs and require specific inputs, which must be accounted for in any accurate assessment of productivity. Most frequently, inputs are represented by

some measure of a firm's or industry's labor and capital. Outputs are often represented by measures of sales and units produced [5].

Although technical approaches may on initial inspection seem insufficient for accurately capturing the productivity in higher education, it is worth highlighting how flexibly different industries have deployed production-function studies to capture very different types of activities, inputs and outputs. Bairam [6] describes numerous productivity studies from different economic sectors. Manufacturing industries often use total book value of capital stocks, along with the total number of full-time and part-time employees to represent inputs. Output may be represented by a measure of 'value added. ' Alternatively, hospital efficiency outputs have been indicated using total outpatient visits against the inputs of hospital size, total staff, and total assets [28]. The professional sports industry often examines individual team performances with points scored and match statistics to represent outputs and inputs, respectively [6, 12, 40].

Input-output studies allow for the estimation of production functions using statistical analysis. Production functions conventionally signify the maximum possible output that could be produced for a given, fixed amount of input [5]. Individual firms and industries may use various production functions to identify optimal production frontiers, so as to compare actual performances with a hypothetical optimal performance. Production frontiers, however, portray static conditions using sets of assumptions that hold numerous other variables constant. This limitation is partially solved by measuring year-on-year productivity changes, or the rate of technical progress. Measuring productivity change is also referred to as growth accounting [11]. This type of productivity measurement has proven highly useful and reliable for numerous industries and is recommended by OECD [31–32].

The United States Bureau of Labor Statistics [10] also employs productivity change and growth accounting methodologies for industry productivity measurements. The specific calculation is called the Tornqvist chain index, which measures multi-factor productivity (MFP). Its widespread use in productivity change measurement can be attributed to its accessibility, and more importantly, to its uniquely accurate and generalizable results, as shown by Caves et al. [14]. Tornqvist indices are calculated using weighted averages of the growth rates of the index components. The index itself represents a percentage change in a given input, output, or a set of inputs and outputs. The following example shows the calculation of an input index, Xt from year t-1 to t, using the capital (K) and labor (L) components:

$$\log(X_t) = \left(\frac{S_{K,t} + S_{K,t-1}}{2}\right) * \log\left(\frac{K_t}{K_{t-1}}\right) + \left(\frac{S_{L,t} + S_{L,t-1}}{2}\right) * \log\left(\frac{L_t}{L_{t-1}}\right) \quad [1]$$

$S_{K,\,t}$ represents the share of capital costs at time t, or capital costs divided by total costs at time t. $L_{K,\,t}$ represents the share of labor costs at time t, or labor costs divided by total costs at time t. The final MFP change index, Q_t from time t-1 to t, takes an output index Y_t, which is calculated in the same fashion as X_t, and divides the output index by the input index, as shown in the equation below:

$$Q_t = \frac{Y_t}{X_t} \quad [2]$$

Some of the foremost productivity research in the field of higher education, conducted by the United States National Academy of Science (NAS), recommends Tornqvist indexing as the standard methodological approach for analyzing higher education productivity and productivity change [37]. The basic higher education MFP model developed by the NAS is further explained and summarized by Massy et al. [26]. Under this model, higher education outputs are combined into a single measure that incorporates instructor delivery of courses and student degree completions. Inputs include labor, capital, and intermediate operational materials and activities. These are represented most commonly within the NAS model by the total expenditures on each input [26].

The NAS model was tailored for the USA's higher education system. The model's input as well as output specifications reflect accounting and measurement techniques specific to the USA. The current study generalizes the NAS model to align with diverse higher education systems worldwide. The new model differs from that of the NAS in three fundamental ways:

1. Education output is calculated based upon the student load.
2. Research output indicators are added.
3. Financial inputs are not apportioned by the academic function.

First, this study internationalizes the base NAS education output indicator by designating the primary function output as the total number of full-time equivalent students (FTEs) in a given year, instead of the USA's 'credit hours. ' The USA universities associate each subject with an assigned number of credit hours or points, which are loosely determined by how much time students should spend attending lectures for that subject during a given week. The full- or part-time status of the students is determined by the number of credit hours they take. Thus, an institution's total annual student load, or total number of FTEs per year, directly indicate how many subjects the institution is currently delivering. Internationally, although subject point calculation methodologies vary, most institutions track their annual student FTEs, so this indicator allows enough consistency and accuracy across countries to represent total output of education delivery during a given year.

The NAS model calculates a number of 'adjusted credit hours' for its final function output for education, which also accounts for the total number of graduate completions by coursework during the same year. The proposed extension also accounts for graduate completions by coursework and calculates 'adjusted FTEs' in the same manner and is described below [26].

Second, this study expands the NAS model by incorporating outputs relating to the research function of higher education. Five potential research outputs seem feasible, based on the broader work [18] and the validation conducted in the current program of research. These are publications, citations, patents, research completions, and research funds. The scientific field of research assessment and evaluation is large and growing, so for future research it would be necessary to go into further details regarding the nature and specification of each of these potential indicators.

Third, the incorporation of research output affords further generalization of the input-side of the NAS model. The financial inputs for the NAS model rely on a unique university accounting initiative in the USA called the Delta Cost Project, in which institutional costs are tracked with respect to academic functions such as education, research or administration [37]. Thus, the financial inputs in the NAS model include only direct costs attributed to education activity. However, most countries HEIs do not employ such methodologies for tracking or estimating costs by academic functions. By incorporating both education and research output indicators, the current study's model allows for inclusion of financial inputs that need not be separated by academic functions. The primary input categories for the current study's model are the same as the NAS model, namely, labor, capital, and operational, but costs associated with these inputs are not divided by the academic functions. The current model assumes that all costs, direct or indirect, are reflected in education and research outputs.

Table 1 describes input indicators and potential data elements. Input indicators include monetary values of labor, capital and intermediaries. Labor is defined as an operational expense tied directly to the employees. Capital includes an institution's non-current assets, or assets from which value is extracted for longer than a single fiscal year. Intermediaries include operational expenditure on various items used or consumed within a single fiscal year. The list below includes a number of indicative data elements. These elements represent large, common budget categories but are not intended to be prescriptive. They are aggregated in a way to account for the total sum of yearly operational expenses, as well as all non-current assets used during the operations. However, actual data elements will vary across countries and institutions, depending on the respective measurement and accounting practices.

Table 1: Input indicators and example data elements

Facet	Indicator	Variable	Data elements
Inputs	Labor	L_1	Academic staff salary and benefits
		L_2	Non-academic staff salary and benefits
	Capital	K_1	Land capital services
		K_2	Buildings capital services
		K_3	Equipment and other capital services
		K_4	Repairs and maintenance
	Intermediaries	I_1	Grants and scholarships
		I_2	Administration and other expenses

Data elements grouped by indicators may be used to create Tornqvist chain indices. The chain indexing method in this study first requires calculating the three indicator component indices for labor, capital, and intermediaries. Then a single composite input index may be calculated from the component indices. The calculation of component indices is done as follows:

Let L_t represent the Tornqvist index for labor expenses from time t-1 to time t. Let $S_{L1, t)}$ be the share of academic staff expenses from total labor expenses at time t. Let $S_{L2, t}$ be the share

of non-academic staff expenses from total labor expenses at time t. These shares serve as weights for the data elements. Then,

$$\log(L_t) = \left(\frac{S_{L_1,t} + S_{L_1,t-1}}{2}\right) * \log\left(\frac{L_{1,t}}{L_{1,t-1}}\right) + \left(\frac{S_{L_2,t} + S_{L_2,t-1}}{2}\right) * \log\left(\frac{L_{2,t}}{L_{2,t-1}}\right) \quad [3]$$

The indices for capital expenses, K_t, and the ones for intermediate expenses, I_t, may be calculated in the same fashion. To find the composite input index, X_t from time t-1 to t, the model takes L_t, K_t, and I_t as arguments. Let $S_{L,t}$, $S_{K,t}$, and $S_{I,t}$ represent shares of labor, capital, and intermediate expenses, respectively, with regard to total operational expenses.

$$\log(X_t) = \left(\frac{S_{L,t} + S_{L,t-1}}{2}\right) * \log(L_t) + \left(\frac{S_{K,t} + S_{K,t-1}}{2}\right) * \log(K_t) + \left(\frac{S_{I,t} + S_{I,t-1}}{2}\right) * \log(I_t) \quad [4]$$

Calculation for the Tornqvist chain outputs follows a similar pattern but takes data elements measured in different units. First, consider the potential education output indicators, such as coursework completions, graduate employment, and student load. As noted above, the five potential research outputs are publications, citations, patents, research completions and research funds. As with inputs, actual data elements will also vary by countries and institutions, depending on the applicable measurement, accounting, and institutional considerations. Table 2 lists out a number of indicative data elements for academic output.

Table 2: Output indicators and example data elements

Facet	Indicator	Variable	Data elements
Education	Student load	E_1	Number of full-time coursework students
	Coursework completions	E_2	Number of coursework graduates
	Graduate employment	E_3	Per cent of prior-year graduates employed
Research	Publications	R_1	Number of publications
	Citations	R_2	Number of new citations
	Patents	R_3	Number of patents
	Research completions	R_4	Number of research graduates
	Research funds	R_5	Amount of research funding

Since output variables exhibit different units of measure, and because the importance and significance of any individual output could be debated, systematic arithmetic averages of value-added shares may not be used as index component weights. Instead, weights must be assigned on the basis of strategic or ideological importance of an output, such that the sum of all the weights equals to one. First, consider how a research component index could be calculated. The following example considers only the first three research variables, but the calculation can be made in the same fashion using all five. Let R_{1w}, R_{2w}, R_{3w} represent the

strategic weights of the research output components. Hence, the research index, R_t from time t-1 to t, is calculated as:

$$\log(R_t) = R_{1w} * \log\left(\frac{R_{1,t}}{R_{1,t-1}}\right) + R_{2w} * \log\left(\frac{R_{2,t}}{R_{2,t-1}}\right) + R_{3w} * \log\left(\frac{R_{3,t}}{R_{3,t-1}}\right) \quad [5]$$

The education component is unique in a different way. As stated above, the NAS recommends a measurement of adjusted credit hours to indicate education output. This indicator incorporates a graduate completion 'sheepskin effect,' which represents the additional value that credit hours have when accumulated and organized into a completed degree [37]. One completion is set at approximately one year worth of credit hours. The current study calculates the sheepskin effect in the same way but uses student FTEs instead of credit hours for greater international compatibility. Let E_t represent the Tornqvist index for education outputs from time t-1 to time t. Let E_{1w} represent the strategic weight for adjusted student load and E_{3w} represent the weight for graduate employment. Note that the student load adjustment, or sheepskin effect, is accounted for by taking the sum of E_1 and E_2.

$$\log(E_t) = E_{1w} * \log\left(\frac{E_{1,t} + E_{2,t}}{E_{1,t-1} + E_{2,t-1}}\right) + E_{3w} * \log\left(\frac{E_{3,t}}{E_{3,t-1}}\right) \quad [6]$$

The composite output index, Y_t, from time t-1 to t, must also incorporate a strategic weighting of education and research. Let R_w represent the strategic weight of research and E_w represent the strategic weight of education. Then, Equation 7 demonstrates the current study's calculation of Y_t.

$$\log(Y_t) = R_w * \log(R_t) + E_w * \log(E_t) \quad [7]$$

This modeling and the associated indicators rest upon a number of assumptions. First, there is an assumption concerning the distribution of inputs across diverse academic functions. In the absence of accounting mechanisms that classify all university expenditures by academic functions, and without accurate, detailed records of faculty members' use of time, the individual inputs cannot be linked directly to specific outputs. Hence, conclusions about individual output component efficiencies, such as research publication efficiency, cannot be made directly with this model. The problem, however, is addressed by output component weighting.

Second, this model assumes equal weighting of research and instruction functions. Also, within the research function, each of the three indicators is equally weighted. This weighting system implies that half of an institution's efforts and resources are allocated to education, while the other half goes into research. By the same token, education and research components are also weighted equally within their respective categories. The topic of weightings is debated intensely in assessment and evaluation literature [16, 20, 38], and for current purposes we have adopted the most neutral, parsimonious and transparent approach.

Inside knowledge about a given institution's strategy and budgeting would likely reveal variable and unequal output prioritization. It is possible, that even in the absence of more

rigorous accounting, this could lead to more accurate productivity estimates. However, the nature of higher education outputs is such that their importance is debatable, depending on different stakeholders' interests in the results. Thus, the equal weighting system, while not exhaustive of the full range of university outputs, selects a set of near-universal higher education priorities and serves to eliminate the biases concerning output significances.

Third, the current study makes further assumptions about capital inputs. Since the Tornqvist indexing method tracks productivity changes from year to year, the model does not include an institution's full book value of capital for each year's calculations. Instead, capital services are estimated based on yearly flows from productive capital stocks. In the absence of directly observable flows, capital services are estimated as a proportion of capitals stocks [31–32]. With little available data on the dynamics of productive capital flows for the higher education industry, the current study has pegged the yearly capital service proportion factor at one-twelfth the value of capital stocks. When considered constant for each institution over the full period of study, the assumption has no bearing on the final MFP indices. Rather, it serves as a placeholder should accurate information on capital services emerge.

This research also recognizes that mathematical models have their own inherent assumptions and limitations, even though they are used to formalize how the key events in a domain of interest relate to each other. As this report conveys, substantial further work is required to make better analytical and practice sense of key aspects such as opportunity costs, the nature and determinants of quality, and the monetization of education and research processes and outcomes. As we concluded, further research is also required to understand and integrate the many country-specific adaptations and applications that are documented in the chapters that follow.

RESEARCH APPROACH

As with the analytical framework, reviewing the overall research approach helps frame the country-specific chapters that follow. As noted, this research has involved the following phases: background planning, background research, coordination launch meeting, in-country research, and synthesis and documentation. Figure 3 shows how these phases played out across quarters in 2015 and 2016 and engaged the APO, the national productivity officers (NPOs), the Chief Expert (CE) and the national experts (NEs). A brief description of each phase follows.

		2015		2016			
Phase	**Who**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**
Background planning	APO/NPO/CE						
Background research	CE/NE						
Coordination launch meeting	APO/CE/NE						
In-country research	NE/CE						
Synthesis and documentation	CE/NE						

Figure 3: Overall project schedule

The background planning phase involved liaison between the APO, the interested NPOs and the CE, to scope out and position the project on an overall basis. NEs were recruited by the APO and the NPOs. NEs represented nine Asian countries: Cambodia, Fiji, India, Indonesia, Malaysia, Pakistan, Philippines, Sri Lanka, and Thailand (Figure 4).

The background research phase involved the CE developing the supranational methods for managing the research and productivity investigations. This included reviewing economics and management principles and practices, reviewing prior theoretical, practical and policy work on productivity in higher education, and developing a productivity framework to guide the review, analysis and development processes ahead. The drafts were prepared and sent to the countries to initiate the research and to guide the NEs in conducting preliminary research on higher education productivity in their respective national contexts. These preliminary research documents were collated and distributed to inform presentations made at the coordination launch meeting.

Figure 4: The participating APO countries

The coordination meeting was hosted by the Thailand Productivity Institute in Bangkok from 23 to 27 November 2015, and involved the APO, the CE, and the NEs (Figure 5). The meeting involved a series of framing presentations made by the CE; presentations and discussions led by each NE; and a series of highly interactive sessions to plan, position and launch the research. The planning meeting played an essential part in developing a generic version of the productivity model (elaborated above) and in discussing various pertinent assumptions and contexts. The CE distributed summary materials to the NEs shortly after the workshop to guide the in-country research phase.

Figure 5: Participants at the coordination meeting held in Bangkok

In-country research ran for three quarters in 2016 and involved a liaison between the CE, the NEs, the APO and a range of other stakeholders. With ongoing international guidance, the experts then consulted nationally to further adapt the model to their own systems and institutions. Quantitative data was collected on inputs, research and education outputs for a minimum of five years, from 2010 to 2015. A necessary variation in data collection methods and quality was accommodated. For certain countries and elements, it was necessary to construct instruments to collect data directly from institutions, while in other cases data was available from ministries, archives or public sources. Missing data was a problem even with major institutions and for core data elements. Nevertheless, sufficient data was collected to support target analyses and outputs.

It is important to note that the data collection complexities exposed the immaturity of research and practice in this field. As the following chapters convey, a number of quantitative and qualitative analyses were performed. Econometric analyses were performed on the quantitative data to validate the model and to produce empirical insights. In each country, critical reviews and consultations were conducted that isolated the pertinent national and institutional contexts. The contextual information was used to build broader interpretations of the factors that appear to influence the productivity and prospects for future improvement. Two key supplementary meetings were held during this phase. First, from 29 August to 1 September 2016, an APO meeting in Jakarta was co-hosted with Indonesia's Ministry of

Manpower (Figure 6). Next, a national working on productivity in higher education was hosted by the National Productivity Council in Tiruchirappalli, India between 19 and 22 September 2016 (Figure 7). The fifth and final stage involved synthesis and documentation of the research, led by the CE, in close liaison with the NEs.

Figure 6: Participants at the supplementary meeting in Jakarta, Indonesia

Figure 7: Participants at the supplementary meeting in Tiruchirappalli, India

To sum it up, the research employed a devolved-and-controlled methodology that leveraged international frameworks that were adapted within countries. Given the innovative and

formative nature of this research, such modifications in themselves furnished methodological insights for study of productivity in higher education.

REPORT STRUCTURE

The structure of this report is straightforward. It may be consumed either as a whole or by select chapters. The chapters pursue common themes; yet, each has its own technical and contextual nuances.

This introductory chapter has sought to present the key ideas, contexts, methods and goals. It has also sought to introduce the topic and to establish the scientific and practical contexts for study of productivity in higher education in Asia.

The next nine chapters each present a summary of research conducted in one of the participating countries. These country chapters are presented in alphabetical order: Cambodia, Fiji, India, Indonesia, Malaysia, Pakistan, Philippines, Sri Lanka and Thailand. Efforts have been made to ensure the coherence and integrity of each of the chapters, which have been constrained by the project scope. Yet, it is important at the outset to affirm that there is a degree of autonomy with which the researchers in each country have adapted the cross-national ideas and approaches.

The final chapter looks at major empirical trends, reviews shaping contexts, and articulates what would appear to be major insights and associated recommendations for future value-creation and feasible productivity assessment.

REFERENCES

[1] Alvesson M., Benner M. Higher Education in the Knowledge Society: Miracle or Mirage? In: Multi-level Governance in Universities. Springer International Publishing; 2016, pp. 75–91.

[2] Amaral A., Jones G. A., Karseth B., eds. Governing higher education: National perspectives on institutional governance, vol. 2. Springer Science & Business Media; 2013.

[3] Asian Productivity Organization. Project Notification. www.apo-tokyo.org/annual_programs/pdf/PN-15-RP-10-GE-RES-B. pdf. Accessed on 1 December 2015.

[4] Avilés-Sacoto S. V., Cook W. D., Güemes-Castorena D. Competitiveness among Higher Education Institutions: A Two-Stage Cobb-Douglas Model for Efficiency Measurement of Schools of Business. Journal of CENTRUM Cathedra: The Business and Economics Research Journal, 2014; 7(1): 91–115.

[5] Besanko D., Braeutigam R.R., Gibbs M. Microeconomics. Hoboken: John Wiley; 2011.

[6] Bairam E. Homogeneous and Nonhomogeneous Production Functions: Theory and applications. Brookfield: Ashgate; 1994.

[7] Blöndal S., Field S., Girouard N. Investment in Human Capital through Upper-Secondary and Tertiary Education. OECD Economic Studies No. 34; 2002.

[8] Bloom D.E., Canning D., Chan K.J., et al. Higher education and economic growth in Africa. International Journal of African Higher Education, 2014; 1(1): 22–57.

[9] Boarini R., H. Strauss. The Private Internal Rates of Return to Higher Education: New estimates for 21 OECD countries. Paris; OECD Economics Department Working Papers, 2007, No. 591.

[10] Bureau of Labor Statistics (BLS). (2007). Technical Information about the BLS Multifactor Productivity Measures. www.bls.gov/mfp/mprtech.pdf. Accessed on 16 August 2016.

[11] Capalbo S.M., Antle J.M. Agricultural Productivity: Measurement and explanation. Washington: Johns Hopkins University Press; 1988.

[12] Carmichael F., Thomas D., Ward R. Production and efficiency in association football. Journal of Sports Economics 2001; 2(3): 228–243.

[13] Carnevale A.P., Cheah B., Georgetown University C.W. From Hard Times to Better Times: College Majors, Unemployment, and Earnings. Georgetown University Center On Education And The Workforce; 2015.

[14] Caves D.W., Christensen L.R., Diewert W.E. The economic theory of index numbers and the measurement of input, output, and productivity. Econometrica1982; 50(6): 1393.

[15] Cedefop European Centre for the Development of Vocational Training. Macroeconomic Benefits of Vocational Education and Training. Research Paper No. 40; 2014.

[16] Coates H. Universities on the Catwalk: Models for performance ranking in Australia. Higher Education Management and Policy 2007; 19(2): 1–17.

[17] Coates, H. ed. Higher Education Learning Outcomes Assessment. Frankfurt: Peter Lang; 2014.

[18] Coates H. Performance measurements and alternatives to rankings. In: Hazelkorn E. ed. Global Rankings and the Geo-politics of Higher Education: Understanding the influence and impact of rankings on higher education, policy and society. Abingdon: Taylor and Francis; 2016.

[19] Esson J., Ertl H. No point worrying? Potential undergraduates, study-related debt, and the financial allure of higher education. Studies In Higher Education 2016; 41(7): 1265–1280.

[20] Hattie J., Marsh H.W. The relationship between research and teaching: A meta-analysis. Review of Educational Research 1996; 66: 507–542.

[21] Holland D., Liadze I., Rienzo C., et al. The relationship between graduates and economic growth across countries. BIS Research Paper 2013; 110.

[22] Holmes C. Has the expansion of higher education led to greater economic growth?. National Institute Economic Review 013; (224): 29.

[23] Jepsen C., Troske K., Coomes P. The labor market returns to community college degrees, diplomas, and certificates. Journal of Labor Economics 2014; 32(1): 95–121.

[24] Lomax-Smith J. Higher Education Base Funding Review: Final report. Canberra: DOET; 2011.

[25] Massy W.F. Reengineering the University: How to be mission centered, market smart and margin conscious. Baltimore: Johns Hopkins University Press; 2016.

[26] Massy W.F., Sullivan T.A. Mackie C. Improving Measurement of Productivity in Higher Education. Change: The magazine of higher learning 2013; 45(1): 15-2.

[27] McMahon W.W. The Social and External Benefits of Education. In: Johnes G., Johnes J., eds. International Handbook on the Economics of Education. Cheltenham, UK; 2014.

[28] Nayar P., Ozcan Y.A. Data envelopment analysis comparison of hospital efficiency and quality. Journal of Medical Systems 2008; 32(3): 193–199.

[29] Nazarko J., Šaparauskas J. Application of DEA method in efficiency evaluation of public higher education institutions. Technological and Economic development of Economy 2014; 20(1): 25–44.

[30] New Zealand Productivity Commission. New Models of Tertiary Education. Wellington; 2016.

[31] OECD. Measuring Productivity: Measurement of Aggregate and Industry-level Productivity Growth. Paris; 2001a.

[32] OECD. The Well-Being of Nations: The Role of Human and Social Capital. Centre for Educational Research and Innovation. Paris: OECD Publishing; 2001b.

[33] OECD. Tertiary Education for the Knowledge Society. vol. 1, vol. 2. Paris: OECD Publishing; 2008.

[34] Oreopoulos P., Petronijevic U. Making college worth it: A review of the returns to higher education. The Future of Children 2013; 23(1): 41–65.

[35] Peracchi F. Educational wage premia and the distribution of earnings: an international perspective. In: Hanushek E., Welch F., eds. Handbook of the Economics of Education, vol. 1. Elsevier, Amsterdam; 2006.

[36] Quah D. The Global Economy's Shifting Centre of Gravity. Global Policy 2011; 2: 3–9.

[37] Sullivan T.A., Mackie C., Massy W.F., et al. Improving Measurement of Productivity in Higher Education. Washington DC: National Academies Press; 2012.

[38] Van Vught F.A., Ziegele F., eds. Multidimensional Ranking: The design and development of U-Multirank. Springer Science & Business Media; 2012.

[39] Wolf A. Education and Economic Performance: Simplistic Theories and their Policy Consequences, Oxford Review of Economic Policy, vol. 20, No. 2; 2004, 315–333 pp.

[40] Zak T.A., Huang C.J., Siegfried J.J. Production efficiency: The case of professional basketball. Journal of Business1979; 52(3): 379–392.

CHAPTER 2
CAMBODIA

Chanrith Ngin[1], Royal University of Phnom Penh, Cambodia
Sovansophal Kao, Ministry of Education, Youth and Sport, Cambodia

EXECUTIVE SUMMARY

Cambodia ranks very low in terms of innovation and competitiveness, and productivity of higher education is also a relatively new phenomenon in the country. Yet, there is an emerging vitality, given the sub-sector's subpar quality. Performance of higher education has primarily been measured against the labor demand of the economy. Nevertheless, the issue of quality has lingered beyond the demand-supply nexus of economy and education, and has led to attributes of productivity.

This study has attempted to establish a productivity indicator for HEIs, mainly for the education and research functions. It has also discussed past initiatives on governance and research capacities of HEIs as well as future prospects for productivity measurement and outcome assessment, which are indispensable for levering up productivities of HEIs.

Outcomes of education, such as encompassing coursework completions, graduate employment, and credit hours, have been found to be constant over the study periods. Only coursework completions and credit hours have slightly declined in the last few years. However, that did not affect the education productivity, as overall the declines weren't substantial.

Research productivity could not be measured due to a lack of research outcome data. Notably, data on citations, patents, and research funds was absent or could not be confirmed. This paucity signifies pitfalls in the research arena of HEIs in Cambodia, highlighting a crucial drawback in the sub-sector. This finding musters further evidence on poor research performance and consequently limited innovation of higher education in the country. It also affirms that HEIs emphasize on instruction, not research, and the quantity, not quality, of their performances.

The Cambodian government has prioritized refinement of governance and research capacities of HEIs to boost the quality of their performance. There have been endeavors to enhance institutional-level governance and industry linkages. Nevertheless, these efforts have intended to tackle the poor quality of instruction and the mismatch between industry and education. While this is critical, to bolster productivity of HE, greater priorities should be invested in productivity measures and outcome assessments. Without

[1]This study was supported financially and technically by the APO. We appreciate the coordination and support provided by the National Productivity Center of Cambodia; the Ministry of Industry and Handicraft; and the Department of Higher Education, the Ministry of Education, Youth and Sport, during the study. The cooperation from the higher education institutions involved in the study is gratefully acknowledged. Colleagues from the other countries provided us with critical and relevant thinking toward mutual learning during the encounters of this project. Finally, we are thankful to the Chief Expert of the project, Professor Hamish Coates, for his insightful guidance, feedback and encouragement throughout the course of the study.

a standardized productivity indicator to measure outcomes, HEIs cannot be evaluated or ranked objectively to foster their performances. The indicator is significant to assess the value of HEIs by weighing their investments against education and research outcomes. The absence of a productivity indicator may skew HEIs to focus on unbalanced variables, such as those that may reduce costs but increase the number of students, at the expense of their socioeconomic merits.

Based on the findings of this study, the following suggestions might be useful for enhancing the productivity of HEIs in Cambodia:

- Continue the initiatives to improve governance and research capability of HEIs, but with greater emphasis on the latter function.
- Institutionalize research outcomes in HEIs by executing a professorial ranking system with commensurate remunerations based on research merits as a core component.
- Emphasize both education and research outcomes in programmatic and institutional assessment for quality assurance and accreditation.
- Enforce and appreciate internal quality assurance units of HEIs as part of rigorous institutional assessment.
- Strengthen the institutional capacity of the Accreditation Committee of Cambodia (ACC) with regards to qualification and competence of staff and assessors.
- Revamp the assessment indicators of the ACC to make them more pertinent, concrete, and measurable.
- Devise a fundamental productivity indicator and include it as an integral element of performance of HEIs.
- Expand productivity research into a wider range of HEIs, including public, private and technical institutions.
- Conduct further investigation into research and service tenets of productivity of HEIs.

INTRODUCTION

Cambodia ranks very low in terms of innovation, 106th out of 143 countries in 2014 [1]. Its expenditure on research and development (R&D), at 0.05% of gross domestic product (GDP) in 2000–10, is minimal [2]. Not surprisingly, the country had just 17 researchers in R&D per million people in 2000–10, and produced merely 27 scientific and technical journal articles in 2009. Cambodian graduates lack technical as well as critical and creative thinking skills. Further, research at Cambodian universities is nascent and donor-driven [3].

As for competitiveness, Cambodia ranks 89th out of 138 in the 2016 Global Competitiveness Index [4]. Higher education and training had the poorest performance among the 12 pillars of the index, ranking 124th. Moreover, the quality of the education system and the quality of scientific research institutions were very low, ranking 87th and 123th, respectively.

The higher education system in Cambodia is at a critical stage. Since the mid-1990s, the numbers of institutions and students have surged dramatically. Apart from private universities, the higher education landscape has seen public universities enroll private students to increase their income. Profit orientation has spurred HEIs to increase enrollments

and expand campuses. However, the rise in coverage and quantity has led to an absence of quality among graduates [5].

In other words, the higher education sector in Cambodia is producing graduates with limited quality and mismatched skills. Employers complain that graduates are short of specialized knowledge, and are lacking in both hard and soft skills. The issue of quality is becoming critical even as the cost of higher education is soaring. The classes, particularly at private universities, are generally oversized, and teaching quality is not properly monitored and ensured. The bulk of faculty at many private universities is either part-time or adjunct.

Research in higher education in Cambodia tends to focus on the sub-sector's contribution to economy in the light of its relation to labor productivity. This study is intended to investigate the productivity of higher education in Cambodia in the realms of instruction and research. It attempts to explore what constitutes productivity of higher education, and how and to what extent it can be measured and improved in the Cambodian context.

The next section provides an overview of the higher education system and the HEIs in Cambodia, while highlighting the quality issue. The third section analyses productivity rationales and definitions used in higher education. It also offers an overview of indicators, data and analytical methods employed in the study. The fourth section examines a few key productivity initiatives that have been instrumental in driving productivity improvements in Cambodia's higher education in the last decade. The fifth one discusses the development and implications for a productivity indicator, culminating from empirical analysis. The last section analyses some key productivity initiatives that would be critical in driving productivity improvements in Cambodia's higher education in the next five years. The final section concludes by summarizing the chief findings and by proposing specific ways forward for measurement and refinement of productivity in higher education in Cambodia.

BACKGROUND

Higher education forms a crucial tenet of various national development plans, including the Rectangular Strategy Phase 3 and the National Strategic Development Plans (NSDP) 2014–18 [6, 7]. The Rectangular Strategy signifies the development of improved quality and efficient human resources through provision of quality education and training; development of the necessary legal and policy frameworks; establishment of HEIs and oversight agencies; and promotion of science, technology, and vocational and technical education. The NSDP underscores the importance of refining human capital to accomplish the development goals. Education in general, and the higher education in particular, needs broader and deeper reforms, so that performances and outcomes are better targeted and measured against the macro socioeconomic goals.

Specifically, higher education is essentialized in the Educational Strategic Plan (ESP) 2014–18 [8]. The plan aims to boost both quantity and quality of the sub-sector so as to better respond to the national development needs. In 2014, the first Policy on Higher Education Vision 2030 [9] was devised to steer higher education development. The vision aspires to "build a quality higher education system that develops human resources with

excellent knowledge, skills and moral values in order to work and live within the era of globalization and knowledge-based society." [9]. Likewise, it is intended to bolster access, equity, quality, governance, and management in the sub-sector. These policy instruments prioritize to address the following shortcomings: inequitable access, especially by female and poor students; skills mismatch; missing or incomplete links between key stakeholders, particularly the industry; poor quality; limited research culture; lack of information on the labor market and the human-resource needs of the sub-sector; and poor institutional governance and management.

At present, higher education in Cambodia is expanding in quantity, but declining in quality. The number of HEIs soared from 10 in the 1990s to 118 under the supervision of 15 ministries and institutions in 2015. Of these, 46 were state HEIs and 72 were private HEIs [10]. There were 71 HEIs under Ministry of Education, Youth and Sport (MoEYS), with 12 being state HEIs and 59 being private HEIs. Also, in 2015, 38 HEIs provided postgraduate programs. Of the 12,256 lecturers teaching at HEIs in 2015, 2,964 taught at the bachelor's level, 8,321 at the master's level, and 971 at the PhD level [10].

The number of students rose from 117,420 in 2006–07 to 227,385 in 2015, consisting of 24,970 associate degree students; 182,987 bachelor's degree students, 18,253 master's degree students and 1,175 PhD students [10]. The number of higher education students was 59,938 in 2015, comprising 7,660 associate degree graduates, 49,254 bachelor's degree graduates, 3,013 master's degree students, and one PhD student. This drastic expansion has exacerbated the coping capacity of the faculty and the HEIs' responsiveness to labor market needs. Consequently, while there is an oversupply of university graduates, their quality has gone down [11–14].

Many stakeholders, including the government, the private sector, and the development partners, complain about the poor quality of the present higher education in Cambodia and the resulting mismatch it has with the labor force demand [11–14]. The system not only suffers in terms of the quality of output, but also faces challenges like low enrollments and uncoordinated organizational mechanisms [15]. These drawbacks hinder the development of the sub-sector and of the human capital required for economic growth.

The quality issue mainly stems from underdeveloped governance arrangements. Fifteen different ministries and agencies supervise the HEIs, with the MoEYS and the Ministry of Labor and Vocational Training (MoLVT) governing the most [10]. According to Education Law 2007, the establishment, management and supervision of HEIs are under the jurisdiction of MoEYS. The accreditation is done by the Accreditation Committee of Cambodia (ACC) of MoEYS. The Department of Higher Education (DHE) under the MoEYS performs a major coordinating role with HEIs and other ministries. But its tasks are mainly confined to the selection of government-funded scholarship students, provisioning of technical assistance on some specific courses, and some policy dialogues [16].

The privatization of higher education in the mid-1990s contributed to the downslide in quality. HEIs in Cambodia today depend heavily on private financing, with over 80 percent of the total funding coming from tuition fees [16]. The high dependence on student fees,

coupled with a weak quality assurance system and an imprecise vision, makes HEIs focus on the short-term gains at the expense of the long-run demand of the economy. The dramatic growth, especially of private institutions, exceeds their absorptive capacity to cope with the rising number of students and to maintain or refine the quality in the meantime. Many private universities have constraints in terms of faculty competence and facilities. Their faculties mostly comprise part-time and adjunct lecturers from public universities, government or private sector, or civil society agencies. Their campuses are small and scattered, with congested teaching spaces and learning environments. As a consequence, classes are crowded and teaching methods are compromised.

In short, after expanding the coverage and quantity, there is a consensus that the higher education sector should focus on upgrading the quality and labor market responsiveness [17–18]. Without addressing the issues of quality and responsiveness, higher education in Cambodia will become further irrelevant to its economy and its graduates will not be competitive enough.

RECENT DEVELOPMENTS

In the last decade, efforts have been made by the MoEYS and the HEIs to improve the productivity of the sub-sector, particularly in the realm of quality. The focus has been on the governance and research capacities of HEIs [19]. Governance, in particular, has been considered a core issue in the performance of HEIs in Cambodia, and significant attention has been paid to aspects such as institutional-level governance and industry linkages.

Improving Institutional Governance

To improve institutional-level governance, regulations require all types of HEIs to have a board of directors (BoD), as the highest governing body. Differential legal instruments stipulate this requirement and composition of BoD. For instance, the Prakas (edicts) on Conditions and Detailed Criteria on Licensing HEIs instructs that the public autonomous institutions (PAI) and private HEIs shall be governed by a BoD, and the BoDs of public HEIs shall follow the requirements of the Royal Decree on the Legal Statutes of Public Administrative Institutions. Another decree, the Royal Decree on Public Universities, requires representatives from the academic community and from the government and private sector to make up the BoD composition of a public university.

The BoD is mandated to be performing the following tasks: chartering policy and direction for the HEI; defining the institution's organizational structure, and the roles and responsibilities of subordinate units; determining and approving the number of staff; approving budget plans and financial reports and statements; approving procurement; deciding on internal rules and regulations; and determining staff recruitment processes, promotions and incentive provisions. However, in practice, not many HEIs have a functioning BoD, and in case they have it, the BoD often performs minimal roles and responsibilities. In reality, some public HEIs are run by the rector, assisted by a few vice-rectors, with no formal board in place. The rector 'acts both as a policy maker and policy implementer' [20].

The practice of institutional governance, including decentralization of authority and autonomy in administrative, academic and financial matters, varies across the HEIs. A survey of 54 HEIs in 2012 depicts that the lowest-level authorities of an HEI, whether public or private, that can make decisions on academic affairs, hiring or firing of the staff, and financial management are the BoD, rector, director, dean or head of a department [19]. The bulk of the HEIs indicate that decisions on staff and financial management are made by the BoD or the rector/director, which signifies centralization in these matters. The decisions on academic affairs are more decentralized.

Improving Research Capacity

Research capacity is another facet that is important for improving the productivity of HEIs. In the face of diversification of the Cambodian economy and the ASEAN Economic Community, educational reform is one of the strategic objectives for Cambodia to produce more skilled and innovative human resources. In this regard, it is believed that fostering a research culture among students and lecturers is conducive to innovation and competitiveness.

Education has received limited public funding, despite slight increases over the last decade. In 2015, of the total government spending of $4.27 billion, the education sector was granted $502 million, which was a 28% increase from the allocation in 2014 [21]. In 2012, the expenditure for the sector accounted for 1.8% of the GDP, and the budget for higher education was 0.1% of GDP or 4.1% of the total education budget.

Public funding for research to HEIs is extremely limited. Consequently, government-sponsored research is scant [22]. Some government agencies have divisions that conduct policy research. However, most research is carried out by not-for-profit research institutions and consultancy firms [3, 23]. Research funding by private and public HEIs is likewise quite minimal. Mostly, prominent HEIs have received research grants from external agencies, such as international universities and donors, to do project-based research. Yet, there is no formal mechanism to track such funding [3].

Of late, some multi-lateral development partners, such as the ADB and the World Bank, have provided funding to improve instruction and research in the HE sub-sector. During 2011–15, the World Bank funded a $23-million higher education quality and capacity improvement project. Further to bolstering the governance of HEIs, the project provided scholarships to disadvantaged students, research grants to HEIs, and international fellowships for graduate students [24].

The research environment in Cambodia is improving, but is still encountering numerous loopholes [23]. The salient inhibiting factors lie in the physical infrastructure, institutional policies, funding opportunities, international collaboration, and capacity building (notably among students). To beef up the research environment, the following measures are suggested: incentivizing research, improving access to literature and research databases, strengthening collaboration, creating national standards for research, and increasing research training and capacity building [23].

RESEARCH METHODS

Economically, productivity is defined as the quantity of outputs delivered per unit of input utilized (labor, capital services, and purchased inputs). In a generic term, productivity is conceptualized as an ability to 'do better and faster, with less' and at the same time, 'sustain the quality and increase the quantity' of outputs [25]. In the context of higher education, productivity should not mean mitigating costs at the expense of quality of graduates [26]. However, educational quality is complex and difficult to measure. Ergo, it is of primacy to comprehend what constitutes quality and iron out measures that tackle quality in a holistic and plausible manner.

Put another way, productivity encompasses efficiency and effectiveness. Efficiency is 'the level and quality of service obtained from a given amount of resources' [27]. Effectiveness entails 'the extent to which the provider meets the needs and demands of stakeholders or customers' [27]. Hence, productivity is multidimensional and delicately interwoven with the goals and missions of the system or the institution.

For the purpose of this study, productivity should deal with an efficient and effective utilization of both physical and human capital, but with a focus on an institutional goal and mission. While it contains costs, productivity should maintain or leverage the quality and quantity of outputs. In higher education, both infrastructural and human resources, particularly the faculty, are critical, and the ultimate milestone should be the quality of graduates. Nonetheless, the components and influencers of that quality should be contextualized and examined in different dimensions and layers.

It is misleading to cherish productivity as having more graduates for lower expenses. Rather, innovation in employing and deploying human and non-human stocks, including technologies, to achieve learning outcomes should be at the fore of a productivity assessment. Institutions that are cost-efficient and scale up but also accomplish their goals and missions, manifest productivity in a true sense. In short, productivity of higher education relies on what a system or an institution is mandated to materialize and how it does that with less consumption of inputs but with more and better outcomes.

In this study, we focused on institutional productivity improvement, i.e. productivity at university level, concentrating on education and research dimensions. For our research, we adopted a hub-and-spoke model as spelled out by the Chief Expert. The hub is a quantitative indicator of productivity while the spokes are analyses of contextual and managerial initiatives to help explain past performance, future opportunities and challenges. That is, P = a + b + c + d + E, where P = productivity, a–d are initiatives, and E is the error term.

The time horizons for our study were: 2005–10 for analysis of past initiatives; 2010–15 for econometric analysis of the productivity indicator; and 2015–20 for future analysis. For the output in the hub facet, we included essential education indicators, such as numbers of graduates, numbers of graduates in employment six or twelve months after graduation, and the numbers of credit hours delivered in each academic year. As for research indicators, we included the number of publications featuring in Scopus, Web of Science or other such

citation databases; numbers of citations of all faculty; patents filed or granted to all faculty; number of PhD holders; and the amount of research funds. For the inputs, we included labor costs (the number of teaching and non-teaching staff, annual time allocation of teaching and non-teaching staff, and costs incurred on teaching and non-teaching staff); capital costs (investments of all types), and intermediary costs (recurring costs). These inputs were used for both education and research outputs.

A productivity model was established to compute a yearly indicator of each component by putting all relevant data into a calculation template created by the Chief Expert. In this model, the variables of the inputs were indexed and calculated against the variables of the outputs in terms of ratios and percentages. For each indicator, the model calculated an index for year-on-year change of each variable and produced a composite measurement of ratios and percentages in each year. For ratio measurement, the model calculated productivity ratio indices. For percentage measurement, it computed productivity change indices.

The labor costs, capital investments, and intermediary expenses were deflated prior to being factored into the model. To adjust for the price level in each year, we divided the nominal value with the consumer price index (CPI) of the year and multiplied it by 100. The CPI was obtained from the World Bank's World Development Indicators.

For the analysis of past initiatives, we discussed the governance and research capacities of the HEIs. For future analysis, we examined productivity measures and outcome assessments.

To establish the indicators of productivity, attempts were first made to obtain relevant data from publicly available sources, such as the university websites, the relevant ministry websites, research institutes' online libraries, and open-source search engines. The search results generated scant data on productivity of HEIs in Cambodia. We then devised a questionnaire based on the presentations of and discussions with the Chief Expert (see Appendix 1 for the questionnaire). The questionnaire was translated into Khmer and administered with seven public universities in the capital city of Phnom Penh. These universities were selected since they are the major ones in Cambodia. With a support letter from the MoEYS, the questionnaire was sent to the universities in hard copies and also via emails. Follow-up phone calls and emails were done to increase the response rate and to seek clarifications or additional data. However, out of the seven universities, only four returned the completed questionnaires. Productivity data are sensitive; thus, this study had a limitation in accessing data from private universities.

ESTABLISHING A PRODUCTIVITY INDICATOR

There is no blueprint model to measure productivity of higher education. For this study, a fundamental model was devised to establish a productivity indicator. As mentioned above, we contemplated the education and research dimensions of productivity. Education productivity was measured by the composition of coursework completions, graduate employments, and credit hours. Research productivity was composed of publications, citations, patents, research completions, and research funds.

Table 3 presents the indices for year-on-year change of the input variables of the surveyed HEIs. On average, the inputs did not substantially change over the study period, except a slight decline of 0.75 in 2013. Specifically, capital decreased in 2012 (0.70), 2013 (0.69) and 2015 (0.83). Intermediaries scaled down in 2011 (0.64) and 2013 (0.59). Labor kept consistent levels throughout the years.

Table 3: Indices for year-on-year change of input variables

Composite	Unit	2010	2011	2012	2013	2014	2015
Labor	Indicator	1.00	1.06	1.03	0.98	0.93	0.97
Capital	Indicator	1.00	1.30	0.70	0.69	1.49	0.83
Intermediaries	Indicator	1.00	0.64	2.26	0.59	0.90	1.25
Average	**Indicator**	**1.00**	**1.00**	**1.33**	**0.75**	**1.10**	**1.01**

Table 4 depicts the indices for year-on-year change of the variables of higher education productivity of the HEIs under study. These results illuminate that the outcomes did not considerably fluctuate during the study periods, with minimal decline in the average indices in 2013 (0.99), 2014 (0.96), and 2015 (0.99). Coursework completions decreased in 2013 (0.98), 2014 (0.97), and 2015 (0.96). Graduate employment dipped only in 2014 (0.99). Finally, credit hours went down in 2013 (0.99) and 2014 (0.94).

Table 4: Indices for year-on-year change of variables of education productivity

Composite	Unit	2010	2011	2012	2013	2014	2015
Coursework completions	Indicator	1.00	1.03	1.02	0.98	0.97	0.96
Graduate employments	Indicator	1.00	1.00	1.00	1.00	0.99	1.00
Credit hours	Indicator	1.00	1.00	1.00	0.99	0.94	1.00
Average	**Indicator**	**1.00**	**1.01**	**1.00**	**0.99**	**0.96**	**0.99**

Table 5 presents the composite ratios and percentages of education productivity. Overall, in terms of productivity ratio indices, education slightly declined in 2012 (1.80), 2014 (2.05), and 2015 (1.99). Consequently, productivity change indices decreased in 2012 (-9.29%), 2014 (-6.35%), and 2015 (-2.93%). Nonetheless, education productivity did not dramatically dwindle as a whole.

Table 5: Ratios and percentages of education productivity

Composite	Unit	2010	2011	2012	2013	2014	2015
Education productivity	Ratio		1.98	1.80	2.19	2.05	1.99
Education productivity	Percentage			-9.29%	21.87%	-6.35%	-2.93%

Due to incomplete data, research productivity could not be computed. Data for most of the variables, particularly citations, patents, and research funds, could not be obtained from the surveyed HEIs. They did not have these variables, and the data could not be verified either. Therefore, a composite research and education productivity indicator was not possible.

These results underscore that Cambodian HEIs kept their inputs (labor, capital and intermediaries) nearly constant. However, the education outcomes did not change in a substantial manner. The absence of research productivity data implies that HEIs did not emphasize or prioritize research as an outcome of their performance.

THE NEXT FIVE YEARS

Productivity Measures

In the next five years, productivity measures and outcome assessments will be crucial for improving the productivity of HE in Cambodia. Given that productivity has never been explicitly examined in the sub-sector, the measures should form a core yardstick for assessing the performances and outcomes of HEIs. This should blaze a trail for new thinking about the value of HEIs, triggering a shift in mindset from profitability to productivity. It is hoped that this study provides the fundamentals and a preliminary benchmark for measuring productivities of HEIs, and becomes a foundation for further, in-depth research into specific facets of the topic. Without a precise productivity measure, Cambodian HEIs will remain weak in terms of quality, and uncompetitive regionally as well as globally.

Outcome Assessments

Outcome assessments are, and will remain, imperative for upping the productivity of HEIs. The most effectual ways for an outcome assessment are accreditation and quality assurance. The ACC of the MoEYS, previously under the Council of Ministers, ensures the quality of HEIs and accredits them. The ACC exercises an external role of quality assurance and accreditation to leverage institutional performance of HEIs up to the national, regional and international standards. This body introduced a Foundation Year Program in 2005 and nine national minimum standards in 2010 to assess the HEIs and their academic programs for accreditation [28]. The standards encompass the mission, governing structure, management and planning, academic programs, academic staff, students and student services, learning services, physical plants, financial plan and management, and dissemination of information.

Nonetheless, this accreditation apparatus has been plagued with negative perceptions [29], low institutional capacity due to nascent professional experience in accreditation and unqualified staff and assessors, complex bureaucracy, and political interference [16, 30, 31]. To perform the accreditations, the ACC chiefly relies on on-contract assessors, some of whom lack qualification and proper training [19]. The qualification for assessors does not stress upon experience in university management and academic society, which culminates in their poor performances.

Thus far, the ACC has accredited mostly Foundation Year programs. Only five out of 105 HEIs have applied for institutional assessments, and by 2013, four had been granted provisional accreditation certificates [19]. In addition to the institutional ineffectiveness and inefficiency, the assessment indicators are too numerous, with over 200 indicators for institutional accreditation; complicated, subjective; and hardly measurable in concrete

terms [19]. This entity has not apparently changed public perceptions about the quality of higher education in Cambodia [16].

Besides external quality assurance, HEIs are required to establish an internal quality assurance unit to conduct quality self-assessments. Nevertheless, few HEIs have done that, or have done so merely for gratification purposes [31]. Moreover, the units are usually staffed with teaching personnel having only piecemeal knowledge of quality assurance and accreditation.

Another instrument for quality assurance and accreditation is the Cambodian National Qualifications Framework (CNQF), which entails both academic and vocational or technical training [32]. In 2015, HEIs were required to revamp their curriculum in accordance with CNQF, which classifies higher education into eight levels. However, it is too early to assess the extent of compliance with this framework by HEIs.

Finally, the lack of professorship system serves as a structural bottleneck for outcome assessments of HEIs. In 2011, the Royal University of Agriculture under the Ministry of Agriculture, Forestry and Fisheries, and the University of Health Sciences under the Ministry of Health started to implement their own professorial ranking systems. But, a 2013 Royal Decree on Professorship Assessment and Appointment [33], which covers all sorts of HEIs, mandates these university lecturers to re-apply for a professorial rank. However, in late 2013, the MoEYS directed that the appointment be executed by individual HEIs [19]. So far, no HEI has enacted a professorship policy.

CONCLUSION

Productivity of higher education in Cambodia is a relatively new phenomenon, yet there is an emerging vitality given the sub-sector's subpar quality. Poor higher education has been identified as one of the major bottlenecks to the country's competitiveness and innovation. The performance of higher education in the country has primarily been measured against the labor demand of the economy. However, the issue of quality has lingered beyond the demand-supply nexus of economy and education.

This study has attempted to establish a productivity indicator of HEIs that fundamentally comprises education and research dimensions. Education outcomes, encompassing coursework completions, graduate employments, and credit hours, have been found to be constant over the study periods. Only coursework completions and credit hours have slightly declined in the last few years. However, this did not affect education productivity, which overall did not substantially decrease.

Research productivity could not be measured due to a lack of research outcome data. Notably, data on citations, patents, and research funds were absent or could not be confirmed. This paucity signifies pitfalls in the research arena of HEIs in Cambodia, highlighting a crucial drawback of productivity of the sub-sector. This finding musters further evidence on poor research performance and consequently the limited innovation of higher education in the country. It also affirms that HEIs emphasize upon instruction, not research, and the quantity, not quality, for their performances.

The Cambodian government has prioritized refinement of governance and research capacities of HEIs to boost the quality of their performance. There have been endeavors to enhance institutional-level governance and industry linkages. These efforts have intended to tackle the poor quality of instruction and the mismatch between the industry and higher education. While this is critical to bolster productivity of higher education, as conceived in this study, greater priorities should be accorded to productivity measures and outcome assessments. Without a standardized productivity indicator to measure the outcomes, HEIs cannot be evaluated or ranked objectively to foster their performances. The indicator is significant to assess the value of HEIs by weighing their investments against the education and research outcomes. Absence of a productivity indicator may skew HEIs to focus on unbalanced approaches, such as having more students at lower costs, at the expense of socioeconomic merits.

It is hoped that this study, albeit having limitations, could provide a premise for further exploring productivity of higher education in the Cambodian context. Expansion of research into a wider range of HEIs, including public, private and technical institutions, is suggested. Moreover, additional investigation into the research and service tenets of productivity of HEIs is worth conducting, provided data is available and accessible.

REFERENCES

[1] Cornell University, INSEAD & WIPO. The Global Innovation Index 2014: The Human Factor in Innovation. Fontainebleau, Ithaca, and Geneva: Authors; 2014.

[2] World Bank. World Development Indicators. Washington, DC: Author; 2013.

[3] Kwok K.W., et al. Scoping Study: Research Capacities of Cambodia's Universities. Phnom Penh: Development Research Forum in Cambodia; 2010.

[4] World Economic Forum. The Global Competitiveness Report 2016–17. Geneva: Author; 2016.

[5] Chet C. Higher Education in Cambodia. In: Hirosato Y., Kitamura Y., eds. The Political Economy of Educational Reforms and Capacity Development in Southeast Asia: Cases of Cambodia, Laos, and Vietnam. Dordrecht & London: Springer; 2009, 153–165 pp.

[6] Royal Government of Cambodia. Rectangular Strategy for Growth, Employment, Equity and Efficiency: Phase III. Phnom Penh: Author; 2014.

[7] Royal Government of Cambodia. National Strategic Development Plan Update 2014–18. Phnom Penh: Author; 2015.

[8] Ministry of Education, Youth and Sport. Education Strategic Plan 2014–18. Phnom Penh: Author; 2014.

[9] Ministry of Education, Youth and Sport. Policy on Higher Education Vision 2030. Phnom Penh: Author; 2014.

[10] Ministry of Education, Youth and Sport (MoEYS). Education Congress Report: Academic Year 2014-2015. Phnom Penh: Author; 2016.

[11] World Bank. Putting Higher Education to Work: Skills and Research for Growth in East Asia. Washington, DC: Author; 2011.

[12] Asian Development Bank. Cambodia: Addressing the skills gap. Mandaluyong City, Philippines: Author; 2015.

[13] Madhur S. Cambodia's Skill Gap: An Anatomy of Issues and Policy Options. CDRI Working Paper Series, No. 98. Phnom Penh: CDRI; 2014.

[14] Bruni M., Luch L., Kuoch S. Skills shortages and skills gaps in the Cambodian labor market: evidence from employer skills needs survey. Bangkok: ILO; 2013.

[15] United Nations Development Program. Human Capital Implications of Future Economic Growth in Cambodia: Elements of a Suggested Roadmap. UNDP Funded Discussion Paper, No. 8. Phnom Penh: Author; 2011.

[16] Sen V., Ros S. Anatomy of Higher Education Governance in Cambodia. Working Paper Series, No. 86. Phnom Penh: CDRI; 2013.

[17] HRINC. Higher Education and Skills for the Labor Market in Cambodia. Phnom Penh: Author; 2010.

[18] Chhinh S., Dy S.S. Education reform context and process in Cambodia. In: Hirosato Y., Kitamura Y., eds. The Political Economy of Educational Reforms and Capacity Development in Southeast Asia: Cases of Cambodia, Laos, and Vietnam. Dordrecht & London: Springer; 2009, 113–129 pp.

[19] Un L., Sok S. Higher Education Governance in Cambodia. In: Leadership and Governance in Higher Education: Handbook for Decision-makers and Administrators, vol. 4. www.lg-handbook.info. Accessed in 2014.

[20] Mak N. Higher Education in Cambodia: University Governance. In: UNESCO, ed. University Governance in Higher Education in Southeast Asian Countries. Bangkok: UNESCO; 2008.

[21] Kuch N., Willemyns A. Defense, Education Get Boost in New Budget. The Cambodia Daily, 22 October 2015.

[22] Ministry of Education, Youth and Sport. Master Plan for Research Development in the Education Sector. Phnom Penh: Author; 2011.

[23] Cambodian Institute for Cooperation and Peace. Doing research in Cambodia: Making models that build capacity. Phnom Penh: Author; 2016.

[24] Ministry of Education, Youth and Sport. Higher Education Quality and Capacity Improvement Project 2011–15. Phnom Penh: Author; 2011.

[25] Coates H. Research on measuring productivity in higher education. Presented at Coordination Meeting in Bangkok, Thailand, 24–26 November 2015.

[26] Massy W.F., Sullivan T.A., Mackie C. Improving Measurement of Productivity in Higher Education. Change: The Magazine of Higher Learning 2013; 45:1, 15–23.

[27] Epstein P. Measuring the Performance of Public Services. In: Holzer M., ed. Public Productivity Handbook. New York: Marcel Dekker, Inc.; 1992.

[28] Royal Government of Cambodia. Sub-decree on the Organization and Functioning of the Accreditation Committee of Cambodia Secretariat. Phnom Penh: Author; 2003.

[29] Chet C. Cambodia. In: UNESCO, ed. Higher Education in Southeast Asia. Bangkok: UNESCO; 2006.

[30] Ford D. Cambodian Higher Education: Growing Pains. International Higher Education 2006; 44: 10–11.

[31] Vann M. Stakeholders' Perceptions of Quality in Cambodian Higher Education. PhD Dissertation. Melbourne: RMIT University; 2012.

[32] Ministry of Education, Youth and Sport. Cambodian National Qualifications Framework. Phnom Penh: Author; 2014.

[33] Royal Government of Cambodia. Royal Decree on Professorship Assessment and Appointment, in Khmer. Phnom Penh: Author; 2013.

QUESTIONNAIRE USED

Study on Measuring Productivity of Higher Education in Cambodia

INTRODUCTION

This study aims to establish a productivity indicator for higher education institutions (HEIs) in Cambodia. It examines the productivity as a ratio of input and outcomes for HEIs. Further, it analyzes the contexts (policies, macro-economic forces, etc.) and managerial (workforce, strategies, etc.) factors that may enhance or hinder the productivity of HEIs. Our focus is on education and research functions. This questionnaire is part of the study, and aims to collect inputs and outcome data of HEIs for the period of 2010–15. All data will be kept confidential, collectively analyzed, and will not be used for other purposes. Identities of individual HEIs will not be disclosed in the publication and dissemination of the study. This study is financially and technically supported by the Asian Productivity Organization, Japan. We highly appreciate your participation in this study. A copy of the final report will be sent to the participating HEIs upon completion of the study.

Name of HEI: _____

Name of Respondent: _____

Phone Number of Respondent: _____

Email Address of Respondent: _____

1. Information on Education

1.1. Numbers of graduates

Item	2010	2011	2012	2013	2014	2015
1.1.1. Number of associate degree graduates						
1.1.2. Number of bachelor's degree graduates						
1.1.3. Number of master's degree graduates						

1.2. Numbers of graduates in employment, including self-employment and part-time employment, six or 12 months after graduation

Item	2010	2011	2012	2013	2014	2015
1.2.1. Number of associate degree graduates in employment						
1.2.2. Number of bachelor's degree graduates in employment						
1.2.3. Number of master's degree graduates in employment						

1.3. Number of credit hours delivered in each academic year

Item	2010	2011	2012	2013	2014	2015
1.3.1. Number of credit hours of associate degree programs						
1.3.2. Number of credit hours of bachelor's degree programs						
1.3.3. Number of credit hours of master's degree programs						

2. Information on Research

2.1. Number of Scopus, Web of Science or other source publications

Item	2010	2011	2012	2013	2014	2015
2.1.1. Number of Scopus publications						
2.1.2. Number of Web of Science publications						
2.1.3. Number of other source publications						

2.2. Number of citations of all faculty, patents filed or granted by all faculty, and PhD graduates

Item	2010	2011	2012	2013	2014	2015
2.2.1. Number of citations of all faculty						
2.2.2. Number of patents filed or granted by all faculty						
2.2.3. Number of PhD graduates						

2.3. Amounts of research funds (in USD)

Item	2010	2011	2012	2013	2014	2015
2.3.1. Amount of research fund from HEI itself						
2.3.2. Amount of research fund from Cambodian government						
2.3.3. Amount of research fund from the private sector						
2.3.4. Amount of research fund from international sources						
2.3.5. Amount of research fund from other sources						

3. Information on Input

3.1. Labor costs

3.1.1. Number of teaching and non-teaching staff

Item	2010	2011	2012	2013	2014	2015
3.1.1.1. Number of full-time teaching staff						
3.1.1.2. Number of part-time/contract teaching staff						
3.1.1.3. Number of full-time non-teaching staff						
3.1.1.4. Number of part-time/contract non-teaching staff						

3.1.2. Annual time allocation of teaching and non-teaching staff (estimation in %)

Item	Teaching	Research	Administration	Leave	Other
3.1.2.1. Annual time allocation of full-time teaching staff					
3.1.2.2. Annual time allocation of part-time/contract teaching staff					
3.1.2.3. Annual time allocation of full-time non-teaching staff					
3.1.2.4. Annual time allocation of part-time/contract non-teaching staff					

3.1.3. Costs (salaries and other payments) of teaching and non-teaching staff (in USD)

Item	2010	2011	2012	2013	2014	2015
3.1.3.1. Cost of full-time teaching staff						
3.1.3.2. Cost of part-time/contract teaching staff						
3.1.3.3. Cost of full-time non-teaching staff						
3.1.3.4. Cost of part-time/contract non-teaching staff						

3.2. Capital (investments of all types) (in USD)

Item	2010	2011	2012	2013	2014	2015
3.2.1. Cost of buildings						
3.2.2. Cost of equipment						
3.2.3. Cost of vehicles						
3.2.4. Other costs/investments						

3.3. Intermediaries (recurring costs) (in USD)

Item	2010	2011	2012	2013	2014	2015
3.3.1. Cost of goods and supplies						
3.3.2. Cost of maintenance						
3.3.3. Cost of outsourcing contacts						
3.3.4. Cost of transport services						
3.3.5. Other operating costs						

Thank you for completing this questionnaire.

CHAPTER 3
FIJI

Robert Misau[1], Fiji Higher Education Commission, Fiji

EXECUTIVE SUMMARY

Higher education is the key to preparing students to be the change agents and contributors for a progressive, sustained, and meaningful socioeconomic development. This public obligation of the higher education institutions (HEIs) and other stakeholders entails the deployment of resources, both public and private. Within the guidelines of productivity, encompassing best practices, efficiency, effectiveness, and quality is the expectation from stakeholders so that the higher education system could produce the desired outcomes.

The justification and motivation of the research was to explore and discuss how productivity could be measured in higher education since this had never been done in the past. The key constraints experienced in the exercise included limited availability or non-availability of data, and information not being present in the required format. The University of the South Pacific and the University of Fiji provided data that was processed. Fiji National University contributed to the summary of key productivity initiatives undertaken in the past 5–10 years as well those for the next five years, but made positive indications of data forthcoming in future studies.

The analysis of data and information from the three universities using the generic productivity model (P=output/input), brought out insights into correlations, not only between inputs and outputs, but also within each component. The analysis of specific components through drill-downs and regression analysis helped in the development of this measurement initiative.

Outcomes have been considered as the ultimate measure of productivity in that the real impact on the student, the society and the country, is sought after by the key stakeholders and providers of resources. Outcomes, rather than just outputs, would add a new dimension to the productivity model and expand the present scope of higher education, while

[1]The research and compilation of the Fiji Chapter was made possible with the assistance of the following entities and personnel by way of administrative support, provision of data and information, consultations, editing of drafts, providing ideas, and providing counter perspectives on various issues:

1. The University of the South Pacific: The Vice Chancellor and senior staff of the Finance and Administration and Planning office with particular mention of Kolinio Boila, Christine Namerua, Prasanna Samarakoon and the heads of the various faculties for the support in collating and providing the required data and information.
2. The University of Fiji: The Vice Chancellor and the Executive Director Finance, Ravineet Sami, for providing the required data and information.
3. The Chancellor and Vice Chancellor of the Fiji National University for providing information and enabling discussions on productivity initiatives and related issues. Some of the ideas had influence in shaping the recommendations in the chapter.
4. The Executive Chairman of the Fiji Higher Education Commission (FHEC) and members of the Finance and Research team (FHEC) for verifying data and information in the compilation of the chapter and for being the 'sounding board' on many issues discussed in the chapter.
5. Professor Hamish Coates of the University of Melbourne, Australia, for the guidance and facilitation as the Chief Expert in the project.
6. To the APO Secretariat and especially to Dr. Jose Elvinia for providing logistics support to the project.
7. The NPO office in Fiji, the National Training and Productivity Center (NTPC), for assisting in the arrangements to involve the Fiji Higher Education Commission in this research project at the outset.

acknowledging that the graduation and completion of studies are just checkpoints on the pathways to outcomes. This new dimension requires the collaboration of key stakeholders to plan, leverage the resources, and implement actions for this paradigm shift to be realized. The key productivity initiatives of the HEIs alone would be inadequate to sustain productivity. The paper discusses the initiatives of both the HEIs and the key stakeholders (government, quality assurance agencies, regulators, financiers) in synergy, while acknowledging the important roles, separately and jointly, in resourcing, implementing and sustaining the initiatives. Toward this end, it is critical that the HEIs, other stakeholders and students are aware that productivity equates to better benefits, better outcomes, and sustained economic and financial progress, in terms that are easier to understand.

To assist in the progressing of this initial work to the next level, the following observations and recommendations are made:

1. A survey of the graduates and a database of alumni destinations for the various HEIs are needed as the first steps toward getting an indication of outcomes.
2. The key stakeholders must get together on a forum, to agree that productivity measurements must be an integral part of a monitoring and evaluation framework for HEIs. This will drive the needed commitment and provide a reasonably standardized data-and-information set to bring about a common understanding of the required work.
3. There is a need to redefine the scope of higher education beyond graduation, to enable the measurement of productivity in terms of outcomes and their impacts on students, society and the economy. This would also entail agreeing on the sets of input, output, and outcome data; and the various compositions of each set, including the various types of measurements and modifications to the productivity model.
4. The resourcing of such work alluded to in the recommendations above, right from the commencement to a sustained development, needs a collaborative network of key stakeholders referred to above. This would help in the mustering of resources to aid in the implementation.

The leadership in all the above works should be shared between the state and the universities, which are the principal stakeholders.

INTRODUCTION

In November 2015, Fiji was part of the research team comprising the APO member countries that met in Bangkok, Thailand, to look at how productivity in higher education could be measured. At the preliminary research meeting, steps were mapped out for measuring productivity, while recognizing that such a project would not be without constraints. The country representatives in the team have since collected data and information for compiling their respective country chapters, which form a part of the research paper coordinated by the APO.

Some of the objectives of productivity measurement are to track changes in technical aspects, efficiencies, real cost savings, benchmarking production processes, and improvements in living standards.

The paper looks into the method and ratios to measure productivity, and also hopes that it can effectively contribute to the creation of a greater interest in productivity conversations in higher education in Fiji, in order to affirm a system to measure productivity in higher education. Such aspiration needs a concerted and collaborative effort from stakeholders that generate and hold data and information relevant to productivity.

While this research project to measure productivity in higher education is a breakthrough in its own right, it is also important to acknowledge the limitations that the project had to live with. These include the constraints in deciding what data to collect; getting that from various sources; analyzing the information that was made available by the participating HEIs; and making deductions and drawing out the insights. This also included the analysis of past and present key initiatives undertaken for enhancing productivity.

This exercise would be incomplete without acknowledging the general constraints of data collection and in some instances the lack of data availability. These issues need to be addressed to access the data needed to measure productivity in higher education, and to agree on the evolution of a model for future measurement needs.

Availability of education and career pathways for all would help meet Fiji's ambition to have and sustain a knowledge-based society, which is a central ingredient for attaining a progressive and sustainable socioeconomic prosperity. Higher education, in particular, lays the foundation for achieving these goals, at the individual, community, national and regional levels.

The investments made in higher and tertiary education by relevant stakeholders in the form of operating costs, capital grants, scholarships, and student loans, justify the need to measure quality, efficiency and effectiveness of the conversions or outcomes. This is not to dilute the view that HEIs as business entities ought to be operationally viable, sustainable and relevant as well.

The perceptions and expectations of stakeholders, which include the students, employers, financiers, the society, and the investors, with regard to productivity, are inevitable. They are also necessary to maintain a check and balance in the higher education system. After all, the productivity of higher education is the value of the return (outcome but not limited to output) to be derived from inputs, as expected and anticipated by the country and society at large and the donors, tax payers and students in particular.

BACKGROUND

The principal providers of higher education and training in Fiji are its three universities, namely the University of the South Pacific (USP), the Fiji National University (FNU), and the University of Fiji (UOF). The USP is a regional university governed by twelve member countries of the Pacific Islands, while the FNU and the UOF are institutions owned by the Fiji Government and a society, respectively. There are numerous other medium to smaller public, private and faith-based institutions offering other programs at levels one to six of the Fiji Qualifications Framework catering to various sectors and subsectors of the economy.

These HEIs help provide diverse alternative pathways for various focus and economic sections of the society. Fiji currently has 70 HEIs and the number continues to grow due to local and foreign interests to establish such institutions to meet local, regional, and international demands. This compliments Fiji's relative position as a hub of the Pacific region.

The Fiji Government's commitment to funding higher education has been steadfast and is an important input towards productivity. This is done by providing a much-needed financial assistance to buffer the projected deficits or shortfalls in the operations of a number of approved HEIs or those that meet certain criteria such as being registered with the Fiji Higher Education Commission. This is invariably an input driven approach, until the outcomes of higher education can be clearly defined, measured, analyzed and then used to incentivize the funding approach.

While the funding system supporting this public obligation is designed to ultimately produce outcomes, and not only outputs, determining the level and areas for financing and outcomes to drive funding, in the face of a lack of relevant data, is quite a difficult task.

Table 6: Percentage of higher education budget versus total education budget

Year	Higher education budget (operating + capital)	Total education budget	Percentage of higher education
2013	67,597,200	334,095,700	20%
2014	85,294,200	452,727,600	19%
2015	85,739,200	483,617,500	18%
2016	76,584,800	505,766,700	15%
2016–17	93,356,300	538,307,800	17%

Source: 2013–16 and 2016–17 Fiji Budget Estimates, a Government of Fiji document

In recognition of its wider environment and for strategic purposes, Fiji continues to play its part in the development of the Pacific Island Countries (PICs). The three universities and other institutions continue to have regional students and remain connected with other HEIs for international benchmarking on best practices. This collaboration has also led to the establishment of foreign owned HEIs, bringing new ideas and offerings to blend with existing alternatives for students.

Such infusion and integration brings diversity to the higher education sector. This dynamic and diverse environment is also alluded to by Chandra [1], in that higher education in Fiji would be influenced by the interplay of globalization, regional requirements and its own national ambitions and capabilities.

The data and graphs on the next page provide some indication of the growth and developments made in Fiji in response to market demands in higher education. The total number of programs offered increased in 2013 by 3% but decreased by 12% in 2014. This decrease is greatly attributed to a relatively significant commitment to quality and the

reduction in the unnecessary proliferation of programs. Such commitment should translate into quality and streamlining on the input side with a view to possible improvements on the output side. Institutional growth has been identified in the number of programs offered in various fields. Table 7 highlights the number of programs offered by the respective universities in six major fields in 2014.

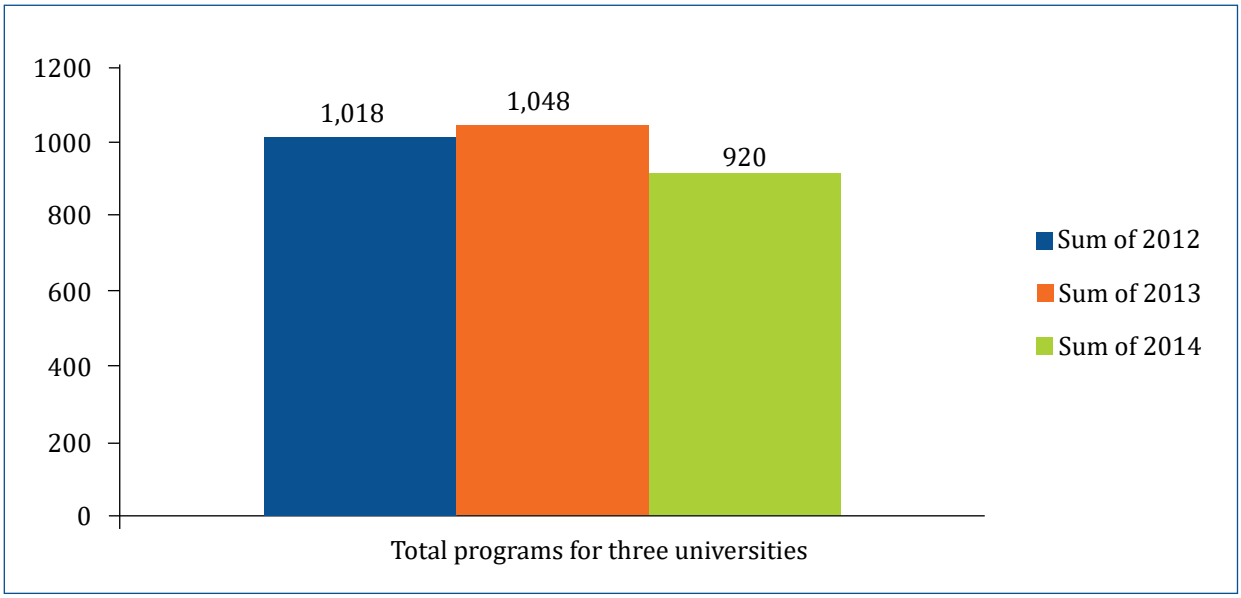


Figure 8: Total programs offered by universities from 2012 to 2014

Source: FHEC internal researched data from HEI annual reports

Table 7: Programs offered by universities in six major fields

	Arts	Commerce	Medicine	Science	Engineering	TVET
FNU	29	119	61	72	30	42
UOF	29	26	3	21	NA	NA
USP	157	133	NA	153	10	3
Total	**215**	**278**	**64**	**246**	**40**	**45**

Source: Fiji higher education internal data collected by HEIs for funding model calculations for 2015

A critical indicator reflecting growth is based on the total equivalent full time students (EFTS) enrollment. Figure 9 shows data for the USP, the UOF and the FNU for the period 2012 to 2014. The graph shows a general increasing trend for non-Fijian students, Fijian students, and the total EFTS enrollments in the three universities from 2012 to 2014. The trend shows an increasing demand in EFTS enrollments towards upgrading of academic qualifications, met by a corresponding commitment by the HEIs to accommodate the demand.

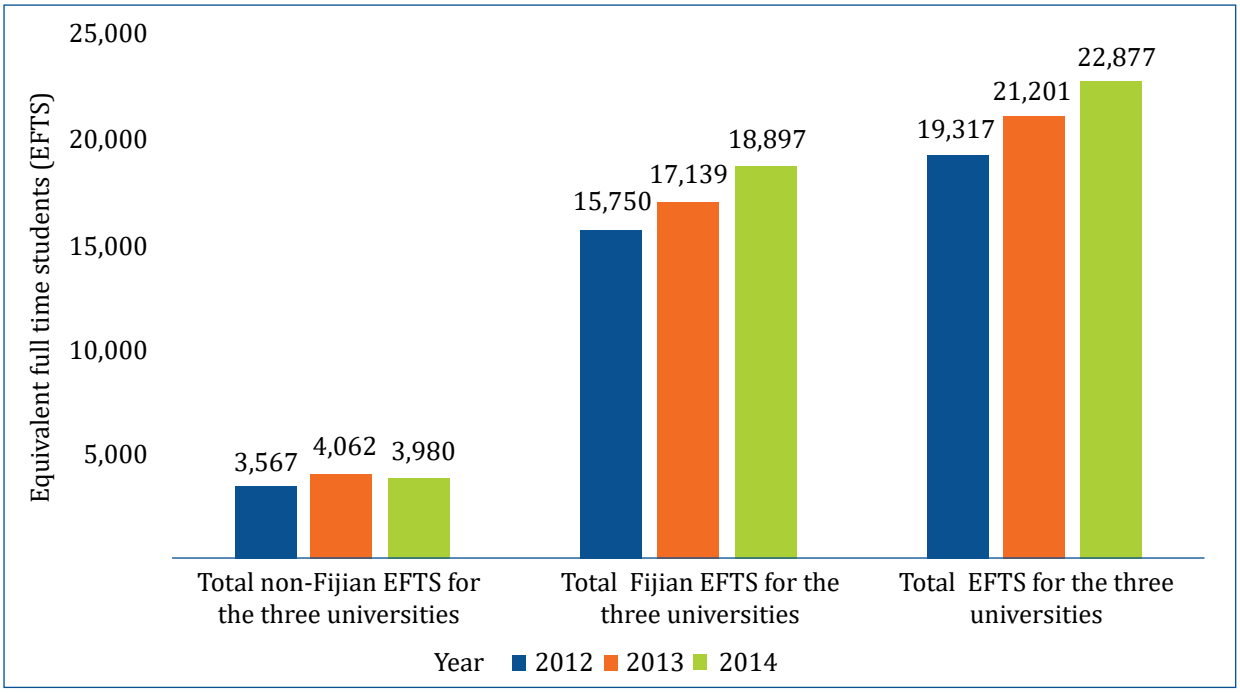


Figure 9: Total non-Fijian, Fijian, and total EFTS for the three universities for 2012–14

Source: FHEC Funding Model data from 2012 to 2014

Given the inevitable evolution and development in the higher education landscape, the Fiji Higher Education Commission (FHEC), mandated under its governing legislation Higher Education Promulgation, 2008, manages a regulatory function that is multi-pronged. It has facilitation and quality-assurance roles, which are not prescriptive, but ensure that effectiveness, efficiency and quality, are embedded and operational in the higher education system and in the HEIs.

The FHEC is associated with internationally recognized bodies in quality assurance, namely the Asia-Pacific Quality Network (APQN) and the International Network for Quality Assurance Agencies in Higher Education (INQAAHE). This is a testimony to the importance the FHEC places on the need to be relevant and competitive as a quality assurance agency. This is an essential network, to facilitate the continuous management of diversity, internationalization and quality, for having a competitive higher education sector.

The FHEC has a structure and a framework that enables the HEIs, the industry (employers), government ministries, professional bodies, and individuals to participate in the pursuit of certain common desired levels of quality. Several processes are governed and prescribed by certain regulations aligned with its legal mandated functions, providing forums and processes toward ensuring quality of the HEIs. Such structures enable provisions for institutional recognition and registration, institutional reviews, program accreditations and the maintenance of the Fiji Qualifications Framework (FQF) to ensure that the latter's vibrancy, robustness and recognition, are enhanced, both locally and internationally.

The funding of the HEIs in Fiji is primarily done through public (state) funds and donor agencies (foreign and local), with the bulk going to the three universities. These funds are

basically to cushion the operational and capital expenditures and also to support students through scholarships and tertiary loan schemes. The funding obligation is preceded by a scrutiny to establish the effectiveness, efficiency, quality, and viability in terms of technical, managerial, and financial aspects, as per the predetermined criteria and best practices.

This does not discount the significant contributions of private investments by the many relatively small higher education providers who provide alternative pathways through programs ranging from certificate to diploma levels in a diverse spectrum of fields. There is an apparent and relatively significant financial risk undertaken by these providers in terms of collaterals to set up these institutions. This may be seen as a reflection of their confidence in the viability of the higher education system in Fiji.

Under varying constraints and circumstances, the HEIs, the FHEC, and the stakeholders have taken great strides in developing the higher education system and the necessary infrastructure and environment in Fiji.

Productivity conversations therefore become significant and central to managing this obligation to stakeholders, particularly the HEIs and the providers of resources. The society also gains in terms of quality outcomes being directed at various communities, and consequently, the country. The equity of such return on investment can only be determined when the higher education outcome is measured and analyzed.

KEY PRODUCTIVITY INITIATIVES IN THE LAST DECADE

Various stakeholders have taken different initiatives from time to time, whether intended or not, which have impacted the higher education sector in Fiji by varying degrees. Below is a list of some of those key initiatives taken by the leading HEIs, especially the universities:

University of South Pacific

The following is a brief on the key productivity initiatives implemented by the USP through its various faculties over the last 10 years. Information was obtained directly from the USP over email:

Initiatives at the Faculty of Business and Economics include:

1. Improved learning management system for better functionality, including online submission, review and marking of assignments.
2. A greater emphasis on supporting students through various initiatives such as Student Learning Support (SLS), which provided academic skills training and peer mentoring.
3. Greater internet access on campus, which enabled students to use their own PCs and mobile devices, thus reducing pressure on computer laboratories.

Initiatives at the Faculty of Science, Technology and the Environment include:

1. E-learning, not only to reduce delivery costs but also to increase the opportunity for

students and persons who would otherwise not be able to take up university studies because of work or geographical locations.
2. The consolidation of programs to become more focused and use more generic foundation programs (i.e. first-year platform) to reduce costs.
3. A global shift to produce graduates who were work-ready. This was an output-based philosophy.

Initiatives at the Faculty of Arts, Law and Education include improvement of course completions through:
1. The establishment of SLS and First Year Experience for undergraduate students.
2. The identification of at-risk students in taught programs with relevant intervention through SLS.
3. The tracking of research students and the implementation of a research support system including establishment of PG Research Center and Lab for MA/PhD students.

Improvement in enrollments through:
1. Targeted marketing strategy through marketing (communication strategy).
2. Increased demand for higher research degrees and university Graduate Assistant scholarship programs.

By way of summarizing key productivity initiatives in USP, similar initiatives recurred in all faculties, although the priority varied according to the different circumstances in each faculty. The two factors common to the above three faculties were:

- Increased focus on student learning support, especially in the appointment of First Year Experience coordinators. This was critical for student retention and had a future bearing on pass rates and completions.
- Improvement in the Moodle Platform; expansion of online delivery; developments in e-learning, and m-learning; and improved Wi-Fi coverage.

The University of Fiji

The UOF stood as a local alternative for those students who wish to attend higher education but could not afford the tuition fees of the USP and the FNU or could not secure a place. Without compromising on the quality of admission standards, the UOF provided an alternative pathway to those students for relatively affordable fees.

In this regard, a commitment to quality at the outset was mandatory and essential. To be attractive to students, the UOF had to position itself as a strong and committed institution that could deliver excellent quality of education that was comparable to other HEIs. The UOF attended to the following broad areas:

- Learning and teaching
- Student services
- Research
- Environmental and social responsibilities

- Governance and financial sustainability
- Infrastructure and systems
- Risk assessment
- Accountability framework

The Fiji National University

At the outset, the FNU simultaneously had certain strengths and weaknesses. Its strength was derived from the many diverse institutions that were amalgamated to form the FNU. This was done to optimize the Fiji Government's resources in the various state-established institutions. However, in the process, the FNU also inherited the diverse weaknesses and opportunities of its different composite institutions. The institutions were the Fiji Institute of Technology, Fiji School of Medicine, Fiji College of Agriculture, Fiji College of Advanced Education, and Lautoka Teachers College and National Training and Productivity Center, previously called the Training and Productivity Authority of Fiji.

A challenge for the FNU then and ever since, has been the transition, as it continues to harmonize the various inherited systems, business practices, and organizational behaviors, into an intended strategic direction.

Since its inception as a university, the FNU has continued to be well supported by the Fiji Government in terms of funding of operations and capital expenditure to meet developments, renovations and establishment of necessary campuses and centers around the country. The state support and the continued collaboration with the FHEC are necessary for the FNU to be competitive as a national HEI.

Below is a summary of key productivity initiatives over the period, provided by the Chancellor of the FNU:

- The opening of training centers in rural areas in central and strategic locations to allow students to study closer to their homes, thus reducing the burden of accommodation and longer-distance relocation of the student.
- The introduction of commercial agriculture through the College of Agriculture, Fisheries and Forests, to encourage the training of practical commercial farmers. This initiative had limited success because of the difficult process students had to go through to access leases and financing, as promised under the scheme
- Securing land for the development of a campus to cater for the northern region of the country.

Summary of Past Initiatives

A summary of past productivity initiatives of the three universities indicates that there was a common desire and dedicated effort toward:

- Better quality and relevance of education through networks with key industry stakeholders to inform the development, accreditation and validation of relevant

programs of study. The industry stakeholders are either at one end of the career pathway for students as employers or as key players in the entrepreneurial environment that students will need to deal with for a livelihood, after the university.

- An increased volume of students passing through the HEIs, and effective student learning support to deal with student retention and course completion. These had implications for revenue and funding for the HEI but also required an effective management of input costs and delivery of quality output (completion quality) and outcome (post-exit quality of employment) delivered by the HEI.
- International recognition. This strategy undoubtedly had wide implications for the validity, credibility and sustainability of an HEI's operation, apart from the portability of qualifications, and cross-border movement of graduates in the global higher education system. This had implications for foreign investor confidence in Fiji, especially where the local component is expected to be significant on the input side of a commercial venture. Blended and joint programs between Fijian and foreign universities could be an offshoot for international recognition that can support more foreign investment into Fiji, based on the confidence that Fiji has the skilled human resources needed to support such incoming foreign investments.
- Being abreast with technological developments in the areas of e-learning and m-learning. This strategy not only gave learners and academic staff time for other schedules but also supported a freer access to learning material and propelled the teaching rate and coverage. The reduction on the input side of the productivity equation is inevitable.

Key Productivity Initiatives by Other Stakeholders

The Fiji Government

National and regional imperatives continued to persuade the Fiji Government and overseas donors to direct much-needed funding for operational and capital expenditure requirements of the universities. The past five to 10 years were marked by input-driven funding that was necessary to establish and develop physical infrastructure, build academic capacity and governance, and grow the respective business capacities of the universities.

This was followed by initiatives to enhance access to the various pathways for existing and potential learners. The state provided tertiary funding through a loans scheme and a national toppers scholarships scheme to support this input strategy.

The Fiji Higher Education Commission

As the regulator for the higher education sector and mandated under the Higher Education Promulgation 2008, the FHEC under its eleven mandated functions, played an oversight role to ensure that the institutions' programs, facilities, academic staff and other important features for a viable university were at an acceptable and sustainable level.

In the conduct of its wide functions, the FHEC was aptly assisted by the following forums, basically for the quality of deliverables by the HEIs: the Fiji Qualifications Council, the

Recognition and Registration Committees, the Committee for the Accreditation of University Qualifications (CAUQ), the Industry Standards Advisory Committees (ISAC), the Review Committee, and the management of each HEI.

The FHEC's involvement in the allocation of funding for HEIs also mandated a monitoring responsibility to ensure that the HEIs produced the desired outputs and outcomes, apart from accounting for operational and capital expenditures.

ANALYSIS OF THE PRODUCTIVITY INDICATOR

Introduction and Definition

The supporting data and information sources for this analysis are found in appendices to this chapter. A standardized template and questions were sent out, to which the responses were provided directly by the participating HEIs, namely the USP and the UOF. The FNU was unable to provide the requested data due to its unavailability in the required format. The FNU, however, sent comments through its Chancellor by email, regarding the key productivity initiatives discussed earlier in this chapter.

Technically, productivity is the ratio of output to input. It is a measure of how efficiently and effectively the higher education sector in Fiji uses inputs such as land, intermediaries, and capital to produce educational and research outcomes.

An increase in productivity means that more outcomes were produced with a certain quantity of land, labor and capital. It is not about cutting costs but 'doing things right' and 'doing the right things' to achieve maximum efficiency and value.

The Model

The model is a basic but progressive one in that it attempts to make a breakthrough in measuring productivity in higher education, given that this is the first such attempt in the Asia-Pacific region. The findings from the analysis are neither intended to be benchmarks for any HEI nor to be prescriptive. However, they hope to show what can be measured and how, to appreciate the issues around data availability and collection, and to look at the opportunities for the future development of such a project (i.e. to serve as a nucleus for the future).

The formula, 'Productivity = Outputs / Inputs (O / I)' and indices were used. The outputs measured over a period of five to 10 years (depending on the availability of data), were education outputs, research outputs, and academic outputs, the latter being the amalgamation of the first two outputs. These were measured against input costs (labor, capital and intermediaries). Education outputs were made up of coursework completions, percentage of graduate employments, number of credit hours, and percentage of learning outcomes. Research outputs were made up of the number of publications, citations, patents, and research completions as well as the amount of research funds. The respective education, research, and academic productivity ratios were derived by using the economic productivity formula of outputs divided by inputs. The inputs were land, capital, and intermediaries.

Relevance for the Future

The specific components in each input and output were relevant at this initial pilot stage, although not exhaustive. There is an opportunity in future studies to 'drill down' to specific items that are considered critical (within outputs and inputs) to investigate relationships such as elasticity between selected items in Inputs (I) with those in Outputs (O), and among components within I and O.

For Fiji, such possibilities are important because they will enhance the analysis of how the input side could be better managed, in the face of limited resources, to drive strategic outcomes (not only outputs). The output side also needs to be managed to deliver desirable outcomes for the society and the economy.

The quality of what comes out of the higher education system (outcome) is not relatively easy to define and therefore difficult to measure [3]. Nevertheless, such ability to measure will form a stronger basis for making improvements in higher education through a regression analysis approach. Much of the problem lies in the varying timeline and the circumstances (socioeconomic and political) that the graduate is faced with after exiting from a university. While output is achieved at the point of a student's graduation, outcomes are usually harvested later as these require the graduate to either enter an employment or demonstrate an entrepreneurship that can be measured.

The environment (time and opportunities) outside of university life are influential factors that can do one of the three things to the outcome and quality of the graduate: a sustained upward spiral movement (improvement); a downward movement (decline); or stagnation (no impact). The environment provides conditions that are unfortunately practically outside the real direct control of the higher education system, yet are critical in nurturing and facilitating the realization of the full potential of the graduate. This may require the redefinition of the higher education horizon and landscape to cover this extended environment. This may also require the revision of the formula for measuring productivity and require more collaboration and resources from key stakeholders.

Given the importance of outcomes rather than outputs only, it is apparent that stakeholders in the higher education system would be interested in the movements of students and graduates along the complete pathway, from entry and progression in the system to employment and beyond. The ultimate target of the higher education system is therefore to get quality outcomes or a return on investment that is expected to flow back to the society and the economy.

The productivity model, P=O/I, despite being a breakthrough attempt to measure productivity in higher education, has inherent limitations, in measuring only a certain point along the pathway alluded to in the earlier paragraph. Productivity at the stage where a student graduates or exits the education system, is only a progression on the path to a quality outcome that a student may develop and master over time. The current model has therefore captured only a part by way of measuring P as 'output ÷ input,' while the ultimate goal could be realized by measuring P as 'quality of outcome ÷ input.'

Return on Depreciation

A next study should consider the calculated annual depreciation figure, based on agreed assumptions, as the annual input figure for capital against which the annual outputs would be measured. For this exercise, the total capital amount invested in a particular year (to reap long-term benefits) was offset by annual outputs, thus giving rise to a mismatch and with the effect of reducing the productivity ratio.

The productivity ratio, however, based on the assumptions used and for the purpose of this research, was sufficient. It also pointed out the possibilities for improvement and the flaws to be addressed in future research.

Productivity Graphs for UOF and USP

Figure 10 through Figure 12 present graphs related to the UOF, while Figure 13 through Figure 16 present information pertaining to the USP.

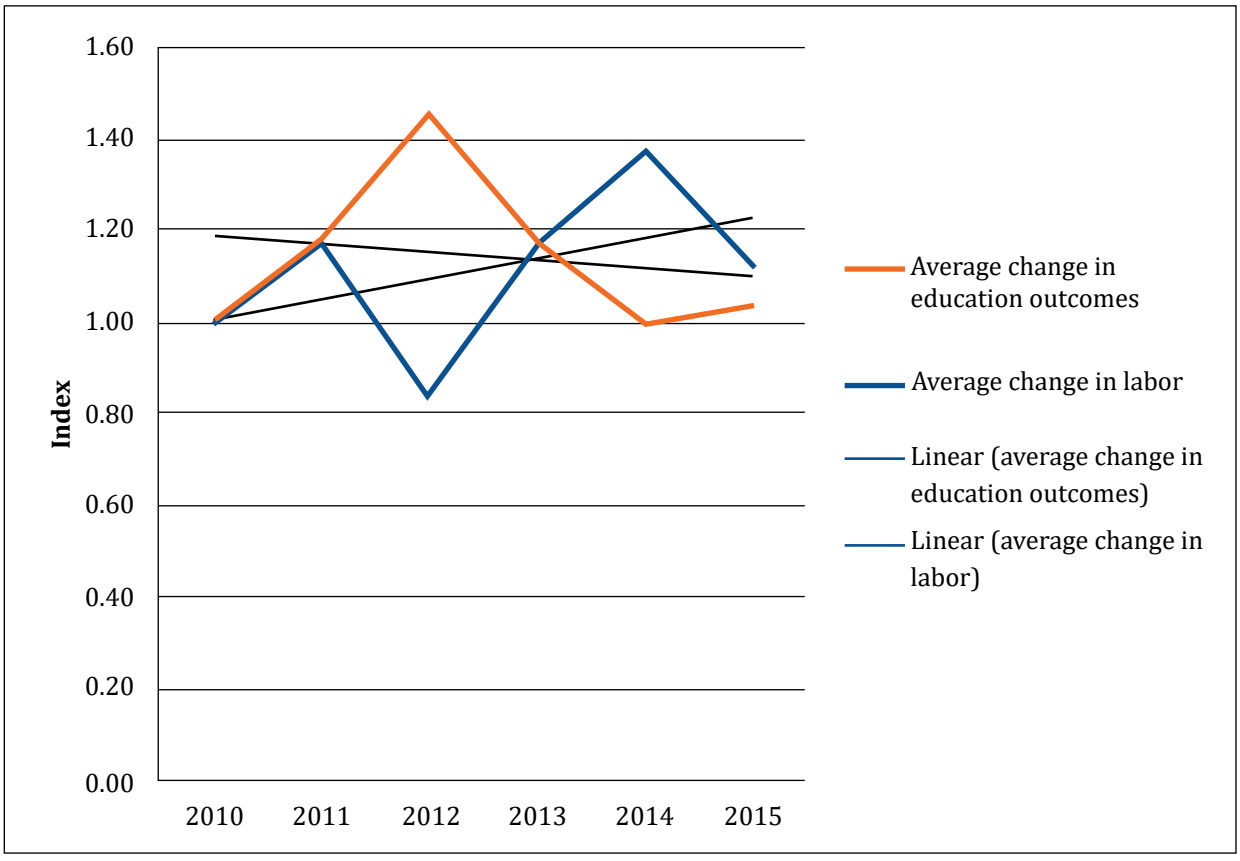


Figure 10: Average change in education outcome versus labor inputs (UOF)

The converging trend of the variables indicates a rather negative response of education outputs to labor inputs. While salaries or increase in the number of academic staff members may have increased the change in the labor input index, there is no positive response by way of average change in the education output index. Teaching and learning (core functions of the academic staff) under normal circumstances, should positively impact the student performance.

Beyond the intersection of the trend lines in 2013, there is a negative return in 2014 and 2015 with increasing costs.

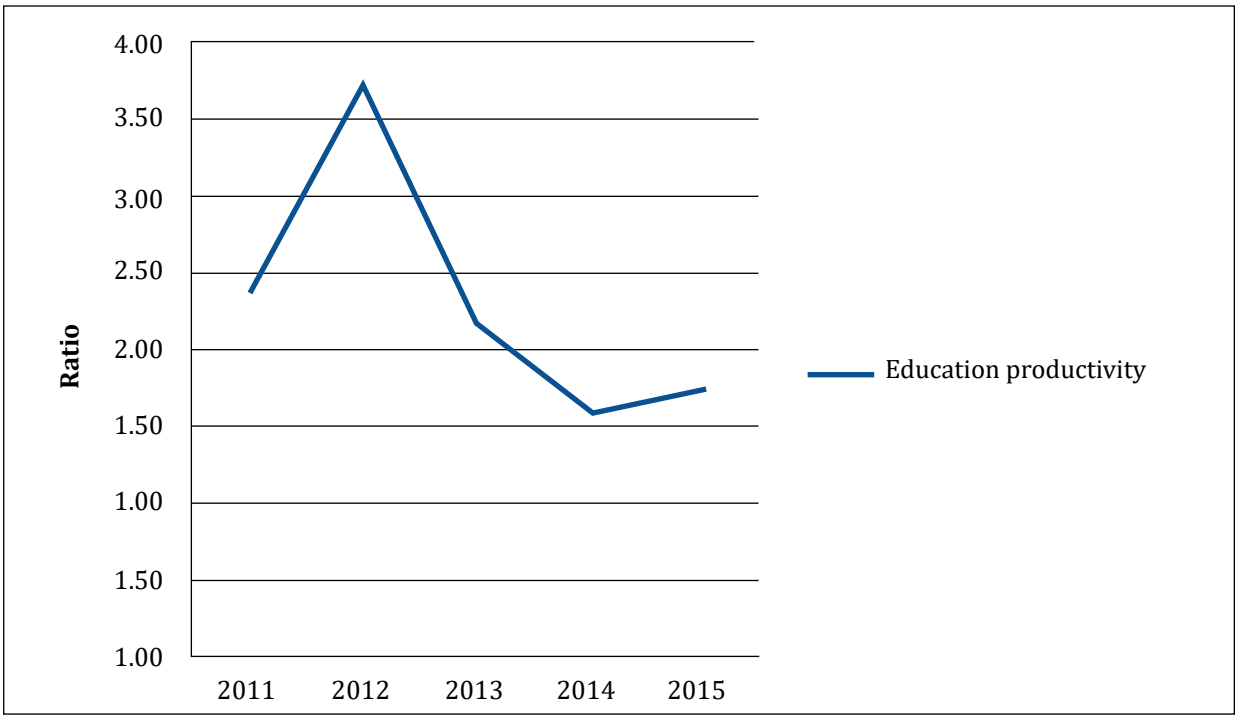


Figure 11: Education productivity (UOF)

The relatively steep decline in the ratio over the period is of concern because this comprises components such as course work completions that directly impact the students' performances and their likelihood to graduate.

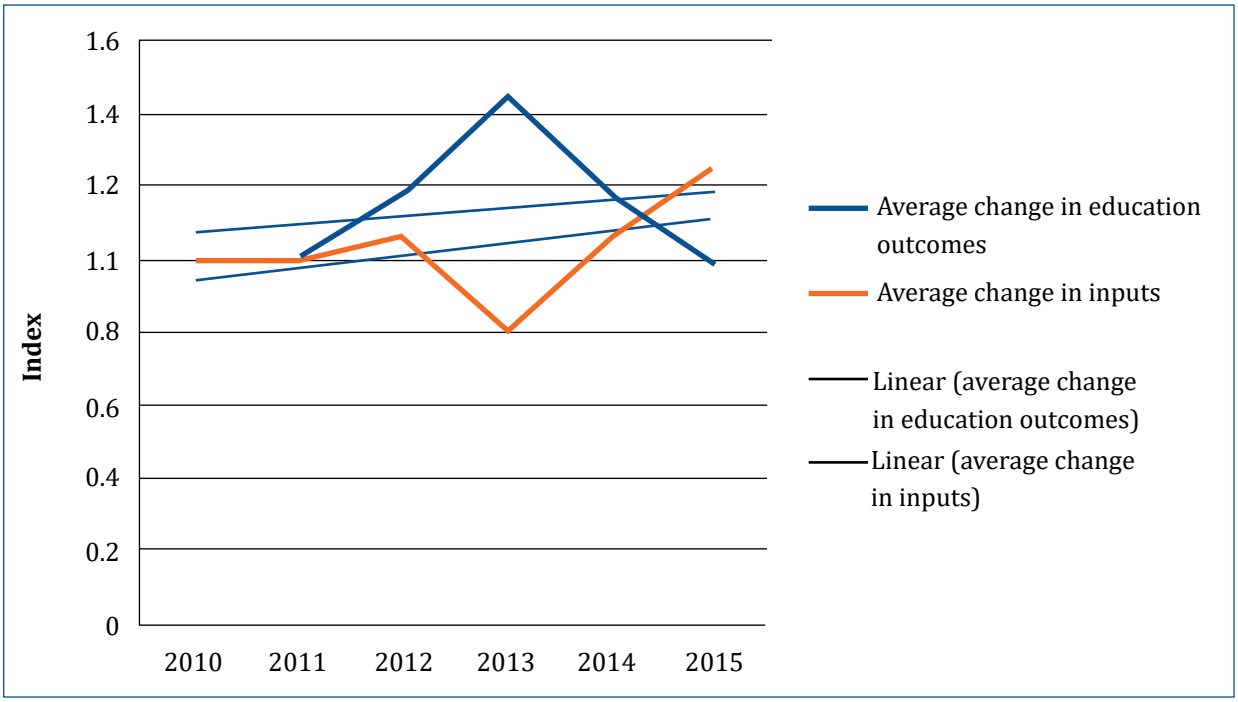


Figure 12: Average change in education outcomes versus average change in inputs (UOF)

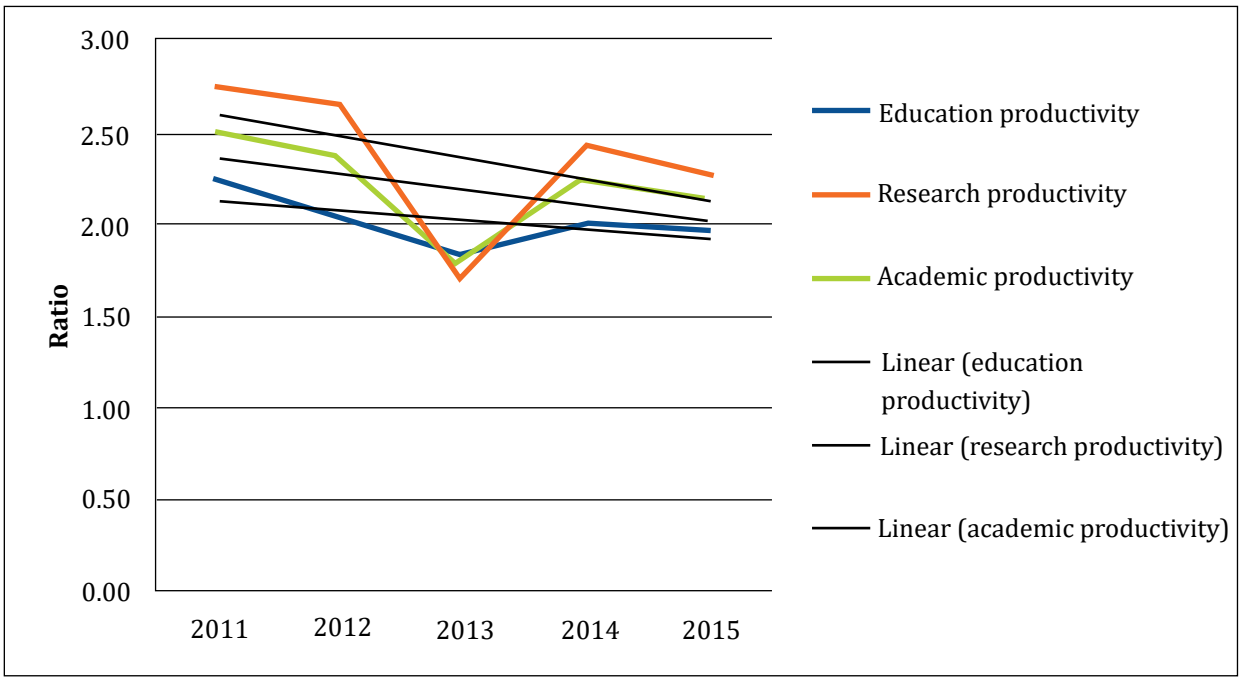


Figure 13: Productivity ratios (USP)

The slight declining ratio trend is still around two, which is a relatively good return but the trend needs to be managed upward. One of the major inputs was capital which contributed significantly.

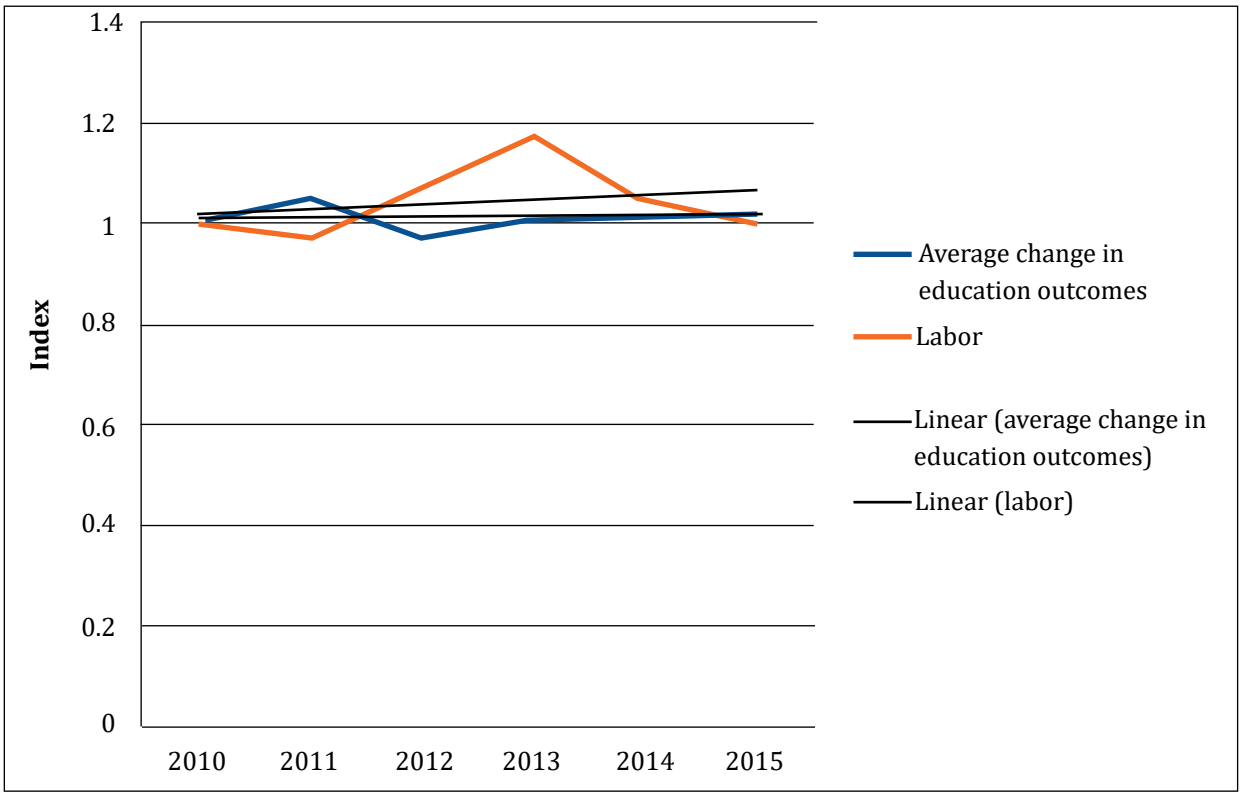


Figure 14: Average change in education outcomes versus change in labor inputs (USP)

There is an apparent positive relationship reflected in a somewhat upward trend, which indicates a relatively positive return on labor (comprising academic staff). However, it

should be noted with caution, given the relatively flat trend of outputs hovering around an index of just one throughout the period.

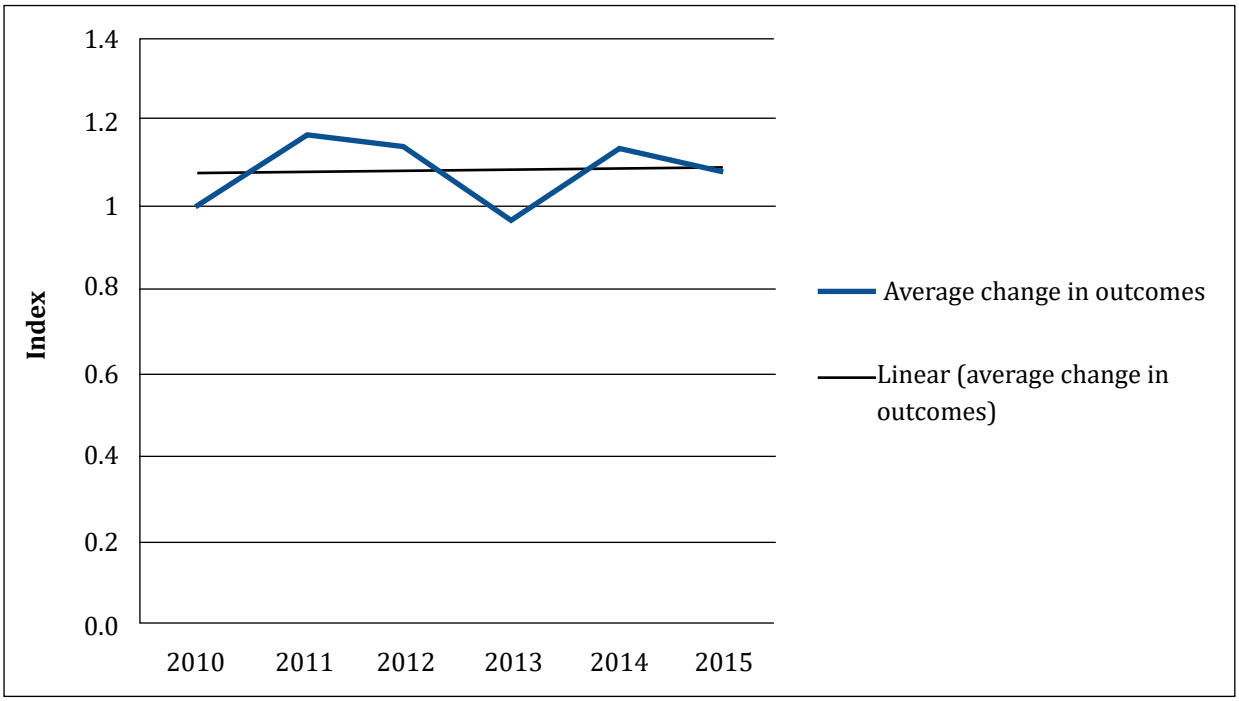


Figure 15: Average change in academic outcomes (USP)

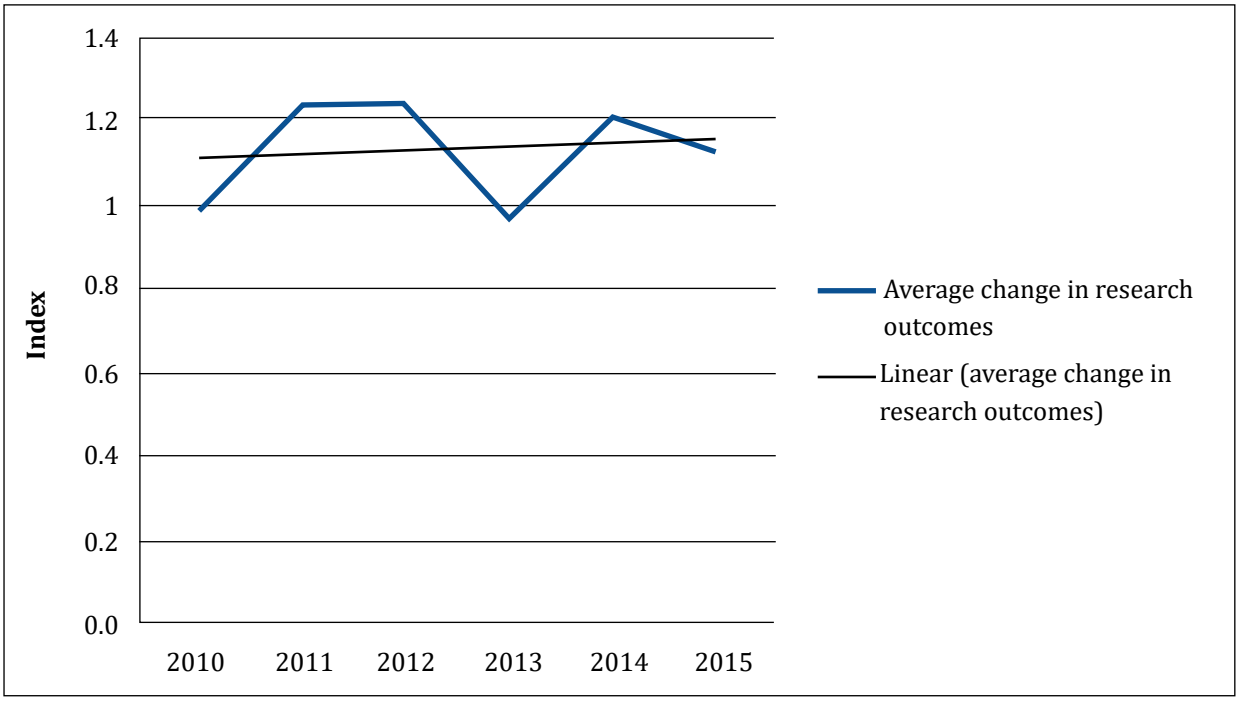


Figure 16: Average change in research outcomes (USP)

All indices for change in productivity outputs are relatively flat (Figure 15 and Figure 16), with a similar trend in labor input (Figure 14). There is an opportunity to improve the response of the output to labor through innovations and key initiatives specific to the HEI discussed in this paper.

Figure 17 through Figure 24 indicate the combined data for the USP and the UOF. Due to different stages of maturity and development between the two universities, the ratios tend to greatly reflect the impact of the USP, which was established earlier and has data of larger values.

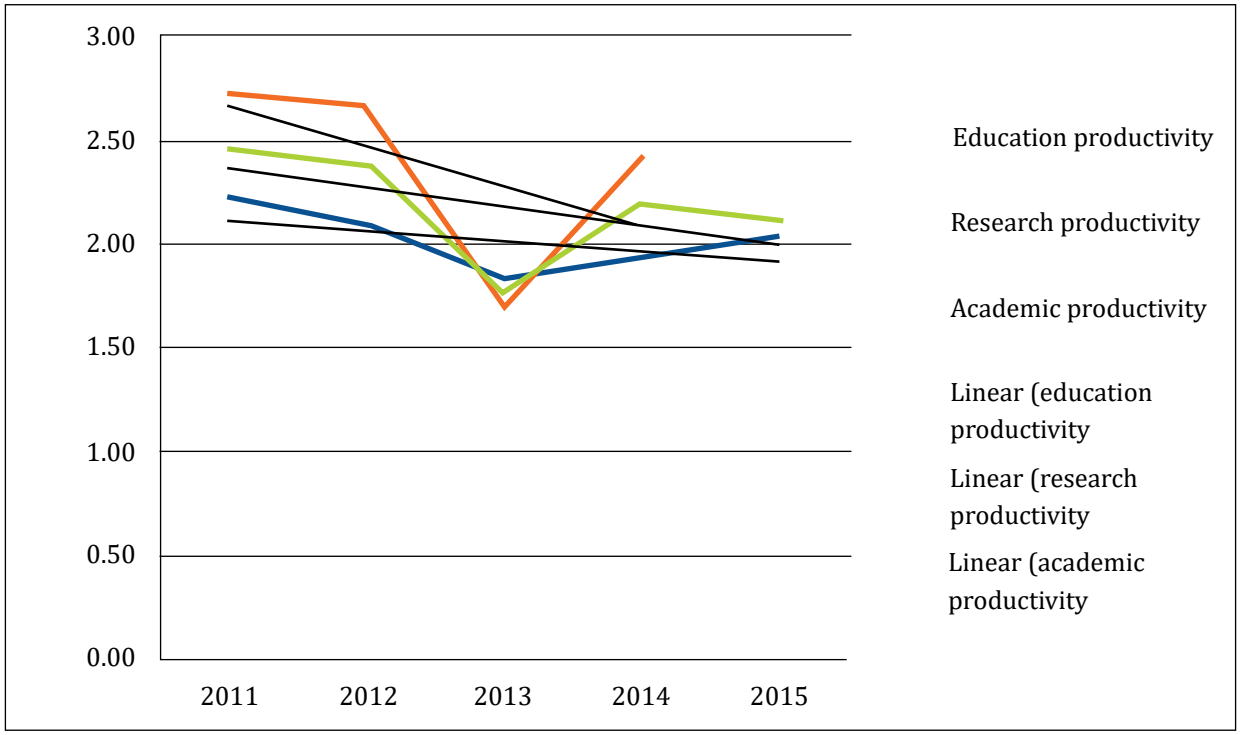


Figure 17: Productivity ratio index

All productivity ratios are above 1.5, but a declining trend over the period provides an opportunity to investigate ways to arrest the decline and reverse it. The pattern more closely reflects the trend shown by the USP (Figure 13), which, as noted earlier, is due to the larger value of data corresponding to the USP.

Hypothetically, if we took the two institutions to model Fiji's situation, given the limited resources in areas such finance, human resource, capital structure, infrastructure, and different systems capabilities, there is a need or possibility to explore the rationalization of developments, academic programs, and resources. This will remove unnecessary duplication of efforts and unnecessary competition in all facets of operations between universities due to different capabilities, resourcing, and maturity of systems (comparative and competitive advantages). More resources could then be directed at measuring and getting quality outcomes.

All three productivity indicators indicate marginal losses in productivity over time. The academic productivity looks to be declining post 2015. Educational productivity and research productivity improved in 2014 but declined again in 2015. Research productivity showed the greatest slump, followed by an improvement between 2012 to 2015.

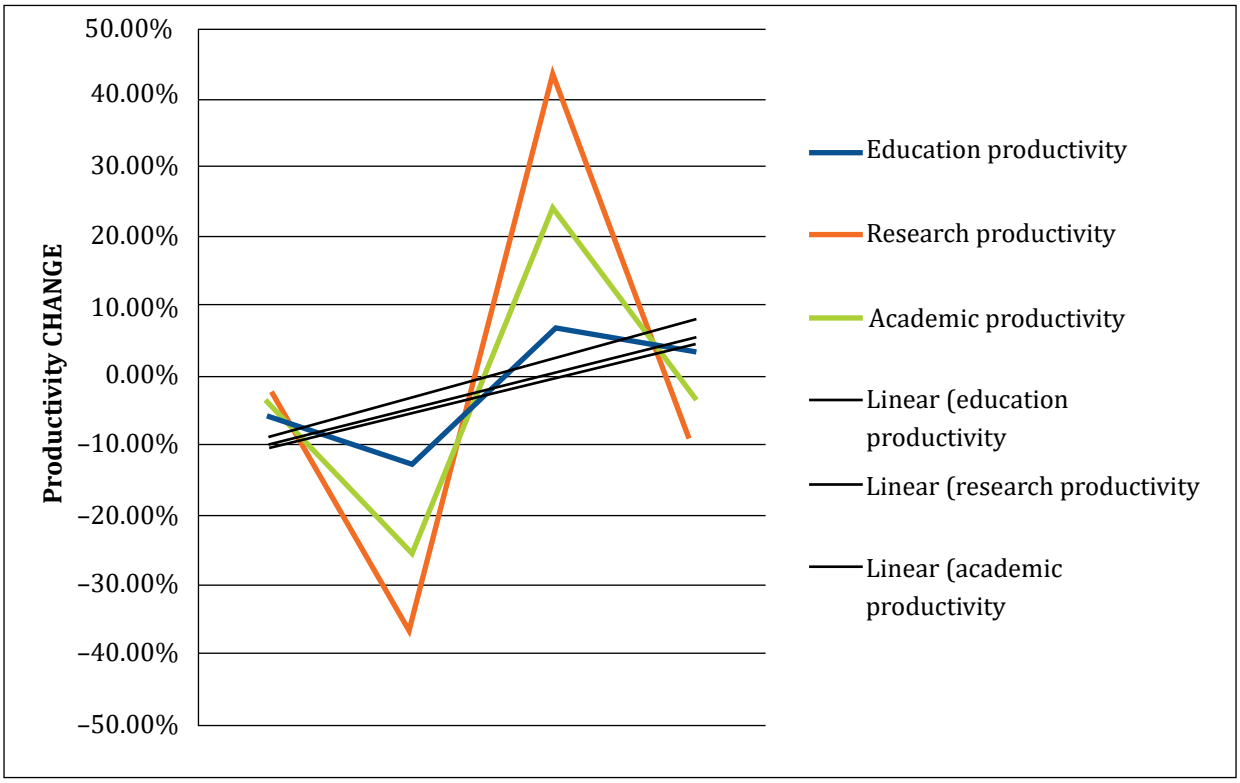


Figure 18: Productivity ratio change

There are marked undulating changes, but these resulted in diminishing incremental benefits (productivity ratio index, Figure 15). The biggest change was in the research productivity transition from 2013 to 2014. The graph also shows major fluctuations during the four years. The average linear trends show a positive intent indicative of greater output yielded from the same amount of input in future.

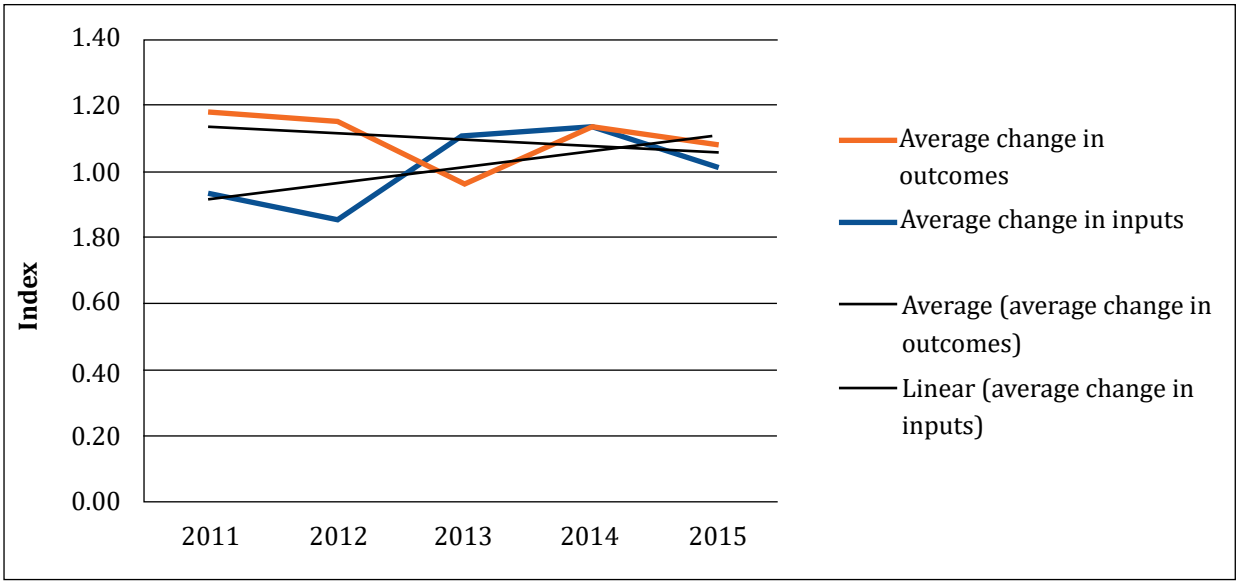


Figure 19: Average change in outcomes index versus average change in inputs index

Figure 19 indicates that the average change in outputs is on a declining trend met by an increasing trend in inputs over the same period. More effort than result is depicted by the

convergence of the trend lines. This needs urgent attention as the incremental benefit shows a diminishing trend.

Figure 20 indicates that labor, a significant component of input, has an increasing trend. This is critical, given that a major item under labor accounts for the salaries (and benefits) of academic staff, but this does not seem to have had a positive impact on the change in index for outputs.

In Figure 19, the average change in index for inputs for the four years increased while the outputs declined. We could hypothesize that in 2014, a breakeven point was reached and that beyond this point, corrective measures need to be taken.

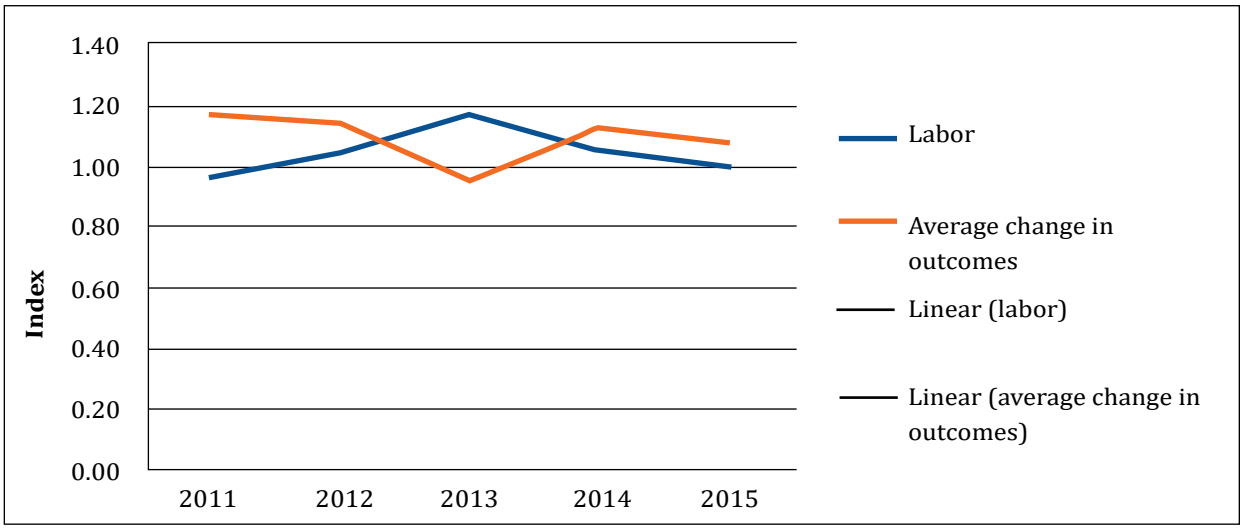


Figure 20: Average change in outcomes index versus average change in labor index

There is a relative close correlation between labor and outputs. The trend lines are close and converging to being relatively flat. The influence of labor input is relatively significant to outcomes. The ideal trend would be for the trend lines to be divergent, reflecting gains from deployment of resources (inputs), which include the academic staff's salaries and benefits.

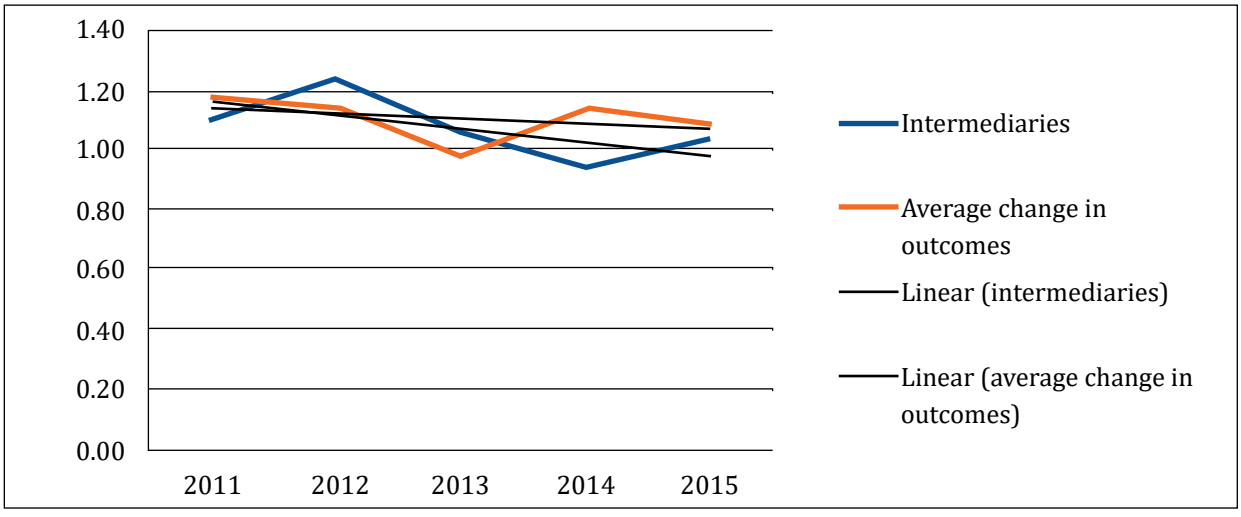


Figure 21: Average change in outcomes index versus average change in intermediaries index

There is a relative close correlation between intermediaries and outputs. The trend lines are close, on a declining trend but relatively divergent. However, because the intermediaries are essential to cover such items as administration overheads, they are an integral part of the parcel of inputs.

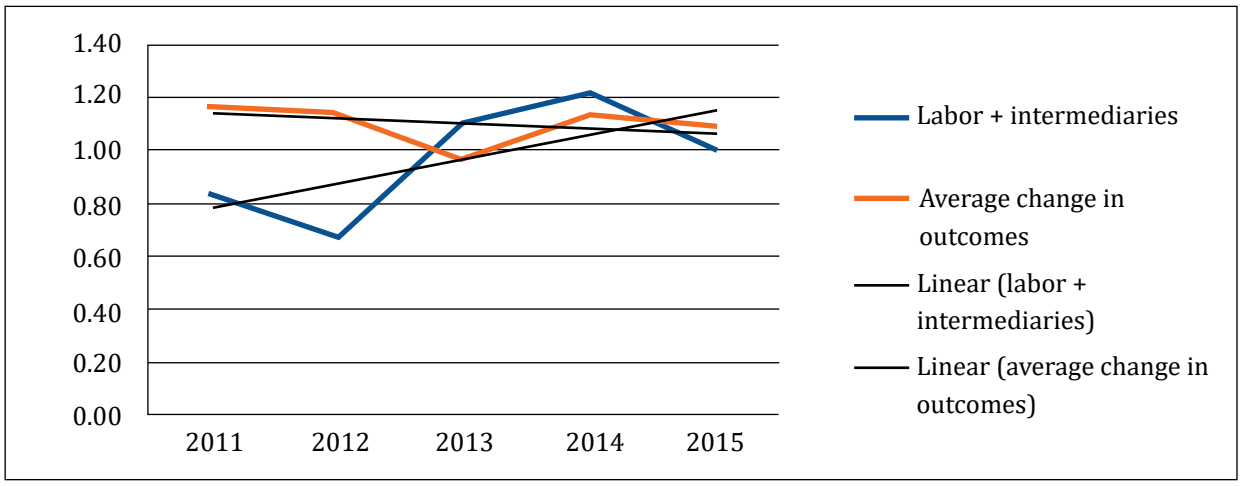


Figure 22: Average change in outcomes index versus average change in labor and intermediaries

With labor and intermediaries holding approximately between 85% and 93% of inputs during the period, the converging pattern of the trend lines implies that outputs have not responded positively to inputs. There is a need to investigate further the cause of the trend and how to reverse it.

Future work may include investigating the various constituents at both ends, output and input, to identify the specific variables that are within the control of HEIs or FHEC to influence improvements.

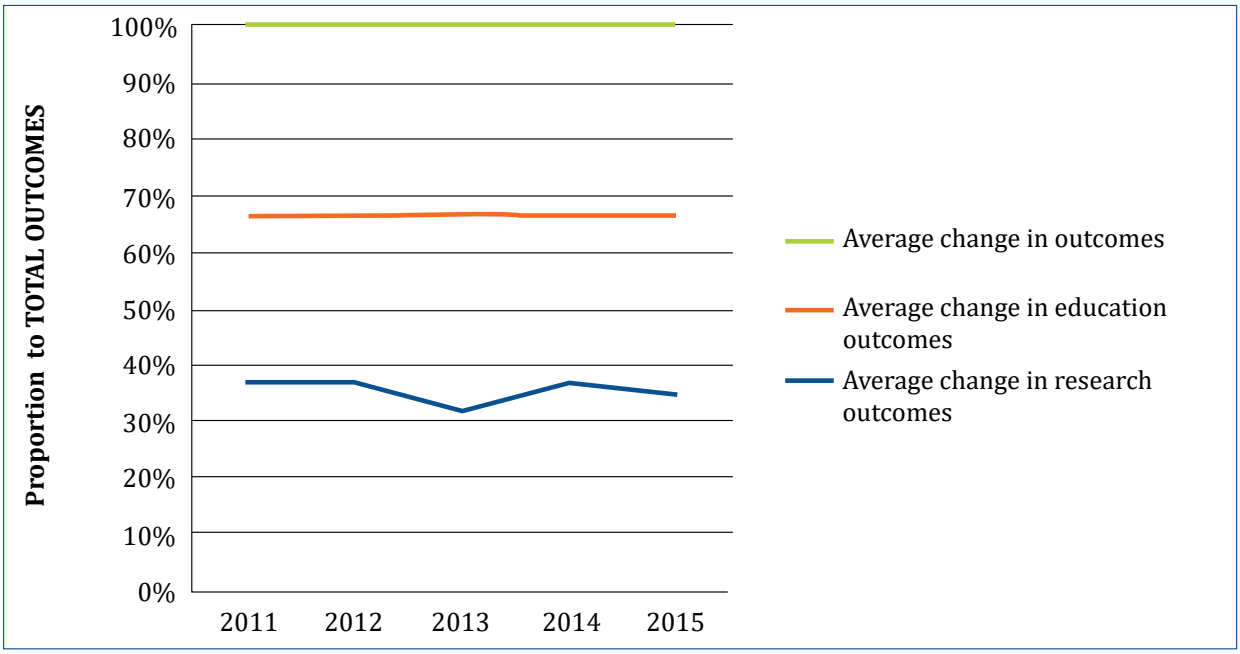


Figure 23: Average research outcome to average education outcome

The average change in research output and education output are relatively the same (flat), implying that there is relatively a negative correlation. Research outputs, however, provide the reservoir of literature and knowledge that may be used over longer periods than the period in which the education outputs are determined.

The attempt is to see if there are relationships within the outputs and the inputs. There is potential to investigate the effect of relative shifts in the various components that make up the research and education outputs. The proportion of each component within the two outputs can determine the impact on the overall academic productivity index.

Ideally, the research component should have a visible positive impact on the education output. It should be informing the education output in areas such as innovation to affect processes, improvement of graduation rates, and coursework completion.

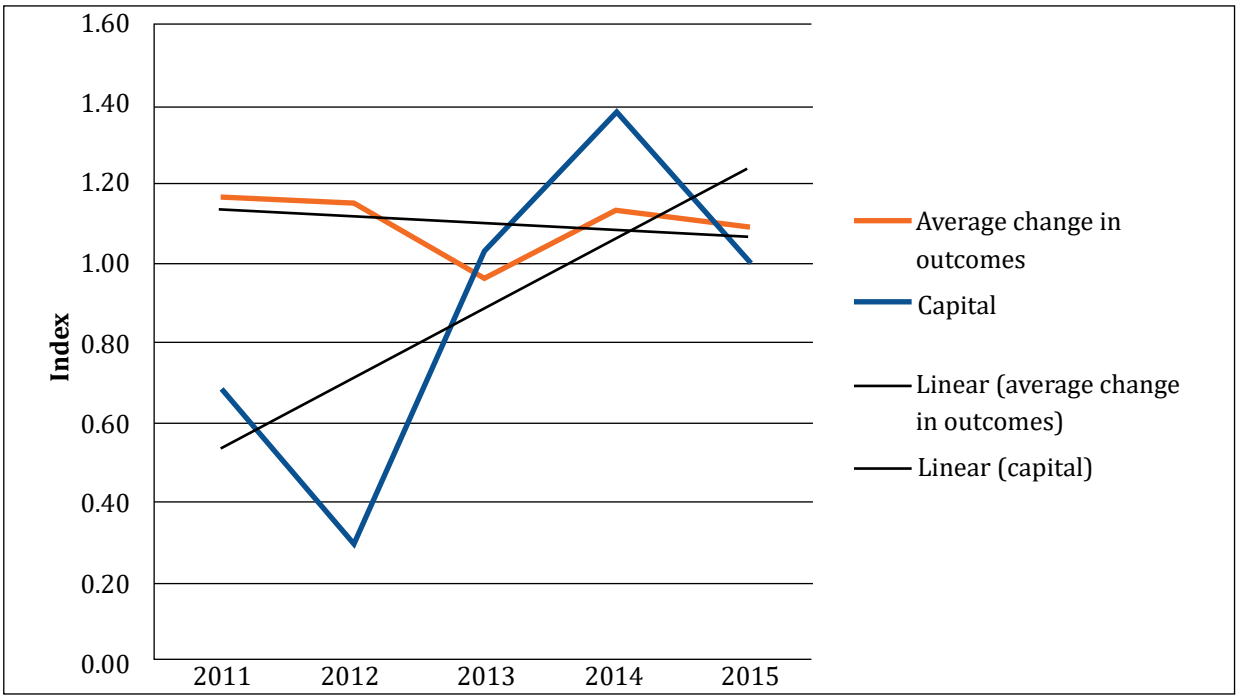


Figure 24: Average change in outcomes versus average change in capital input

Capital investments are long-term assets (long-term benefits) and do not have the same time-periods as the outputs, which have shorter terms (annual) and therefore a comparison is awkward. Annual valuations of capital assets and the use of an annual depreciation value of the capital investment would have been more appropriate.

Having blended programs (online and contact classes requiring lecture buildings) is perhaps the option to manage the issue of heavy capital investments such as in the construction of physical buildings.

THE NEXT FIVE YEARS

The past initiatives discussed earlier have been successful in bringing the three universities from the level of inception to the current stage of development, with different stages of

maturity of the systems. Those initiatives will invariably continue into future as the foundation pillars and platforms from which future initiatives would be launched, thus benefiting from an apparent synergy of initiatives.

The analysis of the productivity indicator has revealed problems with data availability, collection, and processing, and has pointed out perhaps inconclusive but interesting areas for further conversation in productivity.

The need to measure the ratios of outcomes, rather than just outputs, to inputs, means that the key stakeholders in a multi-stakeholder environment, need to agree on how this would be done. This is because of the difficulty in agreeing on what to measure and how, and in getting those stakeholders that hold such information, to collaborate and share the resources needed for the exercise. The required analysis and practical strategies to be implemented also pose opportunities for future development of the project.

The future direction of the research project will need to seriously look into the measurement of outcomes or the value of what the student has become, and the propensity of the student to have an impact on society. This must be done quickly as a matter of urgency to be able to affirm comments on the viability of the proposed initiatives, so as to positively drive productivity over the next five years.

The University of South Pacific

The following is a brief on the key productivity initiatives to be implemented by the USP through its various faculties over the next five years:

Initiatives at the Faculty of Business and Economics are aimed at:

- Delivering more courses in online or blended mode to provide a more dynamic and responsive learning environment.
- Collaborating more closely with the industry to ensure that teaching keeps pace with the current developments. This is toward ensuring that graduates are better prepared for the workplace.

Initiatives at the Faculty of Science Technology and Engineering are aimed at:

- Having a more decisive shift from teacher-centered to ‘learning by doing’ pedagogy.
- Having a much greater emphasis on data-driven improvements to systems and processes, and continuous monitoring and improvements.
- Increasing the partnership between industries and HEIs in providing education.

Initiatives at the Faculty of Arts, Law and Education aim to:

- Increase the number of accredited programs.
- Increase the number of staff with PhD qualifications.
- Strengthen analytics, particularly related to part-time students who often exceed the expected period of candidature in a program.

- Improve accessibility of the internet/USPNet outreach to increase access and equity of blended and online learning across the region, particularly in areas currently inaccessible to USP educational services.

A summary of the key Initiatives for the next five years therefore includes:

- Improving collaboration with the industry to inform on standards of programs from an industry perspective and the shift from teacher-centered to 'learning by doing' pedagogy. This addresses relevance of programs and industry readiness of the graduates.
- Improving the monitoring of student performance to enable early intervention. This is encompassed in student learning support and admission reforms. This entails enhanced and well-designed information systems not only to support student performance measurement but to capture a diverse variety of data that can be analyzed for productivity purposes, among other uses.
- Ensuring the continued expansion of online delivery to reach students in remote locations. The use of the current technology to support a blended mode of delivery of education to achieve better and more access, better speed of delivery of subject material, and better use of student and academic staff time, and to reduce costs of delivery that could be channeled to other important areas of operations. There is also a recognition of the need to maintain the social dimension of learning (not to be biased toward new technology). This would better prepare the students to be socially ready for the job market.

The above initiatives will have a bearing in areas important for productivity. These would include improved quality and employability (output and outcome); improved monitoring of student performance to enable early intervention (improved information systems, analytics, student learning support, retention, and completion); and expansion of online delivery to remote locations and students (access, enrollment, and retention).

The implementation of processes in support of the seven key priority areas in the USP Strategic Plan 2013 to 2018, briefly referred to in section five of this paper, would drive the mentioned productivity initiatives. A skimmed version of the seven priority areas is reproduced in Figure 25 for clarity and emphasis and importantly to demonstrate that the productivity initiatives are well supported (the resourcing of the implementation).

Priority area 1: Learning and teaching
The university will deliver relevant and high-quality flexible programs that contribute towards inculcating and developing the skills, knowledge, competencies and attributes articulated for all its graduates, as future drivers of building knowledge societies and economies.

Priority area 2: Student support
The university will contribute to the success of its students by improving the quality of support services it offers to the students; by enhancing the student community environment to meet health, safety, and community concerns; and by offering a better experience to students.

(continued on next page)

(continued from previous page)

Priority area 3: Research and internationalization
The university will strive to remain an exemplar research institution in the Pacific region by focusing on the success of postgraduate students, increasing the resources available to them, building their ability to compete successfully for international grants, and by increasing the quantity, quality, and impact of its research outputs.

Priority area 4: Information and communication technologies
The university will use its state-of-the-art ICT facilities to deliver high-quality education as well as lead ICT developments in the region to help all regional economies to take advantage of ICT. Further, the university will endeavor to provide innovative and sustainable ICT solutions.

Priority area 5: Regional and community engagement
The USP will build on and preserve the Pacific heritage; proactively engage with the region and its communities; and engage internationally on major development issues relevant to the region. It will further invest in enhancing and expanding its campuses, its membership, and operations. It will strengthen its partnerships with stakeholders, governments, industry, and communities to better serve the region.

Priority area 6: Our people
The university recognizes the people of the USP as the principal enablers of the transformation, and will create opportunities to develop and reward excellence.

Priority area 7: Governance, management, leadership, and continuous improvement
The USP will need to strengthen its processes, including governance, systems, and its senior management. It will also focus on strategically marketing and positioning itself as a premier institution for tertiary education and research.

Figure 25: The USP's key priority areas

The University of Fiji

The UOF is still developing and would be better positioned to continue with the broad focus areas it gave itself at the outset, in order to achieve greater productivity. These are briefly reproduced below:

- **Learning and teaching:** To foster a quality education approach that would generate knowledge-based direction in making a change to the local and global community.
- **Student services:** To support the academic, professional and personal success of students; educate the students to advocate for themselves and others; and engage them in transformative cocurricular experiences to develop them into effective leaders and global citizens.
- **Research:** To target interdisciplinary quality research activities and develop an innovative society to meet the demand in the South Pacific region and other parts of the world.
- **Environmental and social responsibilities:** To develop environmental commitment at all levels of teaching, research, operations and community outreach, and create scientific and social contributions to the society.

- **Governance and financial sustainability:** To ensure that the university has high-quality academic and administrative staff while emphasizing on good governance and sound financial position.
- **Infrastructure and systems:** To upgrade finance systems, IT systems, lines of administrative responsibility, new lecture theatres, office space and recreational facilities for a full-fledged medium-sized university.
- **Risk assessment:** To ensure that all risks of the university are identified and addressed through strategies appropriate to each identified risk.
- **Accountability framework:** To ensure the monitoring of progress against the priorities, commitments and aims, using relevant performance indicators, benchmarks, targets, and academic needs; and respond to the external environment by updating the plan when appropriate.

The productivity indicator analysis in this chapter revealed that research outputs were relatively weak, as many research projects were either incomplete or had no reports to trace the progress, despite funds being disbursed at the outset. The turnaround time of research funds into completed and published papers requires urgent attention.

The Fiji National University

Key productivity advances will arise through:

- Sub-leasing of the FNU Navua farm property to commercial entities to operate professional farms that would allow the FNU's students to attain best commercial practices and experience, with entrepreneurship being a potential outcome.
- The progress made by the College of Engineering, Science and Technology, with the assistance of the Royal Melbourne Institute of Technology (RMIT) to apply to IPENZ for the accreditation of the FNU's engineering courses. Quality improvement and international relevance and recognition are the likely outcomes in this case.
- The development of facilities at the College of Agriculture, Fisheries and Forests to include a veterinary hospital and several other laboratory facilities for research purposes. This entails capital inputs for the faculties.
- The proposed review of all courses taught at the FNU to determine what must be done to be more relevant in future. This would impact the market quality and relevance of programs.

Initiatives from Other Stakeholders

The continued inputs from key stakeholders, along with the HEIs, is critical to a successful drive for better measurement, increased productivity, improved quality, and desirable outcomes. A recent attempt has been made to Fiji's Ministry of Employment, Productivity and Industrial Relations following an APO conference on productivity (Jakarta, Indonesia 29 August to 1 September 2016), raising the importance of measuring the outcomes, apart from outputs, of higher education but not oblivious of the needed collaboration and the 'buy-in' from key stakeholders for the resourcing and sustainability of such work. The fruition of such an initiative will help set the pace for future development of the current research initiative and may contribute constructively to strategic human resource planning at the national level.

CONCLUSION

At the outset, this research set out to break new grounds of discovering how productivity in higher education could be measured. The findings and views expressed were never to be taken as prescriptive but to serve as starting points and proxies to generate further interest in conversations in higher education productivity and its measurement.

This exploration of the possible ways to measure productivity in higher education has brought out various constraints, possibilities, and what-if scenarios.

Even in the face of key constraints such as non-availability of data, limited data, and the unpreparedness of HEI information systems for this project, some interesting findings and analysis were possible. Correlations between outputs and inputs as well as between components within inputs and outputs were explored. The further 'drilling down' to the finer components of the variables to explore the measurement of elasticity is a possibility for the future development of the current project.

The ability to measure, evaluate and make continuous improvements is dependent on the availability of data and information. Toward this end, there is a need for a concerted and collaborative effort by stakeholders, who generate and hold crucial data and information needed for the purpose.

The productivity initiative needs to look at the outcome-input ratio to enhance productivity conversations in higher education. An agreed system for measuring outputs and outcomes would necessarily modify the productivity model because of the complexities in identifying what to measure for outcomes and agreeing upon the methods to use. Looking at the outcomes extends the scope of productivity beyond graduation, but this is a necessary approach to capture the real impact of higher education, while recognizing that graduation is only a checkpoint along the pathway of higher education. A graduate survey and a database of alumni destinations for various HEIs would be needed as the first steps toward getting an indication of outcomes.

The way forward is the need to get the key stakeholders to agree on the importance of productivity measurement being an integral part of a monitoring and evaluation framework for HEIs.

The second important issue is to consider redefining productivity so as to extend its scope to post-university outcomes and their impacts on students, the society and the economy. Agreeing on the sets of inputs, outputs, outcome data and the various compositions of each set, including the various types of measurements, would be the mandatory issues to work out.

The resourcing of such work, from commencement to sustained development, also needs to be worked out. Given the expected complexity of the work required, a collaborative network of key stakeholders is required with the commitment to and ability of mustering resources to implement such a breakthrough initiative for higher education in Fiji. The leadership may require the state and the universities to take the lead role as an initial step forward.

REFERENCES

[1] Chandra R. Higher education developments in Fiji: global, regional and international imperatives and issues of quality and affordability. www.international.ac.uk/media/5518/he%20developments%20in%20fiji.pdf. Accessed in 2016.

[2] Narube, S. Productivity and national development in Fiji. www.bis.org/review/r050511c.pdf. Accessed in 2016.

[3] Sullivan T., Mackie C., Massy W., et al. National Academies Press: Improving measurement of productivity in higher education. www.nap.edu/read/13417/chapter/3. Accessed in 2016.

[4] Pennington B., Ireland N., Narsey W. Fiji education sector program, independent completion report. https://www.oecd.org/countries/fiji/48473721.pdf. Accessed in 2016.

[5] Social Affairs Standing Committee. Review report of the committee on the Fiji Higher Education's 2013 annual report. www.parliament.gov.fj/getattachment/Parliament-Business/Annual-Reports/Review-Report-on-the-Fiji-Higher-Education-Commission-s-2013-Annual-Report-110216.pdf.aspx. Accessed in 2016.

[6] The University of the South Pacific. Strategic Plan 2013–18. www.usp.ac.fj. Accessed in 2016.

APPENDICES

Education and Research Outputs at USP and UOF

	Years					
	2010	**2011**	**2012**	**2013**	**2014**	**2015**
Course work completion						
University of the South Pacific (USP)						
per faculty:						
Faculty of Arts, Law and Education (FALE)	583	721	663	695	650	767
Faculty of Business and Economics (FBE)	1166	1241	1297	1271	1295	1445
Faculty of Science, Technology and Environment (FSTE)	429	494	398	482	516	534
Pacific Centre for Environment and Sustainable Dev. (PACE-SD)	9	29	33	24	36	24
Total(USP)	**2187**	**2485**	**2391**	**2472**	**2497**	**2770**
University of Fiji (UOF)						
per faculty:						
School of Business and Economics	12	22	17	19	21	24
School of Science and Technology	8	14	8	7	6	11
School of Humanities and Arts	0	0	69	98	97	88
School of Law	0	0	11	12	15	22

(continued on next page)

(continued from previous page)

	Years					
	2010	2011	2012	2013	2014	2015
School of Medicine	0	0	0	33	20	32
Centre for iTaukei Studies	2	2	2	4	12	7
Total (UOF)	**22**	**38**	107	173	171	184
Total	**2,209**	**2,523**	**2,498**	**2,645**	**2,668**	**2,954**

	Years			
	2011–12	2012–13	2013–14	2014–15
Graduate employment (%)				
University of the South Pacific (USP)				
Institutional	76	75	71	76
Faculty of Arts, Law and Education	79	77	83	74
Faculty of Business and Economics	79	79	76	79
Faculty of Science, Technology and Environment	65	66	59	70
University Average (%)	**74.75**	**74.25**	**72.25**	**74.75**
University of Fiji (UOF)				
School of Business and Economics	100	100	100	100
School of Science and Technology	100	100	100	100
School of Humanities and Arts	100	100	100	100
Schol of Law	100	100	93	100
School of Medicine	0	100	100	100
Centre for iTaukei Studies	100	50	50	83
University Average (%)	**83.33**	**91.67**	**90.50**	**97.17**
Average	**79.04**	**82.96**	**81.38**	**85.96**

	Years					
Publications	2010	2011	2012	2013	2014	2015
University of Fiji (UOF)						
per faculty:						
School of Business and Economics	0	0	0	0	WIP (4)	**1**, WIP (2)
School of Science and Technology	0	0	0	0	WIP (7)	WIP (2)
School of Humanitites and Arts	0	0	0	0	WIP (5)	WIP (3)
School of Law	0	0	0	0	WIP (2)	0
School of Medicine	0	0	0	0	WIP (2)	WIP (2)
Centre for iTaukei Studies	0	0	0	0	WIP (4)	WIP (1)
University of the South Pacific (USP)	97	87	118	114	171	147
Total	**97**	**87**	**118**	**114**	**171**	**148**

Research Funds ($FJD)	2010	2011	2012	2013	2014	2015
University of the South Pacific (USP)	$ 4,913,745.00	$ 13,879,173.00	$ 7,872,088.00	$ 5,105,989.00	$ 5,517,025.00	$ 9,928,819.00
University of Fiji (UOF)	$ -	$ -	$ -	$ -	$ 229,268.00	$ 89,760.00
TOTAL FJD$	$ 4,913,745.00	$ 13,879,173.00	$ 7,872,088.00	$ 5,105,989.00	$ 5,746,293.00	$ 10,018,579.00
	2010	2011	2012	2013	2014	2015
University of the South Pacific						
Master's Research Completion						
By faculty:						
Faculty of Arts, Law and Education	5	4	7	3	8	10
Faculty of Business and Economics	7	6	12	10	14	11
Faculty of Science, Technology and Environment	22	14	19	20	18	20
PACE-SD	0	0	7	10	5	3
TOTAL	**34**	**24**	**45**	**43**	**45**	**44**
PhD Research Completion	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
By faculty:						
Faculty of Arts, Law and Education	0	2	3	2	0	6
Faculty of Business and Economics	2	0	2	2	3	3
Faculty of Science, Technology and Environment	2	1	2	0	0	3
PACE-SD	0	0	0	0	0	0
TOTAL	**4**	**3**	**7**	**4**	**3**	**12**
	YEARS					
Citations	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
University of the South Pacific (USP)	1475	1577	1812	2139	2263	2333

Learning outcomes						
USP	**Years**					
	2010	**2011**	**2012**	**2013**	**2014**	**2015**
By Faculty:						
FBE	94%	94%	94%	92%	93%	87%
FSTE	91%	91%	92%	90%	92%	87%
FALE	94%	93%	91%	90%	93%	91%
PACE SD	9%	29%	20%	24%	36%	23%
University average	72%	77%	74%	74%	79%	72%
UOF	88.60%	88.60%	88.60%	88.60%	88.60%	88.60%
Average (Fiji)	80.30%	82.68%	81.43%	81.30%	83.55%	80.30%

Inputs (USP and UOF)

INPUTS ($FJD)	2010	2011	2012	2013	2014	2015
University of the South Pacific (USP)						
Labor	$ 52,760,250	$ 51,073,408	$ 54,350,664	$ 63,778,961	$ 66,732,615	$ 66,665,094
Capital	$ 46,414,960	$ 30,997,500	$ 8,685,734	$ 9,249,113	$ 12,963,465	$ 12,411,522
Intermediary	$ 57,906,853	$ 64,016,571	$ 80,014,069	$ 84,393,953	$ 79,102,507	$ 81,652,161
Total	**$ 157,082,063**	**$ 146,087,479**	**$ 143,050,467**	**$ 157,422,027**	**$ 158,798,587**	**$ 160,728,777**
University of Fiji (UOF)						
Labor	$ 2,353,442	$ 2,765,192	$ 2,334,390	$ 2,731,387	$ 3,757,566	$ 4,215,650
Capital	$ 4,110,766	$ 3,375,312	$ 1,618,016	$ 1,451,362	$ 1,817,650	$ 2,485,750
Intermediary	$ 2,136,863	$ 2,550,064	$ 2,797,800	$ 3,070,340	$ 3,458,875	$ 3,795,650
Total	$ 8,601,071	$ 8,690,568	$ 6,750,206	$ 7,253,089	$ 9,034,091	$ 10,497,050
FIJI Total ($FJD)	**$ 165,683,134**	**$154,778,047**	**$149,800,673**	**$ 164,675,116**	**$ 167,832,678**	**$ 171,225,827**
Contributions						
labor	33.26%	34.78%	37.84%	40.39%	42.00%	41.40%
Capital	30.50%	22.21%	6.88%	6.50%	8.81%	8.70%
Intermediaries	36.24%	43.01%	55.28%	53.11%	49.19%	49.90%

Productivity indicators at UOF

Data element	Unit	2010	2011	2012	2013	2014	2015
Coursework completions	Number	22	38	107	173	171	18
Graduate employment	Percent	83	83	83	92	91	9
Credit hours	Hours	720	720	720	720	720	72
Learning outcomes	Percent	89	89	89	89	89	8
Publications	Number	1	1	1	1	1	
Citations	Number	0	0	0	0	0	
Patents	Number	0	0	0	0	0	
Research completions	Number	0	0	0	0	1	
Research funds	Dollars	1	1	1	1	236,182	114,52
Labor	Dollars	2,353,442	2,765,192	2,334,390	2,731,387	3,757,566	4,215,65
Capital	Dollars	4,110,766	3,375,312	1,618,016	1,451,362	1,817,650	2,485,75
Intermediaries	Dollars	2,136,863	2,550,064	2,797,800	3,070,340	3,458,875	3,795,65
Total	Dollars	8,601,071	8,690,568	6,750,206	7,253,089	9,034,091	10,497,05
Labor	Weight		29.59%	33.20%	36.12%	39.63%	40.88
Capital	Weight		43.32%	31.40%	21.99%	20.07%	21.90
Intermediaries	Weight		27.09%	35.40%	41.89%	40.31%	37.22
Coursework completions	Indicator	1.00	1.73	2.82	1.62	0.99	1.0
Graduate employment	Indicator	1.00	1.00	1.00	1.10	0.99	1.0
Credit hours	Indicator	1.00	1.00	1.00	1.00	1.00	1.0
Learning outcomes	Indicator	1.00	1.00	1.00	1.00	1.00	1.0
Publications	Indicator	1.00	1.00	1.00	1.00	1.00	2.0
Citations	Indicator	1.00	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Patents	Indicator	1.00	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Research completions	Indicator	1.00	1.00	1.00	1.00	1.25	2.0
Research funds	Indicator	1.00	1.00	1.00	1.00	236182.00	0.4
Labor	Indicator	1.00	1.17	0.84	1.17	1.38	1.1
Capital	Indicator	1.00	0.82	0.48	0.90	1.25	1.3
Intermediaries	Indicator	1.00	1.19	1.10	1.10	1.13	1.1
	Indicator		1.18	1.45	1.18	0.99	1.0
	Indicator		#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
	Indicator (weighted)		1.01	0.78	1.07	1.25	1.1
Proportion inputs to education			0.50	0.50	0.50	0.50	0.5
	Ratio		2.34	3.75	2.20	1.60	1.7
	Ratio		#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
	Ratio		#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
	Percentage			60.28%	-41.41%	-27.36%	11.88
	Percentage			#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
	Percentage			#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Average change in Education outcomes		1	1	1.18	1.45	1.18	0.9
		1	1	1.06	0.81	1.05	1.2
		1.00	1.17	0.84	1.17	1.38	1.1
average change education outcomes		1.00	1.18	1.45	1.18	0.99	1.0

Productivity indicators at USP

Composite	Data element	Unit	2010	2011	2012	2013	2014	2015
Education outcomes	Coursework completions	Number	2,187	2,485	2,391	2,472	2,497	2,770
Education outcomes	Graduate employment	Percent	75	75	74	74	72	75
Education outcomes	Credit hours	Hours	1	1	1	1	1	1
Education outcomes	Learning outcomes	Percent	72	77	74	74	79	72
Research outcomes	Publications	Number	97	87	118	114	171	147
Research outcomes	Citations	Number	1,475	1,577	1,812	2,139	2,263	2,333
Research outcomes	Patents	Number	97	87	118	114	171	148
Research outcomes	Research completions	Number	38	27	52	47	48	56
Research outcomes	Research funds	Dollars	4,913,745	13,879,173	7,872,088	5,105,989	5,517,025	9,928,819
Inputs	Labor	Dollars	52,760,250	51,073,408	54,350,664	63,778,961	66,732,615	66,665,094
Inputs	Capital	Dollars	46,414,960	30,997,500	8,685,734	9,249,113	12,963,465	12,411,522
Inputs	Intermediaries	Dollars	57,906,853	64,016,571	80,014,069	84,393,953	79,102,507	81,652,161
Inputs	Total	Dollars	157,082,063	146,087,479	143,050,467	157,422,027	158,798,587	160,728,777
Inputs	Labor	Weight		34.27%	36.48%	39.25%	41.27%	41.75%
Inputs	Capital	Weight		25.38%	13.65%	5.97%	7.02%	7.94%
Inputs	Intermediaries	Weight		40.34%	49.88%	54.77%	51.71%	50.31%
Education outcomes	Coursework completions	Indicator	1.00	1.14	0.96	1.03	1.01	1.11
Education outcomes	Graduate employment	Indicator	1.00	1.00	0.99	1.00	0.97	1.03
Education outcomes	Credit hours	Indicator	1.00	1.00	1.00	1.00	1.00	1.00

(continued on next page)

(continued from previous page)

Composite	Data element	Unit	2010	2011	2012	2013	2014	2015
Education outcomes	Learning outcomes	Indicator	1.00	1.07	0.96	1.00	1.07	0.91
Research outcomes	Publications	Indicator	1.00	0.90	1.36	0.97	1.50	0.86
Research outcomes	Citations	Indicator	1.00	1.07	1.15	1.18	1.06	1.03
Research outcomes	Patents	Indicator	1.00	0.90	1.36	0.97	1.50	0.87
Research outcomes	Research completions	Indicator	1.00	0.71	1.93	0.90	1.02	1.17
Research outcomes	Research funds	Indicator	1.00	2.82	0.57	0.65	1.08	1.80
Inputs	Labor	Indicator	1.00	0.97	1.06	1.17	1.05	1.00
Inputs	Capital	Indicator	1.00	0.67	0.28	1.06	1.40	0.96
Inputs	Intermediaries	Indicator	1.00	1.11	1.25	1.05	0.94	1.03
Education outcomes		Indicator		1.05	0.98	1.01	1.01	1.01
Research outcomes		Indicator		1.28	1.27	0.93	1.23	1.14
Inputs		Indicator (weighted)		0.93	0.96	1.10	1.01	1.01
	Proportion inputs to education			0.50	0.50	0.50	0.50	0.50
Education productivity		Ratio		2.26	2.04	1.83	2.01	2.00
Research productivity		Ratio		2.75	2.64	1.70	2.44	2.26
Academic productivity		Ratio		2.51	2.34	1.76	2.22	2.13
Education productivity		Percentage			-10.09%	-9.97%	9.53%	-0.21%
Research productivity		Percentage			-3.95%	-35.88%	44.02%	-7.40%
Academic productivity		Percentage			-6.72%	-24.61%	26.10%	-4.15%
Credit hours - currently not on the radar but exists in the system								

(continued on next page)

(continued from previous page)

Composite	Data element	Unit	2010	2011	2012	2013	2014	2015
average change in outcomes			1	1.18	1.14	0.97	1.13	1.09
Average Change in **INPUTS**			1	0.91	0.86	1.10	1.13	1.00
Average Change in **RESEARCH OUTCOMES**			1	1.23	1.24	0.97	1.20	1.12
Average Change in **EDUCATION OUTCOMES**			1	1.05	0.98	1.01	1.01	1.01
Average change in								

Combined Productivity Indicators for USP and UOF

Composite	Data element	Unit	2010	2011	2012	2013	2014	2015
Education outcomes	Coursework completions	Number	2,209	2,523	2,498	2,645	2,668	2,954
Education outcomes	Graduate employment	Percent	83	83	83	83	82	86
Education outcomes	Credit hours	Hours	720	720	720	720	720	720
Education outcomes	Learning outcomes	Percent	91	91	90	90	91	88
Research outcomes	Publications	Number	97	87	118	114	171	148
Research outcomes	Citations	Number	1,475	1,577	1,812	2,139	2,263	2,333
Research outcomes	Patents	Number	97	87	118	114	171	148
Research outcomes	Research completions	Number	38	27	52	47	48	56
Research outcomes	Research funds	Dollars	4,913,745	13,879,173	7,872,088	5,105,989	5,746,293	10,018,579
Inputs	Labor	Dollars	55,113,692	53,838,600	56,685,054	66,510,348	70,490,181	70,880,744

(continued on next page)

(continued from previous page)

Composite	Data element	Unit	2010	2011	2012	2013	2014	2015
Inputs	Capital	Dollars	50,525,726	34,372,812	10,303,750	10,700,475	14,781,115	14,897,272
Inputs	Intermediaries	Dollars	60,043,716	66,566,635	82,811,869	87,464,293	82,561,382	85,447,811
Inputs	Total	Dollars	165,683,134	154,778,047	149,800,673	164,675,116	167,832,678	171,225,827
Inputs	Labor	Weight		34.02%	36.31%	39.11%	41.19%	41.70%
Inputs	Capital	Weight		26.35%	14.54%	6.69%	7.65%	8.75%
Inputs	Intermediaries	Weight		39.62%	49.14%	54.20%	51.15%	49.55%
Education outcomes	Coursework completions	Indicator	1.00	1.14	0.99	1.06	1.01	1.11
Education outcomes	Graduate employment	Indicator	1.00	1.00	1.00	1.00	0.99	1.05
Education outcomes	Credit hours	Indicator	1.00	1.00	1.00	1.00	1.00	1.00
Education outcomes	Learning outcomes	Indicator	1.00	1.00	1.00	0.99	1.01	0.97
Research outcomes	Publications	Indicator	1.00	0.90	1.36	0.97	1.50	0.87
Research outcomes	Citations	Indicator	1.00	1.07	1.15	1.18	1.06	1.03
Research outcomes	Patents	Indicator	1.00	0.90	1.36	0.97	1.50	0.87
Research outcomes	Research completions	Indicator	1.00	0.71	1.93	0.90	1.02	1.17
Research outcomes	Research funds	Indicator	1.00	2.82	0.57	0.65	1.13	1.74
Inputs	Labor	Indicator	1.00	0.98	1.05	1.17	1.06	1.01
Inputs	Capital	Indicator	1.00	0.68	0.30	1.04	1.38	1.01
Inputs	Intermediaries	Indicator	1.00	1.11	1.24	1.06	0.94	1.03
Inputs	Labor+ Intermediaries			0.83	0.68	1.11	1.22	1.01
Average Change in **OUTCOMES**			1.00	1.17	1.15	0.97	1.13	1.09

(continued on next page)

(continued from previous page)

Composite	Data element	Unit	2010	2011	2012	2013	2014	2015
Average Change in **INPUTS**			1.00	0.92	0.87	1.09	1.13	1.02
Average Change in **RESEARCH OUTCOMES**			1.00	1.28	1.27	0.93	1.24	1.13
Average Change in **EDUCATION OUTCOMES**			1.00	1.03	1.00	1.01	1.00	1.03
Education outcomes		Indicator		1.03	1.00	1.01	1.00	1.03
Research outcomes		Indicator		1.28	1.27	0.93	1.24	1.13
Inputs		Indicator (weighted)		0.93	0.95	1.10	1.02	1.02
	Proportion inputs to education			0.50	0.50	0.50	0.50	0.50
Education productivity		Ratio		2.22	2.09	1.84	1.96	2.02
Research productivity		Ratio		2.74	2.67	1.70	2.43	2.22
Academic productivity		Ratio		2.48	2.38	1.77	2.20	2.12
Education productivity		Percentage			-5.46%	-12.07%	6.66%	3.07%
Research productivity		Percentage			-2.59%	-36.42%	43.43%	-8.66%

CHAPTER 4
INDIA

Dr. Ganesan Kannabiran[1], National Institute of Technology, Tiruchirappalli, India

EXECUTIVE SUMMARY

The Indian higher education system is one of the largest in the world. It was constituted mainly of the government-funded institutions for many decades. However, an excessive demand for graduates led to the privatization of higher education in the past decades. In addition to the large number of private institutions, a proposed foreign direct investment (FDI) in education is likely to change the scenario. While the system is faced with quality requirements, enhancing productivity becomes of paramount importance due to socioeconomic considerations. The research project on measuring higher education productivity is highly relevant to India. This pioneering study focuses on pertinent contextual, technical and managerial dimensions of measuring productivity, while keeping in mind the complexities and quality-productivity dilemma faced by the higher education system in India.

This study broadly focused on the technical education system in India, which can be classified into three categories: central government-funded institutions; state government-funded institutions; and self-financed institutions. This study considers a group of 82 Government of India-funded technical institutions, called the Centrally Funded Technical Institutions (CFTIs). Four institutions are selected through a theoretical sampling method, based on leadership positions among their peers.

An increased demand for quality graduates by the industry led to a gradual increase in intake by these institutions. Reservation for backward classes in government institutions led to around 54% increase in intake over the past 10 years. As a result, these institutions have doubled their capacities of undergraduate and graduate students. However, they have also been provided with increased resources from the governments along with systematic increases in student fees.

The analysis of data relating to four diverse institutions shows that the core productivity indices of the selected institutions have significant variations. In the case of Indian Institute of Technology (IIT), the productivity in education, research and academics has been remarkably high in the recent years despite the declining trends in inputs. The Indian Institute of Management (IIM) showed very high productivity, especially in research and academics during the period 2010–11, although the input indicator was at its lowest during the period. In the case of National Institute of Technology (NIT), the education productivity and academic productivity were found to be maximum during 2008 due to an increase in the intake of students. Interestingly, in the case of School of Planning and Architecture (SPA), the input indicator was very high during 2009–10 while its output indicators were very low for an entire decade. However, the output indicators significantly improved in the next two years and showed a downward trend. A detailed analysis has to be undertaken to understand the impact of specific inputs and outputs on the overall productivity of these institutions.

[1]The author is very grateful to R Subrahmanyam, Additional Secretary and Dr. BN Tiwari, Nodal Officer, Information, Education and Communication, Ministry of Human Resources Development, Government of India; Prof. Jandhyala BG Tilak, Vice-Chancellor of National University of Educational Planning and Administration; and Dr M Anandakrishnan, Former Chairman of IIT Kanpur.

Institutions under CFTI are focused on quality-oriented productivity improvements in the next five years. The government has gradually withdrawn from direct management of these institutions by decentralizing governance and allowing them to manage their sources and utilization of funds. Emerging paradigms such as internationalization of Indian institutions, international accreditation, and industry participation through public-private partnerships (PPPs) could have larger impacts on productivity of these institutions. The institutions are likely to adopt various strategies toward achieving this goal. For example, IIM Indore has started a new campus in another city. NIT Trichy is deploying visiting faculty from leading institutions and organizations so that the cost per-taught-course is significantly reduced while improving the quality of the teaching-learning process.

INTRODUCTION

India is one of the fastest growing free market economies of the world. Its education system, particularly higher education, is of paramount importance to support this growth. By 2030, India will be among the youngest nations in the world. With nearly 140 million people in the college-going age group, one in every four graduates in the world will be a product of India's higher education system. The Ministry of Human Resource Development (MHRD), through its Department of Higher Education, is responsible for the overall development, in terms of policies and plans for higher education in India.

MHRD envisions realizing India's human resource potential to its fullest in the higher education sector, through equity and inclusion. It endeavors for quantitative and qualitative improvements in the sector to support the socioeconomic development of India. India's diversity in many aspects such as language, religion, and demography poses challenges for the higher education system in India and therefore maintaining the present level of growth itself is hard.

The management of higher education system has gone through three major phases. First, for decades, the governments at the center as well as in many states promoted funded institutions in the sector. As such, there has been a tremendous increase in the number of higher educational institutions (HEIs) since the country's independence. However, in the next phase, with the need to keep pace with socioeconomic developments, governments had no option but to bring in private participation in the sector.

The real shift in the higher education system was witnessed when private institutions came into existence. The share of private sector has increased significantly and changed the higher education canvas. In 2015, the share of private institutions was 42% in terms of universities and 58% in terms of student enrollments. The private participation in the higher education sector has significantly grown in the past decade, and has created both opportunities and challenges. India is making special efforts to cope with the rising demand for higher education by expanding the networks of colleges and universities.

FDI in education is the newest challenge to both quality and productivity of higher education in India. It is expected that many leading (global) universities will set up campuses in India. Based on the high levels of productivity in their operations, such universities are expected to price the high-quality education programs competitively. That is likely to significantly impact the higher

education system, both in the government and private sectors. Therefore, there is a pressing need for existing HEIs in India to adopt best practices to achieve maximum outputs with minimum resources. Given the complex canvas of opportunities and challenges, productivity measurement would be essential to India's position as a higher education leader in future.

BACKGROUND

Since the early 1990s, India has been on a growth path that has led to substantial increase in public expenditure on education. Even though the investment in education is currently not at the desired level, the public spending on all levels of education has increased significantly. For instance, in the two decades starting from 1990–91, public expenditure on education has risen almost 14 times, and stood at INR 2,721 billion in 2010–11. Higher education too has witnessed a rapid growth but at a relatively slower pace. Strong supply-side growth and alleviation of poverty have contributed to rising enrollments in schools, which has resulted in an increased demand for higher education. However, it may be noted that the low level of internal efficiency and quality of learning is affecting school education, which in turn is putting supply-side constraints on the expansion of higher education in India. This is because the expansion of higher education is dependent on the size of the pool of eligible students from the school-education sector.

Figure 26 shows that the number of universities has increased 34 times from 20 in 1950 to 677 in 2014. The sector boasts of 45 central universities, of which 40 are under the purview of MHRD; 318 state universities; 185 state private universities; 129 deemed-to-be universities; 82 Centrally-Funded Technical Institutions (CFTIs). The number of colleges has also registered a manifold increase of 74 times, from just 500 in 1950 to 37,204 in 2014. The growth in the number of universities and colleges in the last four decades is presented in Figure 26.

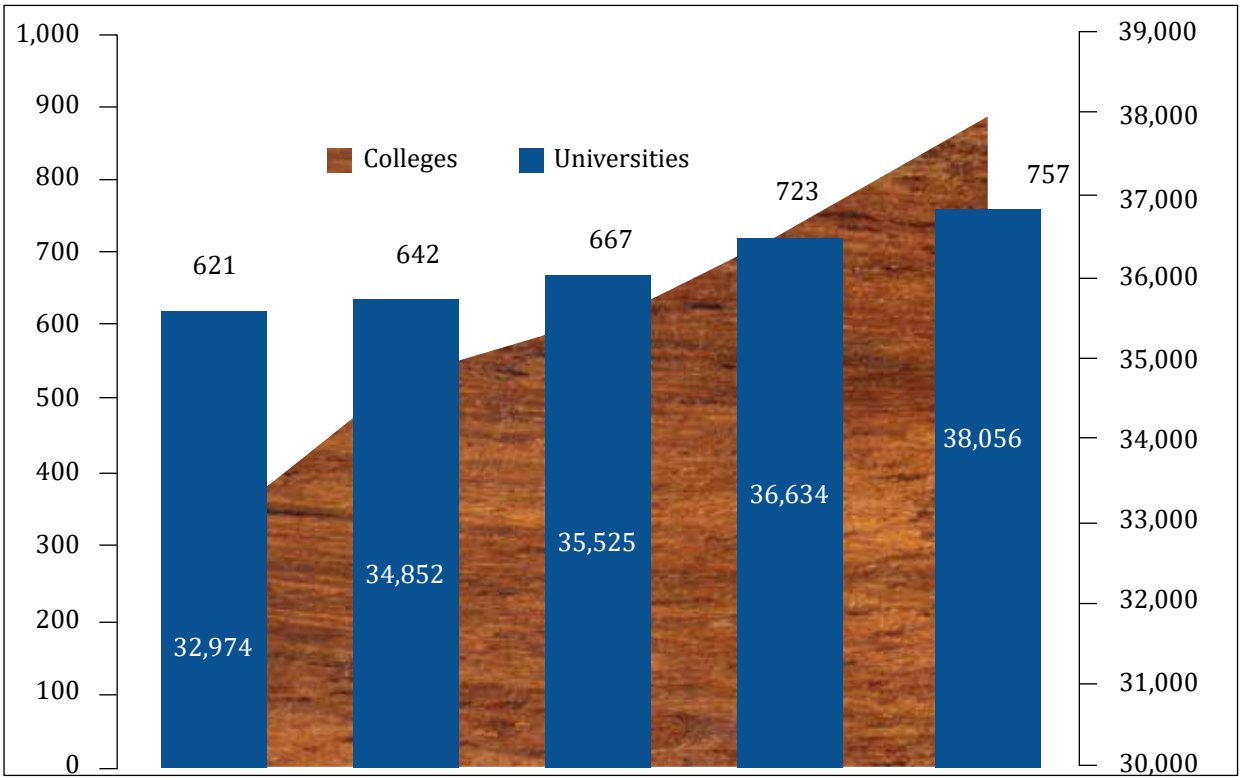


Figure 26: Number of institutions

India has more than 50% of its population below the age of 25 and more than 65% below the age of 35. By 2020, an aging of world economies is expected to create a significant shortage of skilled manpower of around 56.5 million, while India alone would have a labor surplus of 47 million. It is expected that the average age of an Indian would be 29 years in 2020 as compared to 37 in China and 48 in Japan. It is seen that in the recent years, the estimated rates of transition to higher education from the higher secondary level has been reasonably high, at above 75%. However, the gross enrollment ratio in higher education was rather low, at about 23% in 2015, which is considerably less than the ratios in advanced countries and also in the other rapidly growing BRICS countries as well as others in East Asia. With nearly 50% of the population being below 25 years of age and 65% population being below 35 years of age, there is a huge need to expand secondary and higher education. Otherwise, the so-called demographic dividend could turn out to be a demographic problem, resulting in a large number of less educated, unskilled and unemployable youth.

According to recent data, India's gross enrollment ratio (GER) is 23% when compared to the global average of around 30%. If India is to meet its envisaged 30% GER target by 2020, about 40 million students would need to be enrolled. This requires an additional 10,510 technical institutions, 15,530 colleges, and 521 universities with an additional capacity of about 25 million seats. Also, while only one Indian institution figured among the top 200 in the Quacquarelli Symonds (QS) World University Rankings[2], 2015, only six Indian institutions figured in the top 500 of the rankings. Similarly, only four institutions found their place among the top 400 in the Times Higher Education World University Rankings.

There are many challenges to using this demographic advantage. The Economic Survey of 2015 pointed out that total upper primary enrollments had grown. This was in line with the demographic changes in the age structure. Notwithstanding, the overall standard of the education system is well below the global standards. A significant finding of the Annual Status of Education Report 2015 is that the learning levels across India, whether in public or private schools, have not improved. Therefore, to realize India's demographic dividend, one of the key strategies to face the challenge is to focus on productivity of existing and upcoming institutions, keeping in touch with the perennial need for improving quality.

India is a global leader in terms of the GDP spent by public and private sources on higher education. India devotes a very high proportion of its national wealth on higher education, at 3% of its GDP, of which 1.2% comes from public and 1.8% from private sources. This is higher than that of the USA (1% from public and 1.6% from private sources) and the Republic of Korea (0.7% public and 1.9% private). However, according to the University Grants Commission of India (UGC), the per capita expenditure on higher education is sliding and public funding in higher education is not keeping pace with the growing enrollments. The state governments are not matching up to the funds being provided by the central government for higher education. This suggested a limited scope for further increase in funding. Therefore, there is an urgent need to achieve an effective and efficient use of funds.

The research project on Measuring Productivity in Higher Education is highly relevant to India, especially to the institutions that are funded by governments. Many leading HEIs,

[2]Annual listing of the world's top universitiess

including the IITs, NITs, and central universities have been supported with huge funds from the governments. These funds are used to create the infrastructure and competencies to deliver the desired levels of performance. However, in the long run, these institutions would be facing two primary challenges. One, the funding from the government is likely to reduce as per other national priorities, including a focus on primary education; and two, they will need to improve the performance, to take India's position to a global level in the higher education sector.

These challenges are linked in such a way that HEIs have to perform better with lesser resources. Productivity improvement is the only viable strategy to improve competitiveness in the global higher education system. This study will be useful for understanding the complexity of the domain; for sharing and learning unique experiences; and for proposing a strategy for productivity improvement and its operationalization at HEIs in Asia.

According to a senior government official, top public institutions are required to continuously focus on quality with a view to create world-class institutions. On the other hand, many private institutions were able to ramp up their capabilities to handle large intakes of students and churn out graduates, and thus proved to have achieved a high level of productivity. However, a large percentage of the students are not employable and search for employability skills or take up further education through government institutions. For example, in the state of Tamil Nadu, close to 40% of the engineering seats were vacant in 2015, thus making these institutions economically unviable.

RECENT DEVELOPMENTS

One of the significant changes by the new central government is to provide an enabling environment for private and foreign participation in the higher education system. The difference between private and public universities has started to blur due to lower entry barriers such as mandating of accreditation requirements and quality benchmarks. The Indian higher education sector has begun to think in the direction of internationalization of its courses and programs. Toward that end, institutional leaders are selected in an open and competitive process, and many Indian institutions are led by international academics and administrators. The sector needs to be in consonance with global standards and also emerge as a leader in higher education globally in the next decade.

Over the last two decades, the government has gradually withdrawn from direct management of public institutions, while decentralizing governance to boards comprising academics, alumni, and external members. It exerts indirect forms of control, based largely on mechanisms such as performance-linked funding and quality recognition. Over the successive five-year plan periods, the funding model is moving from funding for institutions to funding for individuals such as faculty, students, and researchers. Consequently, institutions are increasingly taking greater responsibility for sourcing funding, thus further increasing their autonomy to plan their own prospects. In order to move the quality of higher education up, compulsory accreditation is being thrust upon the institutions. More sophisticated quality assurance system, based on the establishment of national and international standards for higher education, is an integral part of the emerging governance.

India became the 17th member of the exclusive Washington Accord. This would help create equivalence for engineering degree programs and allow Indians to practice engineering in other member countries. However, becoming part of the Washington Accord does not necessarily mean that all engineering degrees by all Indian colleges will get equivalence with those of other member countries. The present higher education system consisting of public and private institutions presents a paradoxical context for policy making. The government-run institutions are able to achieve a certain level of quality at the national and regional levels. Agencies such as National Assessment and Accreditation Council (NAAC) and National Board of Accreditation (NBA) require meeting of performance criteria in publications, research, job placements, and patents at the institutional level. In addition, faculty members have to fulfill such criteria for career movement. Therefore, although output criteria at the individual and institutional levels are ensured, these may not be related to the inputs in terms of level of deployment of resources.

NBA has shortlisted 220-odd engineering colleges as tier-1 institutes whose undergraduate engineering programs are in tune with the requirements of the Washington Accord. The accord has the charter of promoting mobility and quality assurance of engineers across international boundaries. The charter requires that nations set up suitable accreditation standards, which would ensure a minimum quality of attainment for their engineering graduates. On the other hand, the government is also moving from monitoring the inputs to regulating the outcomes. From consumption of allocated funds to outcomes from utilized funds is now the focus of institutional management. At the same time, greater autonomy in the use of allocated funds as well as greater institutional responsibility toward better utilization is likely to prevail.

In a major move, Government of India has begun to establish HEIs in the technical sector in the PPP mode. The proposal of establishing 20 IIITs in the PPP mode by the government envisages an investment in the ratio of 50:35:15 by the central government, the state government, and the industry, respectively. These HEIs are likely to be administered by a hybrid board that would draw its members from major industries. For example, the IIT established in Srirangam in the state of Tamil Nadu is an academic and research institute jointly funded by the Government of India, the Government of Tamil Nadu, and industry partners. The industry partners include Tata Consultancy Services, Cognizant Technology Solutions, Infosys, Ramco Systems, ELCOT, and Navitas. The industry participation in the administration HEIs is likely to bring about changes in the way performance, particularly productivity, is measured and managed.

Another major development in the past decade was the introduction of 27% reservation for Other Backward Communities (OBCs) in admissions. To address the widespread protests from other classes, the government added a rider that expansion should be done without impacting the other classes. That meant adding a total of 54% additional seats to the institutions in 2007. The additional capacities were created over a period of two to three years, based on the potential of the institutions. Apart from physical infrastructure such as classrooms and equipment, a capacity augmentation involves a need for additional faculty as well, and the estimated cost for creating each new seat at IITs is close to INR 2 million.

RESEARCH METHODS

The higher education system is huge and complex for undertaking any major research on productivity measurement. Availability of data for any systematic research has also been a challenge, given that this study on measuring productivity in higher education is first of its kind in India. Therefore, it was decided to focus on the technical education sub-system within the higher education system in India.

The technical education system in the country can be broadly classified into three categories: the central government-funded institutions, state government-funded institutions, and self-financed institutions. In addition, considering the time constraint, resource availability, and difficulties in accessing data of 10 years, it was decided to focus on the 82 CFTIs within the large sub-system of technical institutions, as detailed in Table 8. In addition, it was decided to consider those institutions which have completed 10 years of existence.

Table 8: Count by institution types

Institution type	Count
Indian Institute of Technology (IITs)	16
Indian Institute of Management (IIMs)	13
National Institute of Technology (NITs)	30
Indian Institute of Science Education and Research (IISERs)	5
Others (SPA, ISMU, NERIST, SLIET, NITIE & NIFFT, CIT)	9
Indian Institute of Science (IISc)	1
Indian Institute of Information Technology and Management (IIITMs)	4
National Institute of Technical Teacher's Training & Research (NITTTRs)	4

Out of the above eight categories of institutions, IIITMs and IISERs are relatively new to the higher education system with a narrow focus on research. Similarly, NITTTRs are institutions focusing on teacher training programs. Therefore, the research is based on select institutions for an exploratory study as per the suggested framework. Accordingly, one institution each within IITs, NITs, IIMS, and SPA was considered as a case unit for the study through theoretical sampling method. A general description of the four categories of institutions is presented below.

The IITs: The IITs are among the top engineering institutions in the world. These were established with the objective of creating a talented pool of trained scientists and engineers who could contribute toward the socioeconomic development of India. These HEIs offer undergraduate programs in various branches of engineering and technology; postgraduate programs with specializations; and PhD programs in various engineering and science disciplines and interdisciplinary areas; and also conduct various basic, applied, and sponsored research. The quality of teaching and research in IITs is of international standards. The institutes are continuously evaluating and modifying curricula as per the emerging trends in the industry. They also contribute to updating the knowledge of faculties of other engineering colleges through Quality Improvement Programs. As host institutions

under the Early Faculty Development Programme (EFDP), IITs act as nuclei to cater to the technical requirements of their respective regions.

The NITs: These are a group of premier federally-funded public engineering institutes in India. These institutions have been declared as Institutes of National Importance alongside the IITs by an Act of Parliament of India. In 2003, the 17 erstwhile Regional Engineering Colleges (RECs) were rechristened as NITs and taken over as fully-funded institutes of the Central Government and granted deemed-university status. The NIT Council is the supreme governing body of the NIT system. All 31 NITs are funded by the Government of India. These institutes are among the top-ranked engineering colleges in India second only to the IITs. Some of the top NITs are competing with older IITs in research, placement, and industry linkages. The main aim of setting up these NITs was to create the required technical manpower by providing undergraduate education and training in different branches of engineering and technology. Further, the RECs were also envisaged to function as pace-setters and to provide academic leadership to the technical institutions in their respective regions.

The IIMS: These HEIs are a group of 20 public, autonomous institutes of management education and research in India. The IIMs are institutions of excellence, established with the objectives of imparting high-quality management education and training, conducting research, and providing consultancy services in the field of management to various sectors of the Indian economy. Each IIM is autonomous and exercises independent control over its day-to-day operations. However, the administration of all IIMs and the overall strategy of IIMs is overseen by the IIM council. Some of these institutions are recognized as premier management institutions, comparable to the best in the world for teaching, research, and interactions with industries. All the IIMs are registered Societies governed by their respective Board of Governors. The two-year Postgraduate Programme in Management (PGP), offering the Postgraduate Diploma in Management (PGDM), is the flagship program across all IIMs. These postgraduate diploma programs are considered equivalent to regular MBA programs. Some IIMs also offer a one-year postgraduate diploma program for graduates with more work experience. Some IIMs offer the Fellow Programme in Management (FPM), which is considered equivalent to PhD globally.

The SPAs: These institutions have been established by the Government of India to provide facilities in education and training in the fields of rural planning, urban planning, and human settlement. SPAs provide undergraduate and postgraduate education and training in the fields of architecture, planning, design, and management of different aspects of human habitat and environment. Each SPA is autonomous and exercises independent control over its day-to-day operations. However, the administration of all SPAs and the overall strategy of SPAs is overseen by the SPA Council. The SPA Council is headed by India's Minister of Human Resource Development and consists of the chairpersons and directors of all SPAs and senior officials from the MHRD. SPAs are committed to produce best architects and planners for the country to take up the challenges of physical and socio-environmental developments as per the global standards. SPAs are to strive for social sustenance through universal design, cultural sustenance through conservation, and environmental sustenance through the disciplines of architecture, planning, and design.

ESTABLISHING A PRODUCTIVITY INDICATOR

For the purpose of this study, four institutions are selected as case studies. These institutions are chosen based on their leadership among their peers. The following section covers an introduction to the institution, and its productivity analysis for a period of 10 years (2005–15). The analysis includes the following output and input indicators:

- Education productivity: This covers the number of students, credit hours, and performance in career placements.
- Research productivity: This considers the number of publications, project funding, patents, etc.
- Academic productivity: This is a combined productivity indicator of education and research.
- Input indicator: This includes all the inputs except student fees.

Analysis of IIT 1

IIT1 is among the institutes of national importance in higher technological education, basic, and applied research. It was established in 1956 based on a foreign collaboration agreement for the establishment of institutes of higher education in engineering in India. The institute has 16 academic departments and a few advanced research centers in various disciplines of engineering and pure sciences, with nearly 100 laboratories organized in a unique pattern of functioning. A faculty of international repute, a brilliant student community, excellent technical and supporting staff, and an effective administration have all contributed to the pre-eminent status of IIT1. It jumped 13 places to be ranked among the top 50 universities across various Asian countries by QS. As against its rank of 56 in 2015, IIT1 was placed at 43 in 2016. It is also ranked as one of the top technology institutions in India by the National Institutional Ranking Framework (NIRF), Government of India.

Table 9: Productivity calculations of IIT1

		2007–08	2008–09	2009–10	2010–11	2011–12	2012–13	2013–14	2014–15
Education productivity	Ratio	2.17	2.19	1.36	1.44	2.60	1.39	2.72	2.15
Research productivity	Ratio	2.08	2.52	1.01	2.30	1.54	1.76	3.88	1.77
Academic productivity	Ratio	2.13	2.35	1.19	1.87	2.07	1.58	3.30	1.96
Education productivity	%	30.01	0.57	-37.71	5.98	80.09	-46.40	95.61	-21.04
Research productivity	%	27.67	20.92	-59.89	127.55	-33.21	14.45	120.83	-54.54
Academic productivity	%	28.86	10.53	-49.59	57.78	10.46	-23.79	109.68	-40.73

As per Table 9, productivity at IIT1 has increased over a period of 10 years. The education productivity increased from 1.67 in 2005–06 to 2.15 in 2014–15, while the research productivity increased from 1.63 to 1.77 for the same period. However, there is no steady increase in productivity, and the change in productivity increase is inconsistent year-on-year. Also, the productivity did not increase with increase in input. An increase in capital, labor or intermediary inputs causes a decrease in productivity. Moreover, the increase of output in terms of education and research does not match with the increase in input. For the year 2012–13, the input increased 1.42 times over the previous year but the education and research outcomes increased by 0.99 and 1.25, respectively. It may be noted from Figure 27 that the research productivity increased phenomenally to 3.8 in 2014, while the inputs were relatively low during the previous years.

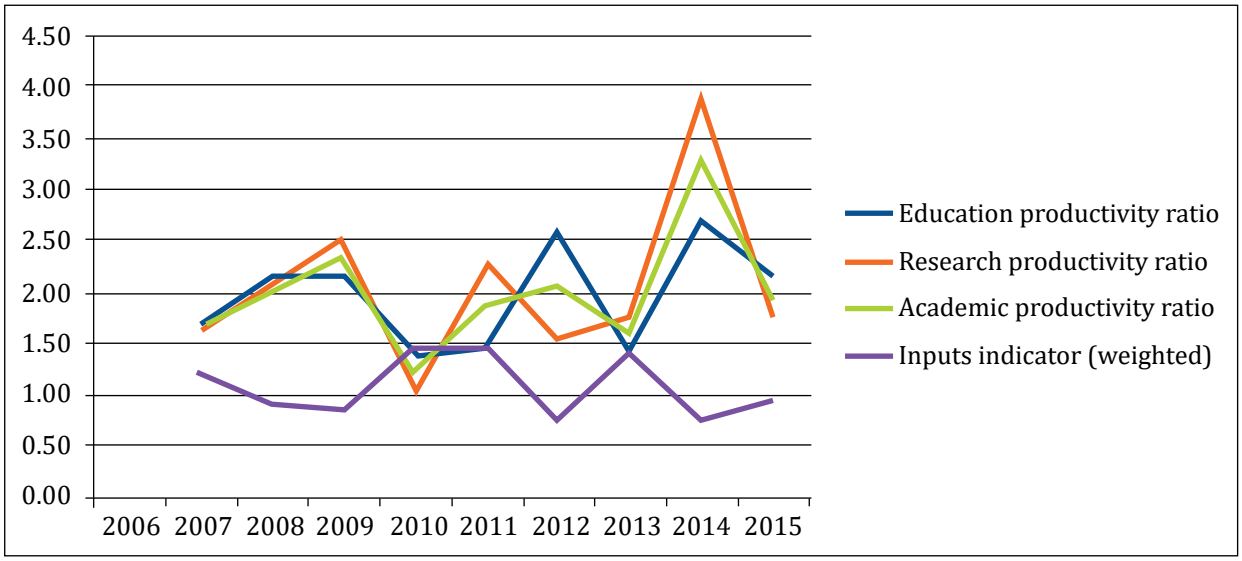


Figure 27: Productivity trends at IIT1

Analysis of IIM 1

IIM1 is the sixth addition to the IIM family of management schools. IIM1 has been acting as a leader in the field of management education, interfacing with the industry since its inception. IIM1 is recognized as a premier management institution, and is comparable to the best in the world for teaching, research, and interactions with industries. It has the latest in teaching aids, rich learning resources, a strong IT backbone, a state-of-the-art sports complex, and hostels as well as contemporary infrastructure. This institution started its satellite campus and launched an integrated program in management to leverage the brand and resources.

Table 10: Productivity calculations of IIM1

		2007–08	2008–09	2009–10	2010–11	2011–12	2012–13	2013–14	2014–15
Education productivity	Ratio	2.41	1.08	1.37	2.10	2.34	1.89	1.64	2.11
Research productivity	Ratio	4.60	1.03	0.87	1.60	1.43	1.03	1.24	1.57

(continued on next page)

(continued from previous page)

		2007–08	2008–09	2009–10	2010–11	2011–12	2012–13	2013–14	2014–15
Academic productivity	Ratio	3.51	1.06	1.12	1.85	1.88	1.46	1.44	1.84
Education productivity	%	94.89	-55.29	26.88	53.61	11.34	-19.20	-13.25	28.69
Research productivity	%	519.59	-77.54	-15.85	84.45	-10.88	-27.93	20.27	26.54
Academic productivity	%	254.28	-69.89	5.96	65.61	1.72	-22.51	-1.42	27.77

The research productivity of IIM1 reached a high in 2011 while its education productivity peaked in 2012 as compared to previous years, as shown in Table 10. As per Figure 28, increased inputs in the period 2009–10 resulted in increased outputs in the subsequent years. The productivity relating to both research and education fell sharply in 2013. However, increased inputs in 2013 has led to increased productivity in both the areas since 2014, even though the inputs were reduced during this period. The institution is now focusing on improving research productivity by letting its faculty to focus on high quality research publications and less teaching.

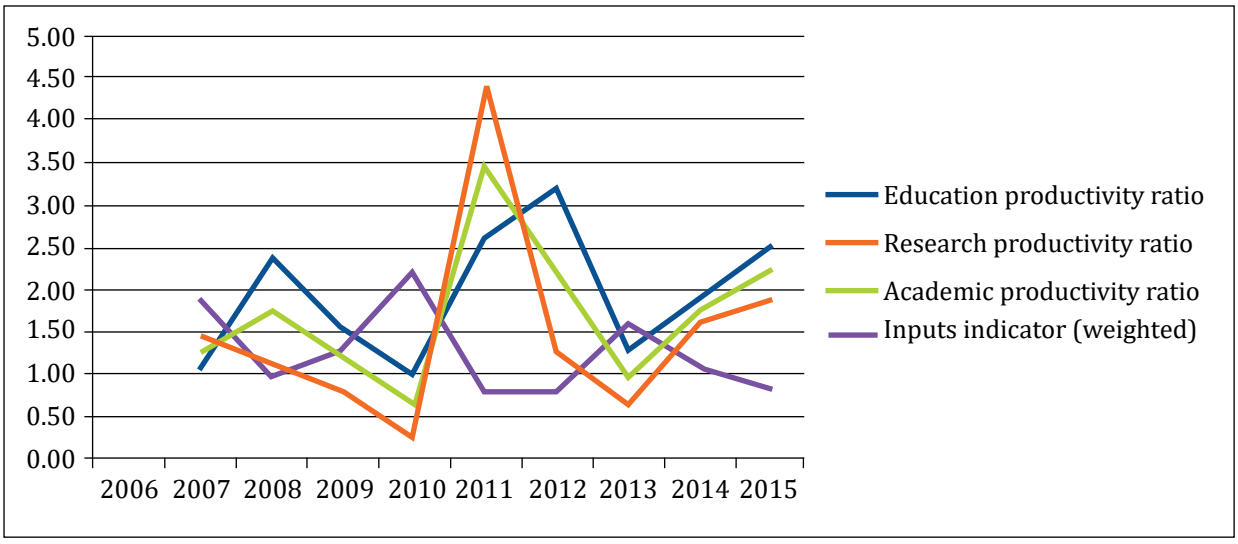


Figure 28: Productivity trends at IIM1

Analysis of NIT 1

NIT1 was started as a joint and cooperative venture of the Government of India and the state government in the early 1960s with a view to catering to the needs of manpower in the technology sector for the country. The institution offers undergraduate courses in 10 branches and postgraduate courses in 21 disciplines of science, engineering and technology besides MS (by research) and PhD in all the departments. A hallmark of the campus lies in the good facilities catering to the academic and extracurricular interests of the students. It is also ranked as one of the top 12 technology institutions in India by NIRF. It was ranked among the top across 30 NITs.

Table 11: Productivity calculations of NIT1

		2007–08	2008–09	2009–10	2010–11	2011–12	2012–13	2013–14	2014–15
Education productivity	Ratio	2.41	1.08	1.37	2.10	2.34	1.89	1.64	2.11
Research productivity	Ratio	4.60	1.03	0.87	1.60	1.43	1.03	1.24	1.57
Academic productivity	Ratio	3.51	1.06	1.12	1.85	1.88	1.46	1.44	1.84
Education productivity	%	94.89	-55.29	26.88	53.61	11.34	-19.20	-13.25	28.69
Research productivity	%	519.59	-77.54	-15.85	84.45	-10.88	-27.93	20.27	26.54
Academic productivity	%	254.28	-69.89	5.96	65.61	1.72	-22.51	-1.42	27.77

In case of NIT1, research productivity and education productivity have been the maximum in 2008 although the input indicators were very low for the entire 10-year period. As per Table 3, the inflow of qualified faculty in 2006 and their research outcomes led to 4.5 times improvement in research productivity. However, it never reached even a 50% growth level for the rest of the period. It may be noted that while education productivity showed some increase from 2011 and 2012, research productivity continued to suffer. After another dip in 2013, both indicators showed positive growths in 2015. In this case, these seems to be no direct link between input and output indicators as shown in Figure 29.

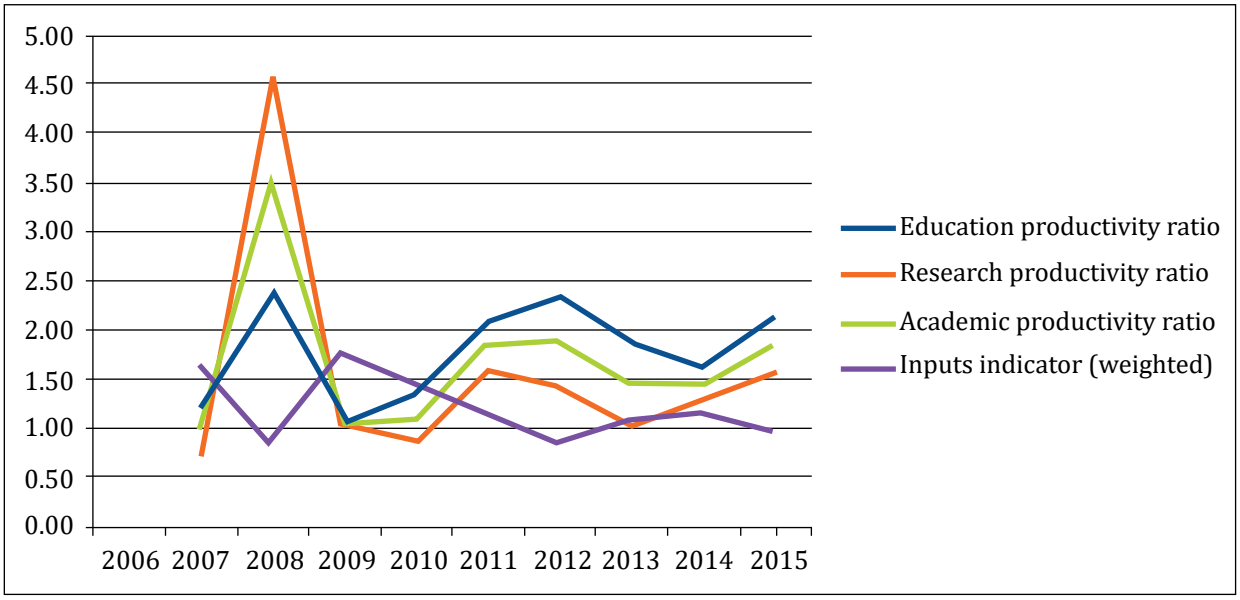


Figure 29: Productivity trends at NIT1

Analysis of SPA 1

SPA1 was started in the early 1940s as a Department of Architecture of a Polytechnic. It was later affiliated to a university and integrated with the School of Town and Country

Planning which was established in the mid-1950s by the Government of India to provide facilities for rural, urban, and regional planning. The school is a specialized institution, only one of its kinds, which exclusively provides training at various levels, in different aspects of human habitat and environment. It offers academic programs in specialized fields both at bachelor's and master's levels.

Table 12: Productivity calculations of SPA1

		2007–08	2008–09	2009–10	2010–11	2011–12	2012–13	2013–14	2014–15
Education productivity	Ratio	0.56	0.68	0.16	1.74	0.74	0.70	0.77	0.60
Research productivity	Ratio	1.85	1.18	0.30	1.33	1.11	0.99	1.01	0.60
Academic productivity	Ratio	1.21	0.93	0.23	1.53	0.93	0.85	0.89	0.60
Education productivity	%	-4.79	21.09	-76.02	961.69	-57.22	-6.37	11.00	-22.69
Research productivity	%	3,878.95	-36.16	-74.47	340.39	-16.61	-10.12	1.32	-40.62
Academic productivity	%	277.39	-22.77	-75.04	559.30	-39.65	-8.61	5.31	-32.83

The productivity analysis of SPA1 shows that there is no significant growth. Increased inputs in 2010 showed some improvements in 2011 and 2012. The following four years showed no change or negative productivity, as per Table 12. As the student intake is fixed and campus placement is not applicable in this type of institution, the education productivity is stable throughout the period. From Figure 30, it may be noted that high level of input in 2010 had a positive impact only for a year.

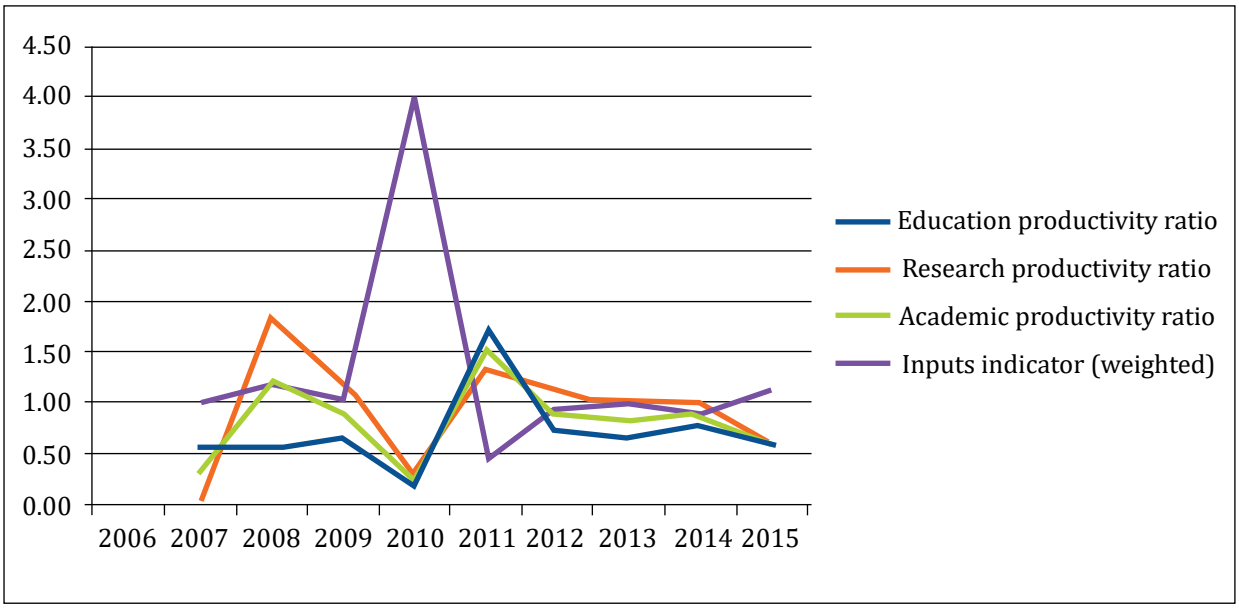


Figure 30: Productivity trends at SPA1

This exploratory study reveals that the productivity pattern varies across different types of institutions under CFTI. It has been noted that IIT1 was found to have a productivity factor of more than one for all the 10 years.

THE NEXT FIVE YEARS

Implementing strategies for improving productivity begins with recognizing its role in the broader performance assessment of academic institutions and also by keeping it as a central part of the higher education management. The difficulty in quantifying productivity measures has also been used as an excuse to ignore its importance. Any effort to improve productivity underpins the need for a well-defined set of metrics. Further, quality requirements should always be a core part of productivity management, even if it cannot be fully captured through the metrics. For example, the engineering and technology institutions in India were facing the challenge of their degrees not being recognized for employment in developed countries. Then, India became the 17th member of the exclusive Washington Accord in 2014. This recognizes the substantial equivalency of programs accredited by those bodies and recommends that graduates of programs accredited by any of the signatory bodies be recognized by other bodies as having met the academic requirements for entry to the practice of engineering in the area of their jurisdiction.

The underpinning concern is the poor understanding of productivity at the institution level. Institutions have not realized that productivity is also a function of quality. It seems that while quality is the major concern of many institutions, the top institutions, in both government and private sectors, are focusing on productivity. Existence of many institutions that are operating at 50% capacity will be determined by market forces. For example, while it takes over INR 3.4 lakh to educate a student in IIT per year, the student pays only INR 90,000 per year while the rest is borne by the government. If extrapolated, for all the 39,540 students in the IITs, the cost borne by tax payers in educating the students extends to INR 988.5 crore annually. According to budget estimates, INR 1,703.85 crore is to be allocated to the IITs for 2015–16. This model of funding is likely to discontinue and institutions have to manage their funds. Here is a potential context for integrating the productivity measures to benchmark institutions. Further, FDI in education would throw a new set of challenges to low-performing institutions and make such institutions completely unviable.

A few top government-funded and private institutions have started thinking of productivity measures to become competitive. For example, one of the leading IITs has started working on productivity measures at the faculty level, which will then be used to arrive at the measures at the department and institution levels. However, these measures of productivity focus more on sponsored research and scholarly publications than teaching. For the faculty, particularly at the government institutions, there are clearly defined measures for funded research, scholarly publications, and outreach activities for promotion to various levels. Ironically, teaching effectiveness and efficiency are not considered a part of the evaluation criteria for career progression. Nevertheless, things are likely to change sooner or later due to many socioeconomic reasons.

According to senior academics in India, productivity measurement is not understood and therefore is not of much interest to institutions as well as the governing agencies of higher education. However, the need has been understood in top institutions funded by the government, as the funds are increasingly becoming scarce. Therefore, in the time to come, funding to many of these institutions will be linked to productivity of the institutions. Some of the top strategies may include expanding the student base of the existing quality HEIs by increasing intake at their campuses and allowing the reputed institutions to set up additional campuses, while replicating their teaching and research-based culture in the new campuses.

These strategies would demand easing of norms to allow established HEIs to increase their intake in the popular streams in existing campuses. Institutions may deploy existing physical facilities more efficiently by scheduling multiple shifts and year-round operations. Other measures would include utilization of surplus land in higher education institutions to build additional capacity, and improvements in campus design and layout for improved utilization of land. Institutions have to also scale up hiring of faculty and train them for effective delivery of education.

Private universities are entrepreneurial in the way they manage their academic and administrative affairs. They come out with innovative strategies and approaches to simultaneously achieve effectiveness and efficiency. For example, Indian School of Business (ISB) opened a new campus at Mohali in 2012, increasing its total capacity from 600 to 800. BITS Pilani is planning to more than double its total number of students by 2021 and increase it by nine-fold by 2030. It has been observed that private institutions are able to achieve high levels of productivity as compared to government-funded institutions. Despite high levels of intellectual capital in government institutions, they have to learn from private institutions how to achieve productivity.

Incentives for productivity have been introduced by some institutions. Introduction of computer training for all administrators has remarkably improved the productivity and the confidence level of employees. Keeping pace with modern development, a university has computerized examination, library, and administrative work. The university has arranged extensive training programs in internet, office automation and record maintenance for its administrators. As an outcome of this, the efficiency of administration has significantly improved. Teachers with lesser salaries in private institutions, teach more courses than in a government-funded institution. Most of the IIMs have adopted a strategy of incentivizing faculty to teach additional courses, beyond their assigned workloads. They are paid a lump-sum for every additional course taught. It has allowed these institutions to achieve overall efficiency in the faculty cost of delivering courses.

The Government of India has brought in National Institutional Ranking Framework (NIRF) in 2015. This framework uses a methodology to rank institutions across the country. The methodology incorporates parameters for ranking various universities and institutions. The parameters broadly cover “teaching, learning and resources,” “research and professional practices,” “graduation outcomes,” “outreach and inclusivity,” and “perception”. It is understood that the government funding and administrative autonomy will be based on the ranking of the institutions.

In a major change in annual funding to MHRD funded institutions, the concept of capital and revenue budgeting have been introduced from 2017–18. A significant portion of the budget has to be met through the funds generated by the institutions. Given the flexibility in administration, institutions may charge higher fees to the students. Therefore, the Government of India institutions, particularly the CFTIs are likely to be placed in completely new orbit in the near future. Productivity measurement and management will be the central theme of higher education funding.

CONCLUSION

Given the socioeconomic considerations, developing countries like India have to necessarily focus on how resources are used in an equitable manner. This is likely to become a central theme of higher education management. The present research is a first step toward sensitizing higher education policy makers and academic administrators on productivity measurement. At an institutional level, productivity measurement will be important for self-assessment of key programs and initiatives. It would also serve to capture and share best practices among similar type of institutions. Further, productivity measurement would serve as a critical input for strategic planning at the department and institution levels.

There also are challenges in implementing productivity measurement programs. First, faculty and administrators will be less willing as institutions may set higher output requirements. Second, data availability is a major challenge at the institutional and sectoral levels. Necessary policy initiatives and support from agencies such as National Productivity Council are likely to drive productivity measurement in the higher education system in India.

CHAPTER 5
INDONESIA

Paulina Pannen[1], Ministry of Research, Technology and Higher Education, Republic of Indonesia

EXECUTIVE SUMMARY

Managing higher education institutions (HEIs) in Indonesia is challenging due to their varied sizes, quality, status, and distribution across the archipelago. In the past years, performance of HEIs has been fragmentally measured based on accreditation, status, number of students and graduates, research and academic products, students' achievements, etc. However, none has been comprehensively done, and a comprehensive measure of productivity is needed.

In this study, the measurement of higher education productivity involved 15 variables involving education and research outputs and inputs. Since secondary data was not available for all variables, primary data collection was conducted across 440 (around 10%) HEIs, in an online mode over a period of six weeks during April–June 2016. Responses were received from 158 HEIs, but the acceptable data sets were only 148. Further, only 73 data sets were considered for longitudinal analysis.

The analysis was done employing the APO's HEIs' Productivity Model based on the Turnqvist Chain Index. The period observed was 2009 to 2014. The results indicate that:

1. There was a sharp increase of education productivity during the observed period and it reached its peak in 2012 with a 26% increase in graduates, while the general trend indicated a flat growth.
2. There was a sharp fluctuation of research productivity during the observed period, with a sharp increase in 2010, and a slow and incrementally decreasing growth unless a major change took place.

[1]The research on Measuring Productivity in Higher Education in Indonesia has been made possible with the support of the Asian Productivity Organization based in Japan, the National Productivity Organization under the auspices of Ministry of Manpower, Republic of Indonesia, and the Secretariat General of Research, Technology and Higher Education, Ministry of Research, Technology and Higher Education, Republic of Indonesia. It has been conducted through a series of activities, including the Coordination Meeting in Bangkok on 24–26 November 2015, and in-country research from 1 December 2015 to 30 November 2016.

This report has been the results of efforts and contributions from many parties and scholars who are committed to looking at the concept of higher education productivity, limitation and complexities in measuring higher education productivity, and the impact of higher education productivity on higher education policy, especially in Indonesia.

The highest appreciation goes to the Indonesian HE Productivity Team members Dr. Paulina Pannen, MLS (MORTHE); Ir Hari Purwanto, MSc DSC (MORTHE); Dr. Ir Agus Puji Prasetyono, MEng (MORTHE); Dr. IN Baskara (late) (Universitas Terbuka); Ir Herr Suryantono, PhD (Universitas Indonesia); Dr. Ir Dahrul Syah, MSc (Institut Pertanian Bogor); Ir Ira Nurhayati Djarot, MSc (Directorate General of Research & Development); Dr. Ophirtus Sumule, DEA (Directorate General of Innovation); Dr. Syaeful Irwan, MM (Directorate General of Research & Development); Dr. Wawan Gunawan (National HE Database Center); Franova Herdiyanto, S Kom (National HE Database Center); David Aulia Akbar Adhieputra, S Kom (National HE Database Center); Dr. Muh Sirojul Munir, MT (National HE Database Center); Dr. M Samsuri (Planning Bureau); Yanuar Firdaus Arie Wibowo, ST, MT (Telkom University); Dahliar Ananda, ST, MT (Telkom University); Dawam Dwi Jatmiko Suwawi, ST, MT (Telkom University); Setiyo Widayat, ST (Telkom University); Rizki Elisa Nalawati, ST (Telkom University).

Special dedication goes to Dr. IN Baskara, the economic analyst of the Indonesian HE Productivity Team from Universitas Terbuka, who passed away in mid-October 2016 while completing this study.

The Indonesian HE Productivity Team is also indebted to the lead researcher of HE Productivity Prof. Hamish Coates, University of Melbourne; Prof. William F Massy, Stanford University; and Jose Elvinia, Program Officer, Research and Planning Department, the APO, for guidance, discussion, and supporting information for this research. Special appreciation also goes to the participating HEIs; the data operators of private HEIs; Coordinating Offices; and Center for Data and Information, MORTHE for data collection and analysis; and the secretariat for providing their full support to this research.

3. The academic productivity was relatively steady and flat over the observed period.
4. The overall HEI productivity is approaching the value of an increase of (one) input will produce increase of (one) output.

In the past, the factors influencing the performance of HEIs in Indonesia have been regulatory and bureaucratic reforms; external challenges such as mission differentiations and certifications; and the merging of research, technology and higher education. The various reforms, and the regional and global competition have also affected HEIs' performances. In future, Indonesian HEIs will face quite a challenging period due to their autonomy, renewed industrial policy, and rapid information and communication technology (ICT) development. Expectedly, higher education productivity will be advanced through the autonomy given by the government to HEIs. Meanwhile, the renewed industrial policy could open an opportunity for network development of HEIs and industries; and ICT could advance the teaching and learning processes of Indonesian HEIs. For a more comprehensive picture of Indonesian higher education productivity, it is also recommended to do productivity analyses of individual HEIs, and of HEI clusters.

The major constraints for this study have been the availability of valid and reliable data, which calls for improvement of the National HE Database so as to integrate the productivity indicators for a continuous analysis of higher education productivity. As such, the results of this study are to be read contextually within the study's limitations.

Based on the results of this study, productivity measures in Indonesian HEIs need further refinement. Further research is needed to tap the most salient variable to calculate productivity in Indonesian HEIs, and to test validity and reliability of the measures of productivity of varied HEIs. Since productivity measures may sensitively lead to executive decisions on the development and support from the government to HEIs in various forms, a number of evidences are needed to prove its usability. Intrinsically, these efforts will need incorporation of the stream of required data in the national higher education data center's system in addition to the current reporting system.

Furthermore, it is expected that measuring productivity of HEIs will soon become the national policy. As such, the national HEI total factor productivity measuring practice needs to be integrated into the national higher education dashboard so as to provide public access into each HEI's productivity profile as part of its self-assessment. It would also provide evidence-based decision support information for the executives. As there is a wide variation of HEIs in Indonesia, it is also necessary to identify and develop specific educational productivity measurement for ICT-based distance education streams. Moreover, as partnerships and collaborations between HEIs and industry have been highly encouraged in the recent years, there is also a need to develop and monitor the productivity of HEI-industry partnership toward having a healthy incentive policy for both the parties.

INTRODUCTION

Indonesia is an archipelago country consisting of more than 17,500 islands and is located between the Asian and Australian continents. The land area is 1,910,932 sq. km and the

maritime area is 7,900,000 sq. km. With a population of 255,35 million in 2015, it is the fourth most populous country in the world. Across the islands, Indonesia has more than 300 distinct native ethnicities and 742 different languages and dialects. The income per capita in 2015 was US $3,379, which was a slight decrease from US $3,541 in 2014. That puts Indonesia at number 115 in terms of income per capita in the world.[2] Nevertheless, the GDP for R&D is only 0.09% of a USD 9,000-billion GDP (Naim, 2015). In terms of education, Indonesia can be categorized as the fourth-largest education system in the world.

Indonesia has only 122 public general HEIs offering 6,047 study programs with enrollments of about 1,962,448 students and equipped with 70,217 lecturers (see Appendix 1). The number of private HEIs is about 25 times that of the public general HEIs. The number of enrollments and the number of lecturers at private HEIs are more than double the public general HEIs. Thus, private HEIs have significant influence in the frame of Indonesian HEIs.

From the 4,445 HEIs in Indonesia, only 950 received institutional accreditations. Of these, 26 HEIs received excellent accreditations (A); 269 received very good accreditations (B); and 655 received good accreditations (C)[3]. Although the number of HEIs in Indonesia is huge, they only have the capacity to absorb about 50% of the two million high-school graduates every year. The gross enrollment rate in 2015 was only around 30% of the higher education-age population of around 20 million.

Among 24,045 study programs, the top five programs are education, engineering, social sciences, health & medicine, and economy. The accreditations for study programs has reached up to 18,956, with 2,101 programs getting the A accreditation; 8,387 programs getting B; 8,468 programs getting C, and 790 programs having expired accreditations. Thus, there are 5,089 study programs that are not accredited[4].

The levels of study offered in Indonesian HEIs ranges from diploma 1 to the doctoral program within three streams of academic, vocational, and professional studies. Also, Indonesia has six types of HEIs: community academy, polytechnic, university, college, institute and academy (see Appendix 2, 3, and 4).

HIGHER EDUCATION IN INDONESIA

Since its inception in 2014, the new Government of Indonesia has made a lot of transformations, especially in the Indonesian higher education system. For quite some time, higher education was managed under the Ministry of Education and Culture, as a directorate general. Since 2014, the higher education management has been merged with the Ministry of Research & Technology to establish a new ministry, Ministry of Research, Technology and Higher Education (MORTHE). While it was perceived to be breaking the education continuum by some, it was also received positively that research would be the focus of higher education and accordingly there would be a major transformation of higher

[2]See: https://www.focus-economics.com/ country-indicator/indonesia/gdp-per-capita-USD
[3]See http://ban-pt.kemdiknas.go.id/hasil-pencarian.php
[4]See http://ban-pt.kemdiknas.go.id/hasil-pencarian.php

education in Indonesia. The merger process itself has taken more than a year to consolidate the people, scopes of works, budgets, and administrative matters including the information system and the building for the new ministry.

In January 2015, the MORTHE launched its strategic plan for 2015–19 (see Appendix 5). The plan emphasizes that the function and role of HEIs is transforming beyond teaching and research. The new role states that HEIs functions as agents of culture, knowledge, and technology transfer, and also as agents of economic development. The overall mission of research, technology, and higher education is to produce innovation that would increase competitiveness and contribute to the welfare of the nation. The main performance indicators are the number of culture, knowledge, knowledge and technology transfers; the number of engagements with the industry and the community; number of innovations; number of employments; number of industries being created and partnered; and the amount of funds generated. This advancement has strongly influenced the nature, role, and development of HEIs in Indonesia.

Based on the strategic plan, there are three focuses of the MORTHE's activities: quality, innovation, and competitiveness of HEIs. As such, the MORTHE's effort is not focused merely on provision of higher education access but more on the quality and relevance of higher education programs. The umbrella of MORTHE's effort is the Nawa Cita, or the national strategic plan that focuses on eight main areas of development: food security, energy, new and renewable energy, health & medicine, information and communication technology, transportation, defense strategy, and advance materials (nano technology) and maritime development.

Under the present strategic plan, the success of Indonesian HEIs is currently measured by the number of innovations produced, the skilled workers graduated, and the degree of competitiveness of the innovation as well as the graduates in the industry, as depicted in Figure 31.

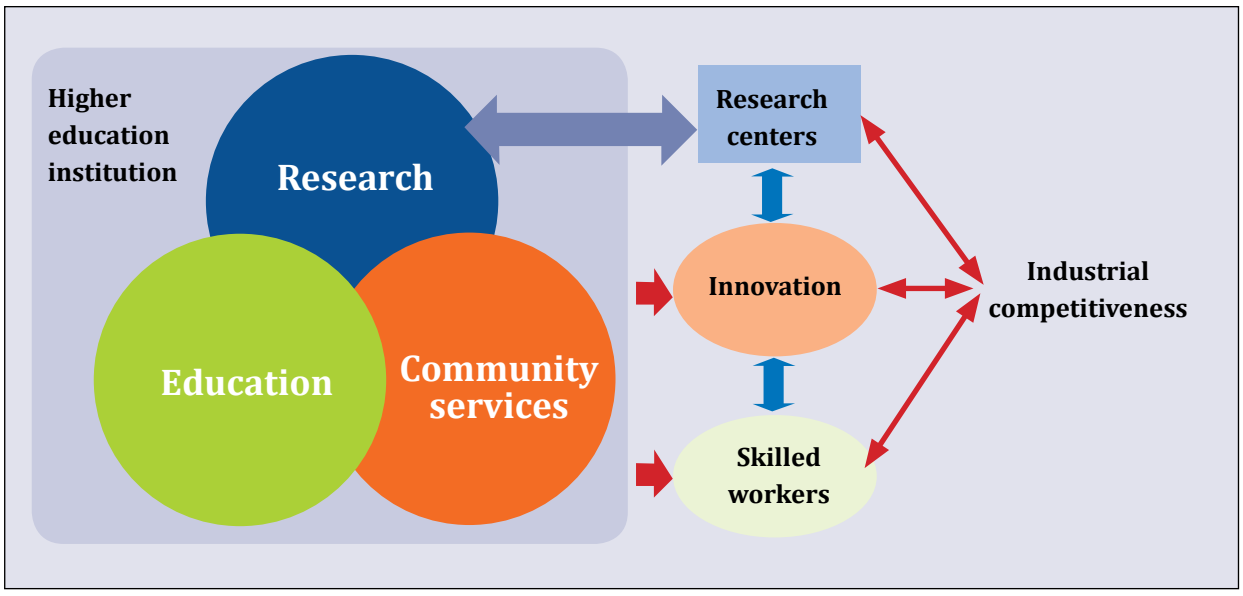


Figure 31: Current measurement of HEIs in Indonesia

Innovation is measured by the research, publications, patents, and innovations that are taken by the industry, while the skilled worker measurement is done by the graduates' employments. Meanwhile, the degree of competitiveness and the degree of innovativeness apply to both the measures. Industrial competitiveness indicates the number of skilled workers and innovations being adopted commercially by the industry.

For an innovation to have industrial competitiveness, it has to achieve both a technological readiness level (TRL) 7 and an innovation readiness level (IRL) 7, on a 9-level scale. A majority of research from HEIs are of low TRL, and thus are not yet ready to be commercialized.

For Indonesia to be able to improve its innovative and competitive index, the HEIs have to make concerted efforts to increase productivity, i.e. the effectiveness level of its operation, and the efficiency level to produce more with less resources while maintaining quality. In 2015, according to the World Economic Forum, the Indonesian innovation index was 4.0, with 60th rank worldwide. Also, the Indonesian competitiveness index was 4.5 with a rank of 60 in 2014, and 4.5 with a rank of 65 in 2015. These data points inform that while Indonesia's growth is stable, there are other countries that are climbing and having better innovative as well as competitiveness indices. The target is for Indonesia to be in the 56th place by 2020. With the given development target, and in a period when resources are decreasing, an increase in efficiency and overall productivity is expected. HEIs' productivity contributes significantly to the target under the tertiary education and innovation indicators.

Despite the new strategic plan, at this moment, the measurement of HEIs' success has been focused on the external quality measures of HEIs, such as the number of graduates; accreditations or world-class ranks; measures of research output, such as the number of research, publications, and patents. Such measures have not taken into account the value of HEIs, especially that of the public HEIs, and their role in the nation's economic development or productivity measurement. Thus far, a majority of public HEIs are still employing a cost-center strategy, while the private HEIs are merely measured by the number of graduates and accreditations. Only 11 public HEIs have been given the autonomy for managing their financial matters. Meanwhile, the cost of higher education is increasing from time to time. A comprehensive measure of HEIs' productivity has not yet been implemented, which will actually fit the purpose of the bureaucratic reform taking place in Indonesia at present.

Therefore, although measuring productivity of the HEIs is a challenge for Indonesia, it is highly needed, so as to illustrate the value of the money spent by the public and the government on higher education for the nation's economic development. The new strategic plan, the government's new paradigm, as well as the bureaucratic reforms are calling for a comprehensive measure, such as the productivity measure that allows for multifactor measures, for the higher education sector in Indonesia.

RECENT ADVANCES

This section discusses factors that have influenced the productivity of HEIs in Indonesia in the last five years.

Regulatory Reform

In 2012, the Government of Indonesia passed a special law on higher education (No. 12/2012). It indeed marks higher education as being an independent entity, and not governed by the National Law on Education (No. 20/2003) anymore.

The National Law on Higher Education introduced new regulations on:

1. Kinds of higher education, levels of higher education, and forms of higher education.
2. Higher education qualification and National Qualification Framework, and its relations to job markets.
3. Quality assurance system.
4. Positioning of higher education across stakeholders and ministries.

Accordingly, a major transformation was carried out in the higher education governance at the institutional level as well as at the level of Directorate General of Higher Education under the Ministry of Education and Culture at that time. The focus on quality comes stronger under the new law.

With this focus on quality, the government reinforced the regulation and standards on higher education through internal as well external quality assurance mechanisms, while HEIs are in pursuits of improving their quality. The measures include improving qualification and quantity of the lecturers, and improving the teaching and learning facilities and labs, among others. The indicators of this focus on quality have been the national accreditation ranks and world-class university ranks. The accreditation ranks of A=excellent, B=very good, and C=good have been the basis for sampling the HEIs to be surveyed in this study.

The compliance with the higher education regulations and standards, for example, has required HEIs in Indonesia to improve the students-lecturer ratio as well as the quality of their lecturers. Such improvements may increase their accreditations and reputations, but may not directly relate to the increase in productivity of HEIs. On the other hand, these may increase the operational costs, which could lower the productivity. Thus, the decline in the value of education productivity, in this case, may be interpreted as a positive for the higher education development in Indonesia. It implies that HEIs are refraining from increasing productivity and are first focusing on improving their operations.

Bureaucratic Reform

The bureaucratic reform in Indonesia was started as an impact of the national reform in 1998. It was meant to reform significant bureaucratic elements, to adapt and adjust to the new dynamics of national and global development. It involves the changing paradigm and the changing governance of the Government of Indonesia, to create a bureaucratic system that is characterized by its professionalism, integrity, outstanding performance, honest, neutrality, dedication, and public service, and is based on the norms and ethics of civil servants.

The bureaucratic reform covers institutional reorganization and restructuring; development and improvement of human resources; institutional governance; institutional and individual accountability; institutional supervision and quality monitoring; improvement of public services; development of the new working culture of coordination; and integration and synchronization. The reform has imposed new priorities; new ways of doing business in higher education; and a new working environment and culture. As such, there was a need to define new business processes that affected the public HEIs as part of the Ministry of Education and Culture and also the private HEIs as stakeholders of the ministry at that time.

Through the reform, the government has provided a different degree of managerial autonomy to HEIs, especially the public HEIs. The categories of public HEIs, in terms of management, are autonomous HEIs; public service HEIs; and operational unit HEIs. An autonomous HEI can manage its own budget and funding, and its implication toward its academic management, but is still to be operated as per the government's general rules and regulations. A public-service HEI can manage its own budget and income from non-governmental sources under the auspices of the government, while the operational unit HEI is managed and controlled by the government. This evolution has influenced the way of doing business as well as the performance of HEIs. However, there need to be more studies in future on its effects on the productivity of HEIs in general.

External Challenges

The ASEAN Economic Community (AEC) and global dynamics have especially put pressures on HEIs to be globally comparable in quality terms. As such, each of the HEIs has been making efforts to improve its quality and distinctiveness. Meanwhile, the government itself has been engaged in defining the national qualification framework, applicable both to the workers and the higher education sector.

Mission Differentiation

In order to be distinctive, each HEI has made efforts to differentiate its mission. The terms research universities, teaching universities, academic streams, professional streams, teacher education, and vocational education have become popular, and each HEI tries to define its distinctiveness based on any of the term applicable to its situation.

The mission differentiation strategies employed by MORTHE have been categorizing the HEIs based on their status and institutional accreditations. The 11 public universities given the autonomy are driven to be world-class universities. These are, Universitas Indonesia, Institut Teknologi Bandung, Institut Pertanian Bogor, Universitas Gajah Mada, Universitas Padjadjaran, Universitas Airlangga, Universitas Pendidikan Indonesia, Universitas Sumatera Utara, Institut Teknologi Sepuluh November, Universitas Hasannudin, and Universitas Diponegoro. MORTHE provides some incentives for each of HEIs to enter the Quacquarelli Symonds (QS) or the World University Ranking or both.

In early 2016, two public universities in Indonesia earned their places among the top 500 universities in world based on QS World University Ranking; Universitas Indonesia was

ranked 358 (67th in Asia) and Institut Teknologi Bandung was ranked 431–440 (86th in Asia). The Government of Indonesia has made efforts to put at least five universities among the top 500 in the QS World University Ranking. Furthermore, those HEIs with B accreditations are facilitated to achieve A accreditations, while the C accredited HEIs are facilitated to achieve B accreditation through MORTHE's grant and development program. Also, it established the International Islamic University to function as international refereed Islamic university.

With such affirmative efforts, research, publication, and obtaining patents becomes more dominant activities and efforts in the 11 autonomous HEIs and the A-accredited HEIs, while improvement in teaching becomes dominant in the B- and C-accredited HEIs. Likewise, the non-accredited HEIs, to achieve C accreditations, have to be excellent. Other HEIs are being guided to accelerate improvements in their teaching, structure, and infrastructure as well as in their national accreditations.

Certainly, these changes have implications on the business processes of HEIs, as well as on their governance, prioritized programs, and other components, and consequently on their productivity. The HEIs are making the effort to furnish and fulfill all required elements in their respective missions.

Given the data-availability constraints in the current study, it is not possible to depict the effect of mission differentiations at HEIs (for example, a research university versus a teaching university). The mission differentiation, combined with HEIs' autonomy will initiate a different business model. Although indicators for the new business model may remain the same, the weight of each indicator for calculating the productivity may not be the same under a different mission.

Certification

The global bodies, specifically the AEC, have required Indonesian workers to have professional certificates to be in the job market. This has opened up a new view of lifelong learning, continuous professional development, and qualification upgrades. The first big reform has been the 'teachers and lecturers reform' to be professional in 2005, which was followed by other professions, such as medical doctors, engineers, nurses, and accountants. The certification and professional movement also involves Ministry of Manpower and other ministries in the economic area.

The movement has also made HEIs in Indonesia engaged with HEIs in other countries in various networks, as well as in the development of national qualification framework within the international qualification network (AUN, etc.). At this moment, the Indonesia National Qualification framework has been issued and is being practiced. Other legal instruments for learning outcomes, professional organizations, recognition of prior learning, equivalence of certificates, examination centers, etc. are being prepared.

It is acknowledged by the higher education community at present, that a formal education diploma for graduates is to be accompanied by many other certificates of competency, to provide value-adds to HEI graduates in the job market. Therefore, professional organizations

are emerging to provide professional certificates to the graduates, even as the graduates are seeking additional courses for certifications.

Within the context of HEIs, the lecturers are also expected to be certified professional lecturers. The government provides mechanisms for lecturers to obtain certifications, and also offers financial support and participation for various government programs. However, lecturers are also expected to fulfill the standard requirement of being a lecturer in order to obtain the certificates. These requirements include a master's degree, good teaching performance, excellent research performance (national and international publications), and recognized community services. This professional lecturers' certification has encouraged lecturers to be performing more and going beyond the usual baseline standards in HEIs.

This certification expectedly influences the graduate employment as one of the indicators of this study. Graduates with more certified skills are expectedly more competitive than those without one.

One Ministry

Starting October 2014, higher education is integrated into the new Ministry of Research, Technology, and Higher Education, or MORTHE. The objective of this integration is that higher education would be more involved in research and technology development activities. With this, the role of an HEI has changed from being a mere agent of teaching or research, to that of cultural, knowledge, and technological transfer, as well as of economic development. Indicators of HEIs' performances are expected to be number of skilled workers, number of innovations, number of industries created and being partnered, and the amount of funding each HEI can generate.

The integration process took about a year to complete with both sides learning new terminologies, scopes, and works. The integration has also imposed a new working system, culture, and management. Thus, all units are adjusting to the new coordination.

According to the strategic plan, the integration opens a vast opportunity for HEIs to get engaged with the industries through the provision of quality human resources and innovation through collaborative research, which had previously been a difficult effort. A strong emphasis is now put on innovation, from research up to the commercialization of the innovation. There are eight research priorities of the nation, namely, agriculture and food, energy, new and renewable energy, health and medicine, information and communication, transportation, defense and security, advance material (nanotechnology), and maritime development.

As such, all HEIs are adjusting to the new focus, direction, management and system. The adjustment has to be carried out in parallel to the routine operation of the HEI. The process is taking place at high speed. New policies are being devised, new regulations are getting drafted, and new culture is being instilled, with the expectation that new innovations will rapidly flourish and HEIs can play a significant role as the agents of the nation's economic development.

This integration has influenced the productivity of HEIs, especially at the end of 2014 and 2015. It will also impose evolving influence into the future, as the culture and management of

the HEIs is adjusting to a new paradigm of research and technology. Nevertheless, since different performance indicators are expected for HEIs under the new role, separate measures of education productivity and research productivity are highly necessary. Also, an overall reform of HEI managements is needed to increase the Indonesian higher education productivity.

In this study, the different performance indicators for HEIs are integrated. These include the education indicators of coursework completion, graduate employments, credit hours, and graduate numbers; and the research indicators of publications, citations, patents, and research completions.

ESTABLISHING A PRODUCTIVITY INDICATOR

Research Methods

Since the products of higher education are multiple, the concept of higher education productivity is complex and goes beyond indicating decreased costs or increased outputs. This study employs higher education productivity concepts introduced by the APO, i.e., the calculation of output relative to input. It uses multiple indices and indicators to tap the multiproduct and complex nature of HEI operations and also uses weighted indices of inputs and outputs based on the Törnqvist Chain Index [3].

In this study, higher education productivity is illustrated through three categories. The first is education productivity, which uses output indicators of coursework completion, credit hours, and learning outcomes (GPA); while the input indicators are costs of labor, capital and intermediaries. The second category is research productivity with output indicators being publications, citations, patents and research completions; and the input indicator being the research fund. The third category is academic productivity, which is a combination of the first two categories, with the combined output indicators being all output indicators of both the other categories and the combined input indicators also being all input indicators of the other two categories. Meanwhile, the calculation of HEIs' productivity growth is done by comparing the change in output to input changes in a specified period with the previous period [9]. This refers to the decrease in Tornqvist index. Indicators of HEIs' outputs and inputs are illustrated in Table 13.

Table 13: Dimensions and variables used in productivity analyses

	Education	Research
Output	Coursework completions Graduate employment Credit hours	Publications Citations Patents (+ royalty) Research completions
Input	Labor (academic) (75% from total) Labor (non-academic) (75% from total) Capital Intermediaries/opex	Labor (academic) (25% from total) Labor (non-academic) (25% from total) Capital research fund Intermediaries/opex

For education productivity, the output indicator on graduate employment is measured through the length of waiting period of the graduate to be first employed, from zero to six months. Meanwhile, it is to be noted that the research input indicator of labors (academic as well as non-academic) has been calculated to be 25% of the total labors available in an HEI; while the education input indicator of labor is calculated to be 75%. This is based on the government's regulation on the three principles that an HEI operates with and its implication on the workload that is carried out by the academics as well as non-academics. Of the 40 hours of work per week, 26 hours is for teaching and education (65%); 11 hours is for research (27.5%); and three hours for community services (7.5%). As such, the 25% weight has been applied to the research input indicator, while 75% weight is applied to the education input indicator.

Further, the education and research productivity are measured separately, as an increase in education productivity may or may not reflect an increase in research productivity of HEIs. It is important to note that, the separation of education capital and intermediaries in education inputs from those of research inputs has been practiced in the HEIs' financial (budgeting and expenditure) system, especially for public HEIs. Thus, financial report of each public HEI will show the separate capital and intermediaries for research. The private HEIs are required to allocate at least 5% of their operational budgets for research purposes.

Data for the study was expected to be from secondary sources available in Indonesia, especially the *Pangkalan Data Pendidikan Tinggi* (National HE Database). Nevertheless, it was found that secondary data was not available for all indicators. Even if it was available, it was not comprehensive enough to allow longitudinal analyses and productivity calculations. As such, primary data collection was employed.

The primary data collection involved a sample of 440 HEIs of various types in Indonesia, selected randomly in a proportion as shown in Table 14.

Table 14: HEI population and sample

	Institutional accreditation				
	A	B	C	Accredited HEI	Non-accredited HEI (D)
Population as in January 2016	23	212	568	804	2,398
Sample HEIs	23 (100%)	65 (30%)	112 (20%)		240 (10%)

The data collection was conducted through an online mode, between 11 April and 28 May 2016, extended till 10 June 2016. By 10 June 2016, 158 HEIs had responded, of which, 148 sets of data were found to be acceptable (see Appendix 6). After these 148 data sets were cleaned, only 73 were found to be complete for the period of 2006 to 2014. Thus only 73 data sets from as many HEIs were considered valid for further analysis. The analysis was done using the template from the APO, along with a multifactor analysis.

Some adjustment of variables was made based on the availability of data as follows (See Appendix 7):

- Learning outcomes as input variable was not included since the data was not valid.
- Research fund was considered to be an input, and not an output variable.

Education Productivity

The education productivity is calculated based on the output variables of work completion, graduate employments, and credit hours; and the input variables of labor cost, capital, and intermediaries. Capital and intermediaries are measured based on real value, starting from 2008. Other variables are also calculated based on 2008–14 data from the 73 sample HEIs. The underlying assumption for the calculation is that the weights for all output variables are the same, i.e., 0.33, while the input variables are using real values.

The result in Figure 32 indicates that there was a sharp increase of education productivity during the observed period. The blue line in Figure 32 indicates the education productivity, while the orange line indicates the education productivity growth, which is nothing but the difference between each year's education productivity. In case of education productivity growth, the graph indicates that the highest productivity growth of 0.38 has been in 2012, as compared to other years from 2010 up to 2014. The peak in 2012 was partly due to a 26% increase in graduates from HEIs, and the provision of new scheme of operational funds through block grant (BOPTN) from MOE/MORTHE, especially for public HEIs, which has been part of the bureaucratic reform in higher education in Indonesia. In general, the trend indicates a flat growth.

Table 15: Education productivity and growth

	2009	2010	2011	2012	2013	2014	Average
Education productivity (blue)	1.20	0.77	0.83	1.22	1.06	0.92	1.00
Productivity growth (orange)		-0.43	0.07	0.38	-0.16	-0.14	-0.06

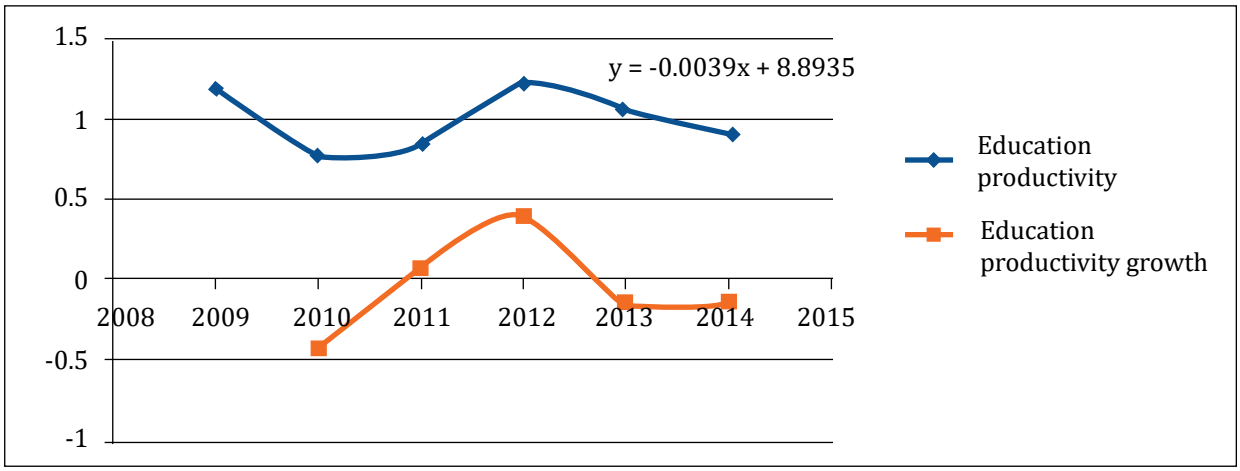


Figure 32: Education productivity and growth

Research Productivity

The research productivity is calculated based on output variables of publications, citations, patents and research completions; and input variables of research funds of each HEI. The output variables are given the same weight of 0.25 each, while the research funds use real values, starting 2008.

The result in Figure 33 indicates that research productivity fluctuated sharply during the observed period of 2008–14. A sharp increase in 2010 was due to a 250% increase of research funds granted by the government in 2009, especially to all public HEIs. In the following year of 2010, the research funds were back to the normal range. Figure 33 also illustrated that a sharp increase in research funds had no effect on the research output, which remained relatively the same.

The trend of research productivity index also indicates that in the long run, unless a major change takes place in the research activity, research productivity will be slowly and incrementally decreasing.

Table 16: Research productivity and growth

	2009	2010	2011	2012	2013	2014	Average
Research productivity (blue)	0.48	2.27	0.97	1.00	1.04	0.90	1.11
Productivity growth (orange)		1.80	-1.30	0.02	0.04	-0.14	0.08

The sharp increase in research productivity in 2010 was due to the new research scheme provided by the MOEC to the HEIs. Named as National Strategic Research Scheme, it provided 100 million rupiahs (around US$10,000) per research package per year for faculty members to do research. It allowed for a multiyear research up to three years. The research block grant was provided to the public HEIs, and was included in their budgets. Each HEI had the flexibility of distributing the grant based on competition among lecturers. The new scheme was intended to increase research activities among the lecturers, to develop and improve the academic atmosphere, and at the end of it, increase the research productivity of HEIs. Apparently, it was materialized in the first year of the scheme but not in the following years since the research projects, being multiyear projects, were not completed yet.

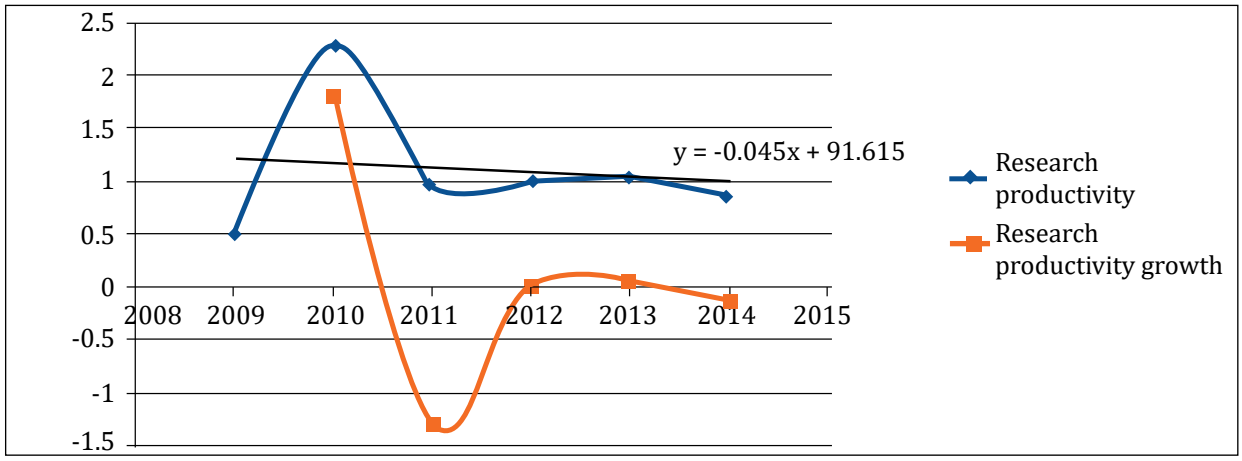


Figure 33: Research productivity and growth

A small decrease in the later years (2013 and 2014) was due to the regulation from the Ministry of Finance, which said the researchers in public HEIs were not to receive research honorariums when involved in research projects. Thus, the long effort of researching was not rewarded financially. It was still rewarded through academic credit points, and especially through publications and patents, if any. Research was then no longer an attractive activity for many lecturers.

Academic Productivity

Academic productivity is the combination of education productivity and research productivity calculated using the Tornqvist Chain Index [3].

Table 17: Academic productivity and growth

	2009	2010	2011	2012	2013	2014	Average
Academic productivity (blue)	1.092	1.057	0.871	1.129	1.251	0.939	1.057
Academic productivity growth (orange)		-0.035	-0.186	0.257	0.123	-0.312	-0.031

The trend in Figure 34 indicates that academic productivity was relatively steady and flat over the observed period. Thus, there is relatively no growth in the academic productivity despite the dynamics of education productivity and research productivity.

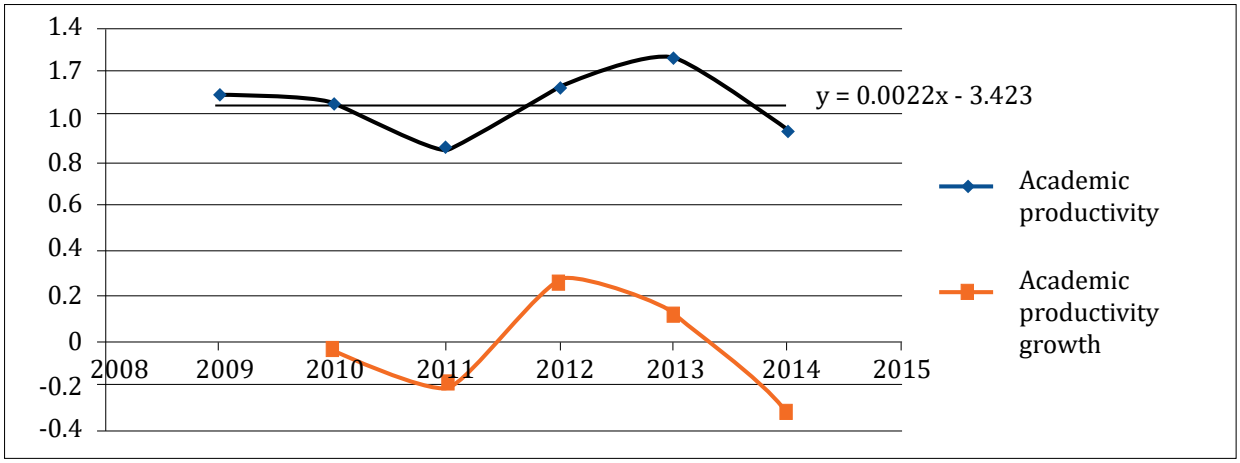


Figure 34: Academic productivity and growth

Meanwhile, the composite of the three productivities in Figure 35 indicates that the trend of overall HEI productivity is approaching 1 (one), which means that one input will produce one output. Thus, the general trend is that an increase in input will increase the output.

Table 18: Composite productivity

	2009	2010	2011	2012	2013	2014	2015
Education productivity	1.20	0.77	0.83	1.22	1.06	0.92	0.70
Research productivity	0.48	2.27	0.97	1.00	1.04	0.90	0.76
Academic productivity	1.09	1.06	0.87	1.13	1.25	0.94	0.84

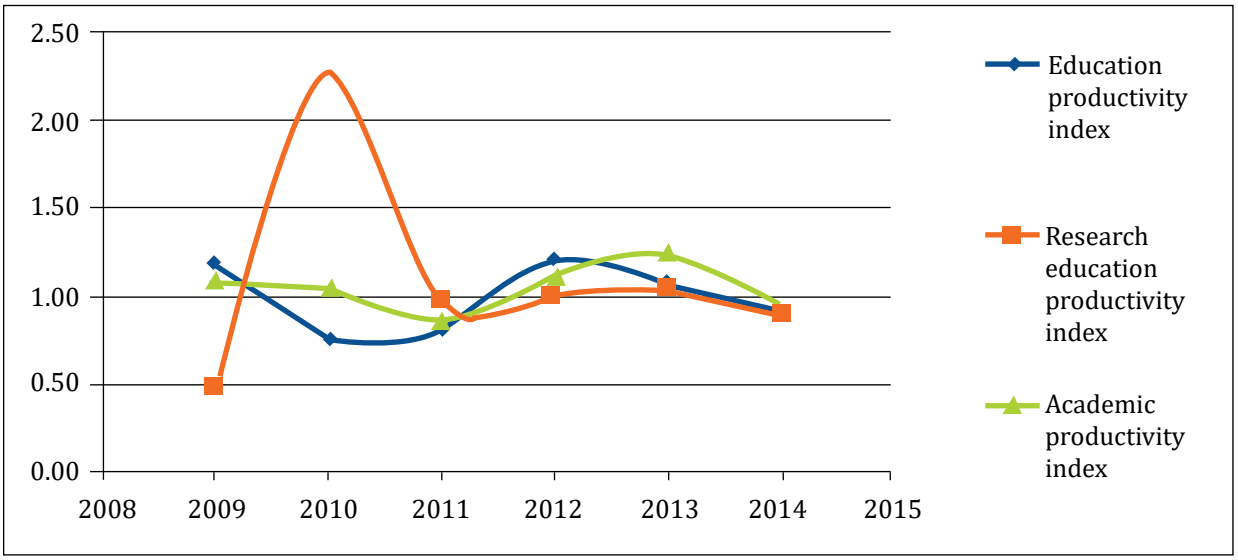


Figure 35: Composite productivity

The overall picture of productivity of Indonesian HEIs is relatively stable over the observed period. Nevertheless, due to data constraint, the analysis is relatively limited. It has proven the basic idea that an increase in output is relative to input, but it has not been able to prove that HEIs in Indonesia can do better and faster with less resources. As such, reform of HEIs' management is needed to increase Indonesian HEIs productivity, for education, research as well as overall academic productivity.

A Case of Three Universities

Looking deeper at some individual HEIs as compared to the national view of the higher education productivity, three universities were selected as samples, coded as University ABC, University PQR, and University XYZ. The selection is based on the most comprehensive data available for those universities, starting 2010 onward. The indicators being counted toward productivity measures for the three universities are as shown in Table 19.

Table 19: Indicators used in institutional analyses of the three sample universities

	University ABC	University PQR	University XYZ
Input education	• Labor • Capital • Intermediaries	• Labor • Capital • Intermediaries	• Labor • Capital • Intermediaries
Input research	• Research fund	• Research fund	• Research fund
Output education	• Coursework completions • Credit hours • Learning outcomes	• Coursework completions • Credit hours • Learning outcomes	• Coursework completions • Credit hours • Learning outcomes

(continued on next page)

(continued from previous page)

	University ABC	University PQR	University XYZ
Output research	• Publications • Citations • Patents • Research completions	• Publications • Citations • Patents • Research completions	• Publications • Citations • Research completions

All three universities are private universities. University ABC is a private Islamic affiliated university, established in 1947, offering both Islamic subjects and general subjects. It has 46 study programs for bachelor's, master's, doctoral, diploma, as well as professional degree, with about 671 lecturers and 24,203 students. It has received 'excellent' institutional accreditation from the National Accreditation Agency.

University PQR is a non-affiliated private university offering general subjects, and was established in 1966. It has 21 study programs for bachelor's, master's, and professional degrees, with 320 lecturers and 9,500 students. It has also received 'excellent' institutional accreditation from the National Accreditation Agency.

University XYZ is a private Catholic affiliated university offering general subjects, and was established in 1955. It has 31 study programs for bachelor's, master's, doctoral, diploma and professional degrees, with 354 lecturers and 3,500 students. It has received 'very good' institutional accreditation from the National Accreditation Agency.

It is very common for private universities to orient themselves more as teaching universities rather than research universities. Research funds in private universities are usually perceived as highly expensive without a clear return, and therefore are rarely coming from their respective foundations. Although there is a requirement of 5% allocation for research purposes from operational costs, it was mostly measured as in-kind allocation by the foundation. Most lecturers are seeking the government (subsidized) research funds made available through various competitive schemes by the MORTHE and various other ministries or non-government agencies. As such, research in many private universities is mostly exploratory with the highest output being its publication. A patent earned by a private university is already considered an advancement in the university's research activity.

Research output of a university will usually grow if the university has graduate schools, since most scientific research is conducted by graduate students and lecturers. Nevertheless, graduate study has not always been attractive to private universities that depend on earning coming from the number of students, while a graduate school usually takes only a few number of students. Further, the qualifications of graduate schools' lecturers have also been costly to private universities.

Nevertheless, earning a patent can increase the accreditation level. Therefore, University ABC and University PQR, which have been earning patents, have received 'excellent' accreditations for their institutions, while University XYZ only received 'very good' accreditation for its institution since it does not have a patent yet.

The following are illustrations of the three universities' growths in education, research, and overall academic productivity. The education productivity growth of the three universities are relatively comparable and similar, indicating a slight decrease over the observed period (Figure 36 and Figure 37). However, the research productivity growth is relatively different for the three universities (Figure 38 and Figure 39).

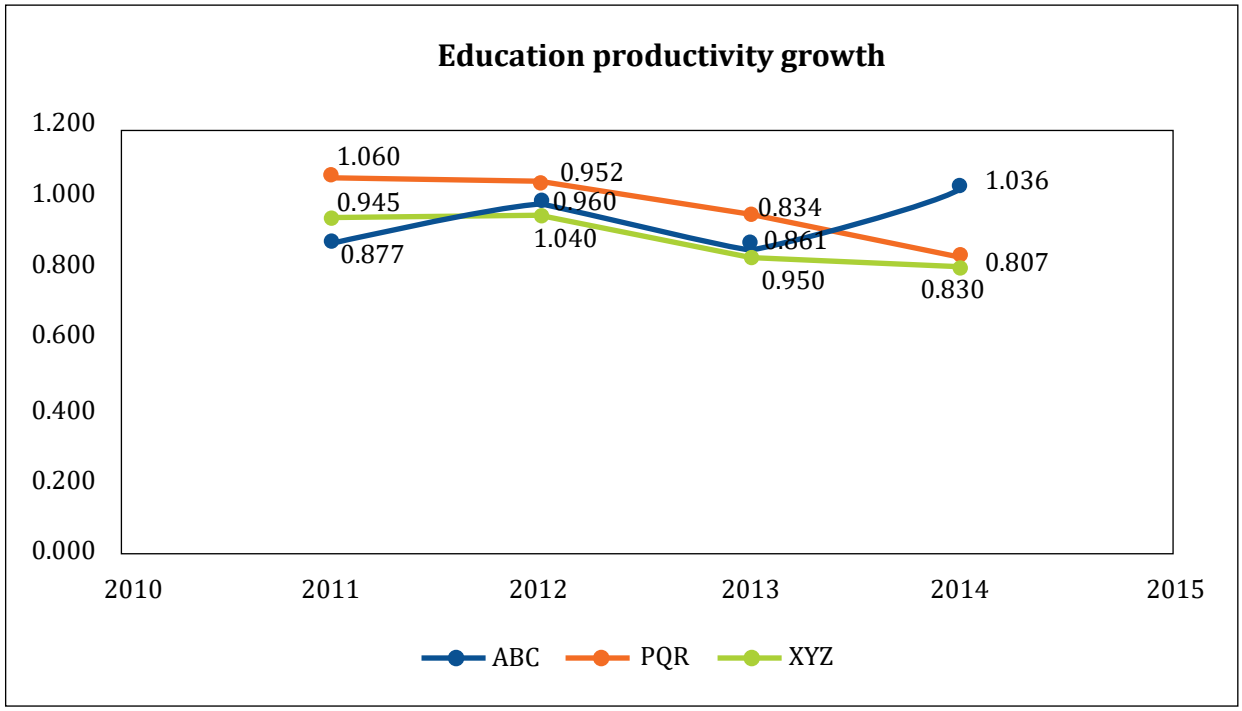


Figure 36: Education productivity growth for the three universities

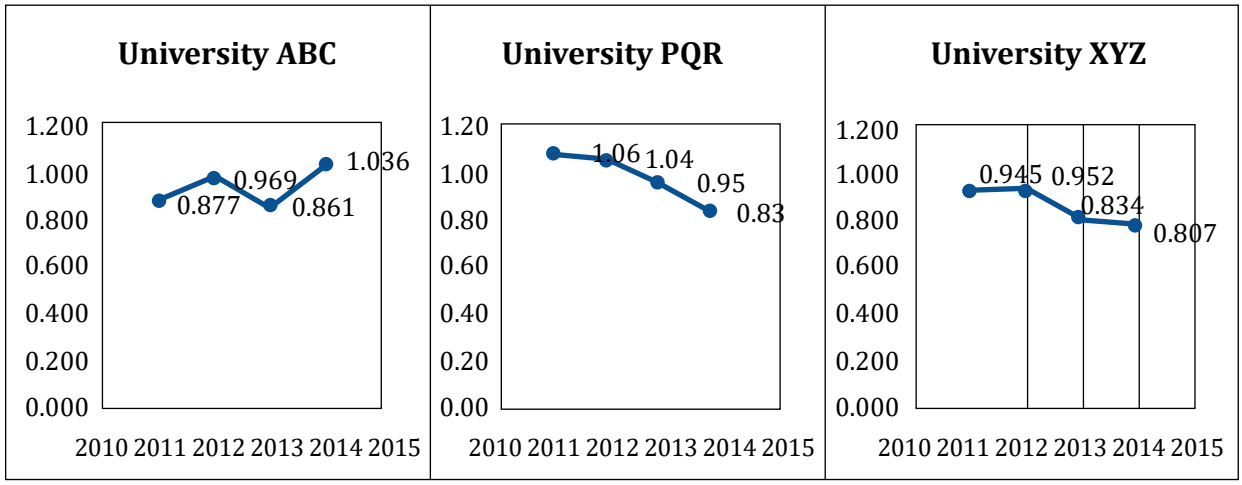


Figure 37: Comparison of education productivity growth for the three universities

In the year of 2014, only University ABC experienced a slight increase in its education productivity, while for the other two universities, it was slightly decreasing. This is perhaps due to the high number of graduates from University ABC, thus reflected in the coursework completions, credit hours, and learning outcomes, if compared to the two other universities with lesser number of students and graduates.

The three graphs in Figure 38 and Figure 39 depict a fluctuating research productivity growth of the three universities. While the research productivity index of University ABC was increasing in 2013, the research productivity index of the two other universities were decreasing in 2013. The overall fluctuating growth indicates unstable condition of research in the private universities mainly due to a lack of support funds and the fact that research activity is not an attractive activity without research allowance. In fact, the number of researches in none of the universities has been high, though the increase in the number has caused a sharp increase as indicated in the graph depicted for University ABC. This is because the increase from one research project to two research projects amounted to an increase of 200%.

There was also an internal policy to improve the data and archival system of research outputs in each HEI by 2012 by establishing the individual HEI research database. This is due to a requirement from Directorate General of Higher Education, MOEC, that to obtain research grants from DGHE, the HEIs need to have their own research databases.

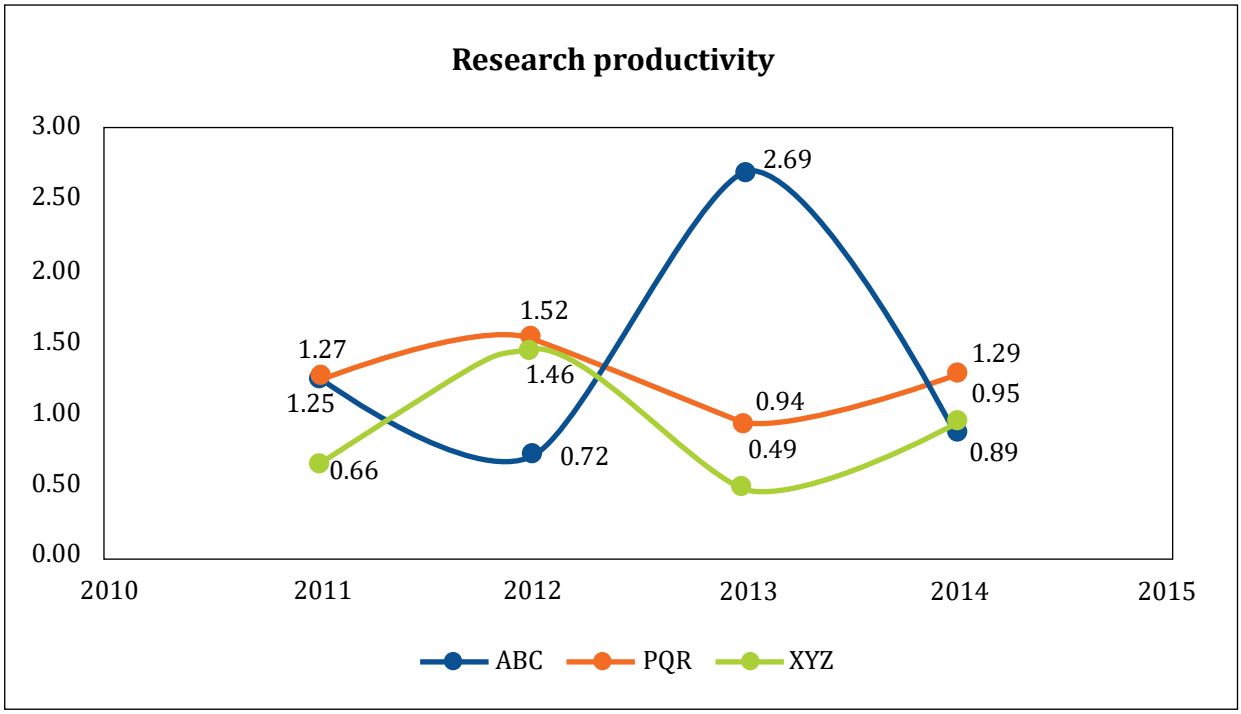


Figure 38: Research productivity growth for three universities

The overall academic productivity growth for the three universities is shown in Figure 40 and Figure 41. The graph indicated that the overall academic productivity growth has been influenced by the research productivity index for the three universities. The following indicated a comparison of the overall academic productivity growth of the three universities.

Relatively, the trends indicate that University PQR and University XYZ are experiencing a decreasing productivity growth, while University ABC is experiencing a slight increase. These trends are relatively different than the national growth which shows a somewhat stable increase over the observed period.

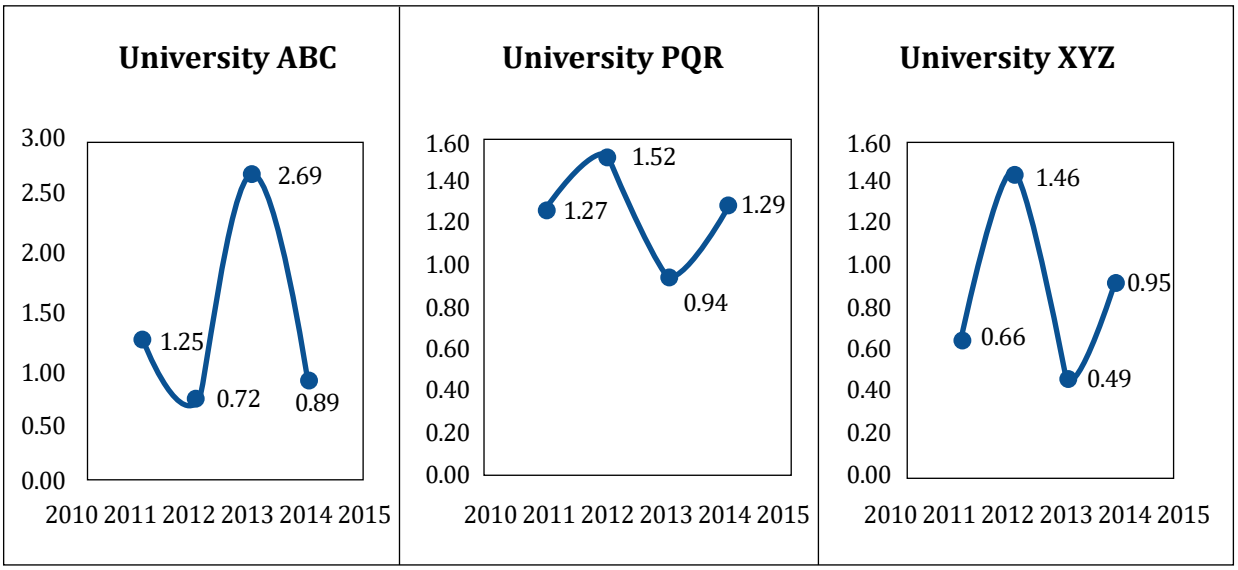


Figure 39: Comparison of research productivity growth for three universities

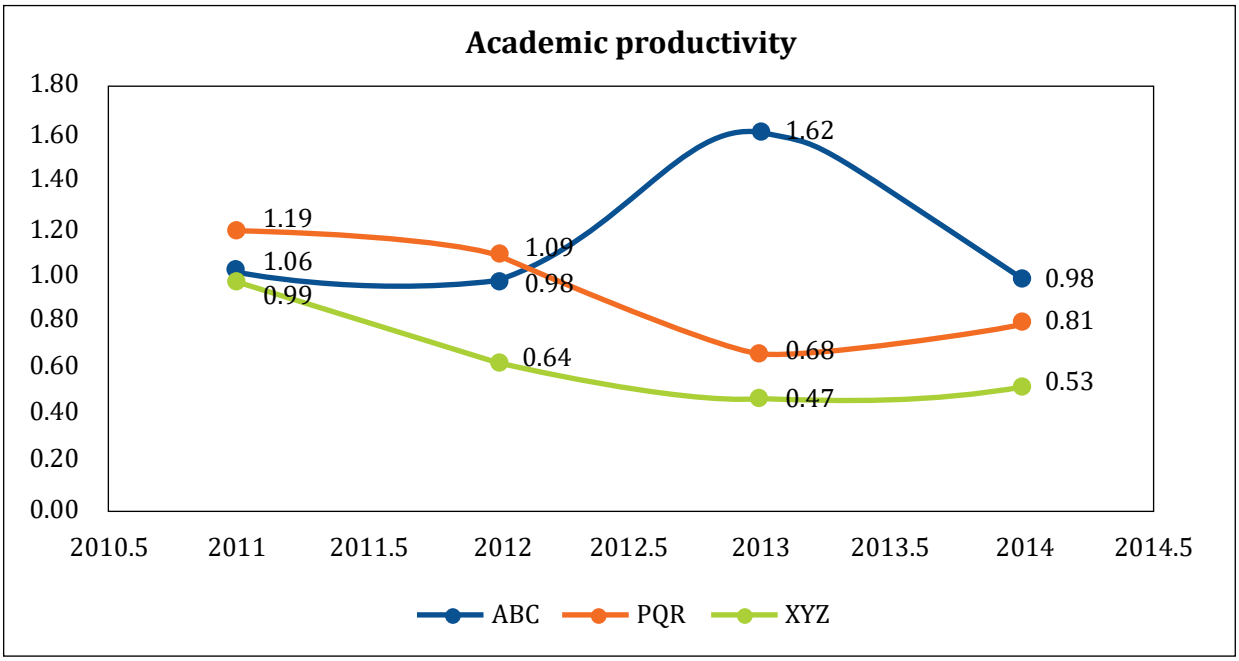


Figure 40: Academic productivity growth for three universities

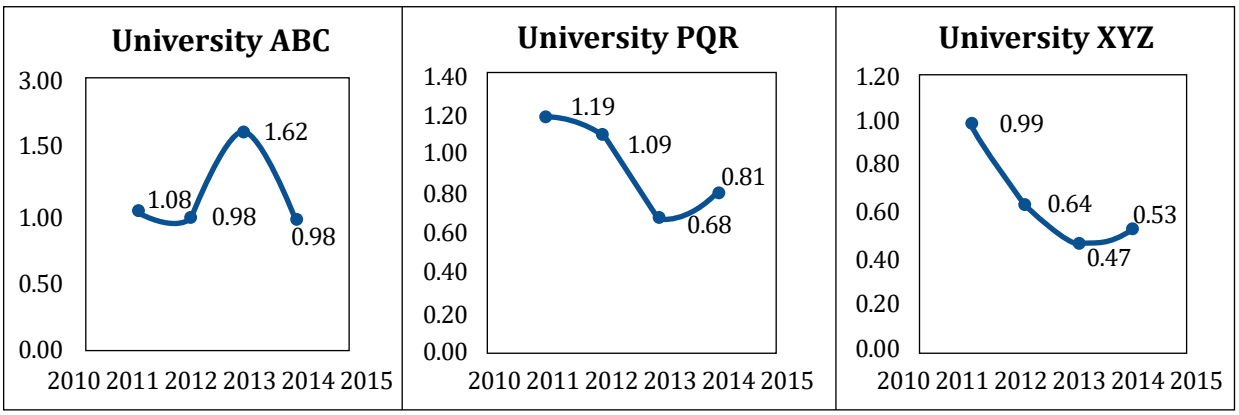


Figure 41: Comparison of academic productivity growth for three universities

It is worth noting that the overall exercise to search for productivity factors to measure HEIs in Indonesia has been useful. The models employed, namely the APO model that is based on multifactor productivity for higher education and the Tornqvist Chain Index, have successfully measured and depicted the productivity growth of HEIs in Indonesia, nationally as well as individually. However, it is noted that the research productivity is highly sensitive to the movement and indicator of research output, especially at the individual HEI level, and for relatively medium to small HEIs. In large HEIs with large number of students, the academic productivity measure has been somewhat influenced by the education productivity and not so much by the research productivity.

THE NEXT FIVE YEARS

HEIs' Autonomy

With the spirit of deregulation and providing HEIs more room to innovate in creative ways on matters such as financial management and academic management, Government of Indonesia has provided some public universities with autonomy. Given the autonomy, a public university become a legal entity of its own, and financial support by the government is provided based on a performance contract which is renewed annually. The university can also receive funding from other funding agencies, based on research and services contracts or product dissemination. As such, research funds being measured in this study can be an output indicator (the earning of the HEIs from research activity) instead of input indicator (research expenditure).

The autonomy is given based on the institutional performance of the university, which includes an institutional accreditation of excellence; international accreditation and rank; the status of annual financial accountability report; and evidence of institutional earnings from sources other than the government. (Institutional accreditation of excellence requires 75% of the study programs of the university to be accredited as excellent.)

The autonomy provides the university with self-managing capacity in terms of financial and academic management, but it is still required to base its activities on the government's regulations and laws, and to report to MORTHE for end-of-year performance based on the contract. As such, each HEI can manage its input as well as output indicators to become productive.

There are 11 public universities that have received the autonomy so far. These are: Universitas Indonesia, Institut Teknologi Bandung, Institut Pertanian Bogor, Universitas Gajah Mada, Universitas Padjadjaran, Universitas Airlangga, Universitas Pendidikan Indonesia, Universitas Sumatera Utara, Institut Teknologi Sepuluh November, Universitas Hasanuddin, and Universitas Diponegoro. Two of them have been able to attain ranks between 300 and 450 in the QS World University Ranking 2016.

University autonomy has been seen as the highest status for a public university in Indonesia, as the university receives a higher degree of freedom in managing its institution. The second level of status is 'public service institution' that receives autonomy in financial management, and then the third level is 'operational unit' that operates fully under the MORTHE. In future,

the number of autonomous HEIs is expected to increase, and finally a majority of public universities will be autonomous. The given autonomy has impacted the business processes as well as the productivity measures, as the HEIs are allowed to receive and earn funding for their education as well as research activities. This has not been depicted in this study since only two newly autonomous universities participated in this study.

With autonomy, HEIs are able to decide on mission differentiation, which would affect the number of undergraduate students and the number of research undertakings. In this situation, each indicator must be weighted accordingly (Tornqvist Chain Index), so that the weighted indicators will show the primary focus of the HEI's mission, and accordingly the teaching and learning processes, facilities, and other variables. Nevertheless, in this study, with only two autonomous HEIs participating, a focused analysis of weighted indicators to indicate a relative mission differentiation cannot be done.

Within the university autonomy scheme, the public universities that have not received the status of autonomous are working hard to improve their management and operations with the expectation that they will be able to achieve such status in future. Some polytechnics have also indicated interest in receiving autonomy, especially the ones that have had teaching industries within. Meanwhile, the autonomous public universities are working their ways to achieve higher international ranks. As such, this university autonomy scheme has impacted the management and operations of HEIs, and will, in future, affect the productivity of HEIs in Indonesia.

Industrial Policy

The Government of Indonesia has emphasized on incrementally increasing the connection between HEIs and the industry through research down-streaming, innovations, and provision of skilled workers.

The government has opened up opportunities for foreign industries to come to Indonesia, and also to develop the domestic industry. For this to take place, HEIs are expected to intensify the process to produce skilled workers and innovations.

As for skilled workers, graduates from HEIs have to be able to fill in the available job market. For this reason, they are expected to come with value-adds in the form of certified skills and good characters (soft skills), in addition to the diploma they are receiving on the completion of their study programs. At present, only 11.34% of Indonesian skilled workers are higher education graduates, while more than 70% are elementary-to-high-school graduates. Meanwhile, there is a staggering 5.8% unemployment rate, which includes graduates from higher education. With the new policy of linking HEIs with industry through innovation and technology transfer, it is expected that the quality of HEI graduates will be improved. As graduate numbers and graduate employments, two of the key output indicators of education, increase, education productivity will also likely increase.

Innovation comes from research that does not stop at a mere report, document, or publication, but is pilot-tested and assessed for further development and shows a potential

for commercialization. However, publication and patent numbers are good indicators for research productivity, as depicted in this study.

Publication and patents are outputs of research grants and rewards provided for researchers by HEIs, governments, and research centers. In addition, the down-streaming process also involves making available labs for alpha and beta testing of prototypes, that come under the umbrella of teaching industries. These teaching industries can have different names, such as teaching factory, fab center, technology transfer office, and business incubation center. The teaching industries are established and encouraged to bridge the researchers in HEIs with the industry. Each HEI can established various teaching industries based on its research strength. In addition, there are also national innovation centers in various areas being established as shared facilities. Regulations and deregulations are devised to ease research and development, and innovation activities. Rewards are also devised for industries collaborating with the HEIs. It is expected that such efforts will result in closer relationships between HEIs and the industry. As such, this will increase the research productivity of HEIs and its outcomes, namely, publications, patents, and innovations. The first two indicators are tested in this study as research outputs, while the latter needs more data to be tested.

With the new open policy on industry involving massive infrastructure development, skilled workers are needed in those industries. The HEIs are expected to be able to fill in the needs and to help boost the industrial development in the country. As such, the MORTHE has devised a policy to focus on development of vocational education, especially comprising polytechnics, community colleges, and institutes of technology. The new study programs to be opened are also encouraged to focus on engineering and vocational areas. Meanwhile, general-education HEIs are not expected to increase for the time being.

At this stage, it is expected that the existing and new vocational HEIs will continue with their efforts to improve the quality as well as quantity of their graduates, especially those demanded by the industry. It is also expected that more innovation will come from HEIs based on a strengthened relationship with the industry.

In addition to the indicator of graduate employment, this development in industrial policy will also be affecting the research productivity of HEIs. In particular, when partnership and collaboration between HEIs and the industry are forged, the research productivity will also expectedly increase.

IT and New Technology

The advancement of information and communication and technology (ICT) has given advantage to the HEIs in Indonesia. In addition to automation of the academic information and administrative system, it has also driven the advancement of ICT-based distance education or e-learning in Indonesia. ICT has promoted new ways for HEIs to answer to the industry's demand for skilled workers in Indonesia. New strategies are employed by HEIs, including provisioning of online learning and distance education and off-campus programs,

to offer study opportunities to a larger number of students to meet the industry's demand, and also to be involved in the development of massive open online courses (MOOCs).

Recognizing its potential, the MORTHE has also embarked on a series of initiatives to promote and to integrate the use of ICT in education, including ICT-based distance education. Some HEIs are permitted to develop ICT-based distance education as part of their academic programs, in addition to Universitas Terbuka.

ICT-based distance education has been perceived to be a strategic tool to bridge the disparity of quality education across geographical areas in Indonesia; to open access and ensure equity; and to support the growth of knowledge-based Indonesian society with competitiveness toward globalization. Therefore, ICT-based distance education has been one of the priority programs of the government. Toward this end, a special legal instrument, the Ministerial Decree No. 109/2013 on Implementation of Distance Education in Higher Education Institutions, was devised. The MOEC/MORTHE then supported the procurement of ICT infrastructure for many public universities, as well as the development efforts for various online courses, encouraging the use of the courses across HEIs through lecturers' partnership and course sharing. That marked the start of ICT-based distance education at various HEIs in Indonesia. The Indonesian Higher Education and Research Network in early 2000s; Hybrid Learning for Indonesian Teachers project in 2007–12; and the Indonesian MOOC initiated in 2014 are some examples of the initiatives being supported by such advancement (Pannen, et al., 2007, 2010, 2015).

The introduction of ICT-based distance education in the form of online learning, distance education, blended learning, and off-campus programs into the conventional HEIs was not merely an additional study program or a change in the delivery system. These programs usually demand dedicated resources, energy, management, and business processes that are totally different from the face-to-face conventional programs. ICT-based distance education is an education program by itself which needs to be supported by all other components of its system. High capital investment, economy of scales, network and crowd sourcing, and students' autonomy are new popular terms in the context of ICT-based distance education initiated by various HEIs. This certainly has wide impact on HEIs' productivity, as it enables them to increase the number of students, make their operations more efficient, and increase the number of graduates.

CONCLUSION

The trends of higher education productivity growth in Indonesia is relatively stable, nearing an index of one. This indicates that Indonesian HEIs are relatively effective in producing the intended outcomes, based on the provided inputs. Nevertheless, the system has not been efficient yet, as it has not been able to do more with the provided inputs.

The higher education productivity contributes significantly to the Indonesian development target under the tertiary education and innovation indicators. With the given development target, and in a period when resources are decreasing, an increase in efficiency and overall productivity growth is expected. This requires HEIs to improve their overall performance in terms of teaching, research, community services, skilled graduates, innovations,

and industrial competitiveness, as reflected in their accreditation status, national and international ranks, and productivity indices. A major reform of Indonesian HEIs, academically as well as operationally, will be needed to increase the productivity growth. In case of business-as-usual, the Indonesian HEIs will face tremendous challenge to compete regionally as well as globally.

Due to data constraints, the analysis in this study has been limited, and therefore is to be read carefully within its context. Nevertheless, it shows that productivity measures can be carried out to evaluate performances of HEIs, and that the productivity index can be used to assess the productivity growth of HEIs in Indonesia. The information resulting from the measure can be highly important in making decisions to facilitate the development of higher education, nationally as well as individually.

Currently, the model being employed is the APO model based on the multifactor productivity index. The APO model is somewhat oversensitive to the movement of research output. This is perhaps because it is developed based on the assumption of a research university, while in Indonesia, research is one of the three pillars of higher education, and which, at this stage, is just beginning to evolve. As such, other models need to be explored to best fit the measurement of higher education productivity growth in Indonesia.

The most important intrinsic requirement for measuring productivity is availability of data, which is a luxury in Indonesia. In the near future, it would be logical to include higher education total factor productivity measuring practice into the national HEIs dashboard. This would promote public access into each HEI's productivity profile as part of their self-assessment. As such, productivity analysis can be performed regularly and continuously, and its results would be beneficial for executive decisions for the development and support from the government to HEIs in various forms.

Further analysis is also needed for individual HEIs as well as clusters of HEIs based on their kinds, accreditation results, and other criteria. The individual productivity profiles of HEIs would enable them to make continuous improvements in their performances and growth. Further, to obtain validity and reliability, measurement of productivity growth needs to be repeated over a span of time as a longitudinal study.

In parallel with the Government of Indonesia's priority program to encourage ICT-based distance education by supporting procurement of ICT infrastructure for many public universities; the development efforts for various online courses; and the use of the courses across higher education institutions through lecturers' partnership and course sharing, it is also important to start development of specific educational productivity measurement for ICT-based distance education.

It is expected that the regulations devised to ease research and innovation activities, in addition to the rewards system for industries collaborating with HEIs, will result in healthier relationship between HEIs and industry, and in turn, will increase research productivity. To sustain the program, it is necessary to develop and monitor the effective productivity of the HEI–industry partnerships to provide healthy incentives to both the parties.

REFERENCES

[1] Asian Development Bank. Asian development outlook 2015. Financing Asia's future growth. Mandaluyong City, Philippines: Asian Development Bank; 2015.

[2] Cornell University, INSEAD, WIPO. The Global Innovation Index 2015: Effective Innovation Policies for Development. Fontainebleau, Ithaca, and Geneva; 2015.

[3] Goodridge P. Index numbers. Economic & Labor Market Review 2007; vol. 1, no. 3.

[4] Kementerian Riset, Teknologi dan Pendidikan Tinggi. Peta Jalan Reformasi Birokrasi Kementerian Riset, Teknologi, dan Pendidikan Tinggi 2015–19; 2016.

[5] Mckinsey Global Institute. The Archipelago Economy: Unleashing Indonesia's Potential. www.mckinsey.com/insights/asia-pacific/the_archipelago_economy. Accessed in 2016.

[6] OECD, Asian Development Bank. Education in Indonesia: Rising to the Challenge. Paris: OECD Publishing. http://dx.doi.org/10.1787/9789264230750-en. Accessed in 2016.

[7] Peraturan Menteri Riset, Teknologi dan Pendidikan Tinggi (Ministry Decree) No. 13 Tahun 2015 tentang Rencana Strategis Kementerian Riset, Teknologi dan Pendidikan Tinggi 2015-2019

[8] Schwab K., Sala-i-Martín X. The Global Competitiveness Report 2015–16. Geneva: World Economic Forum; 2015.

[9] Sullivan T.A., et al. Improving the Measurement of Productivity in Higher Education. Washington, D.C.: The National Academies Press; 2012.

[10] World Bank Development Policy Review 2014. Indonesia: Avoiding The Trap. Poverty Reduction and Economic Management Department East Asia and Pacific Region. Jakarta: The World Bank Office Jakarta; 2014.

[11] https://www.focus-economics.com/country-indicator/indonesia/gdp-per-capita-USD. Accesses in 2016.

[12] http://ban-pt.kemdiknas.go.id/hasil-pencarian.php. Accessed in 2016.

[13] www.scimagojr.com. Accessed in 2016.

APPENDICES

Appendix 1: Number of HEIs in Indonesia

(As of May 28, 2016)

	Higher education institution			Lecturers			Study programs				Students	
	Public	Private	Total	Public	Private	Total	Public	Private	Total	Public	Private	Total
HEIs	122	3,112	3,234	70,217	152,569	222,786	6,047	13,259	19,306	1,962,448	4,151,760	6,114,208
HEIs with religious affiliation	76	960	1,036	11,794	9,533	21,327	1,643	2,365	4,008	277,601	131,801	409,402
HEIs under other ministries	175	0	175	9,350	0	9,350	731		731	110,218		110,218
Total	373	4,072	4,445	91,361	162,102	253,463	8,421	15,624	24,045	2,350,267	4,283,561	6,633,828

Appendix 2: Level of Study

The level of study offered in Indonesian HEIs ranges from diploma 1 up to the doctoral program. Diploma 1 is a one-year study with study load of about 40 credits; diploma 2 is a two-year program with study load of about 80 credits; diploma 3 is a three-year program with study load of about 120 credits; and diploma 4 & Sarjana 1 (bachelor's) are four-year programs with study loads of about 144 credits. S2 and Specialist 1 are magister programs of one-to-two years, with about 36 credits of study loads. S3 and Specialist 2 are three-year doctoral programs with study loads of about 42 credits or more.

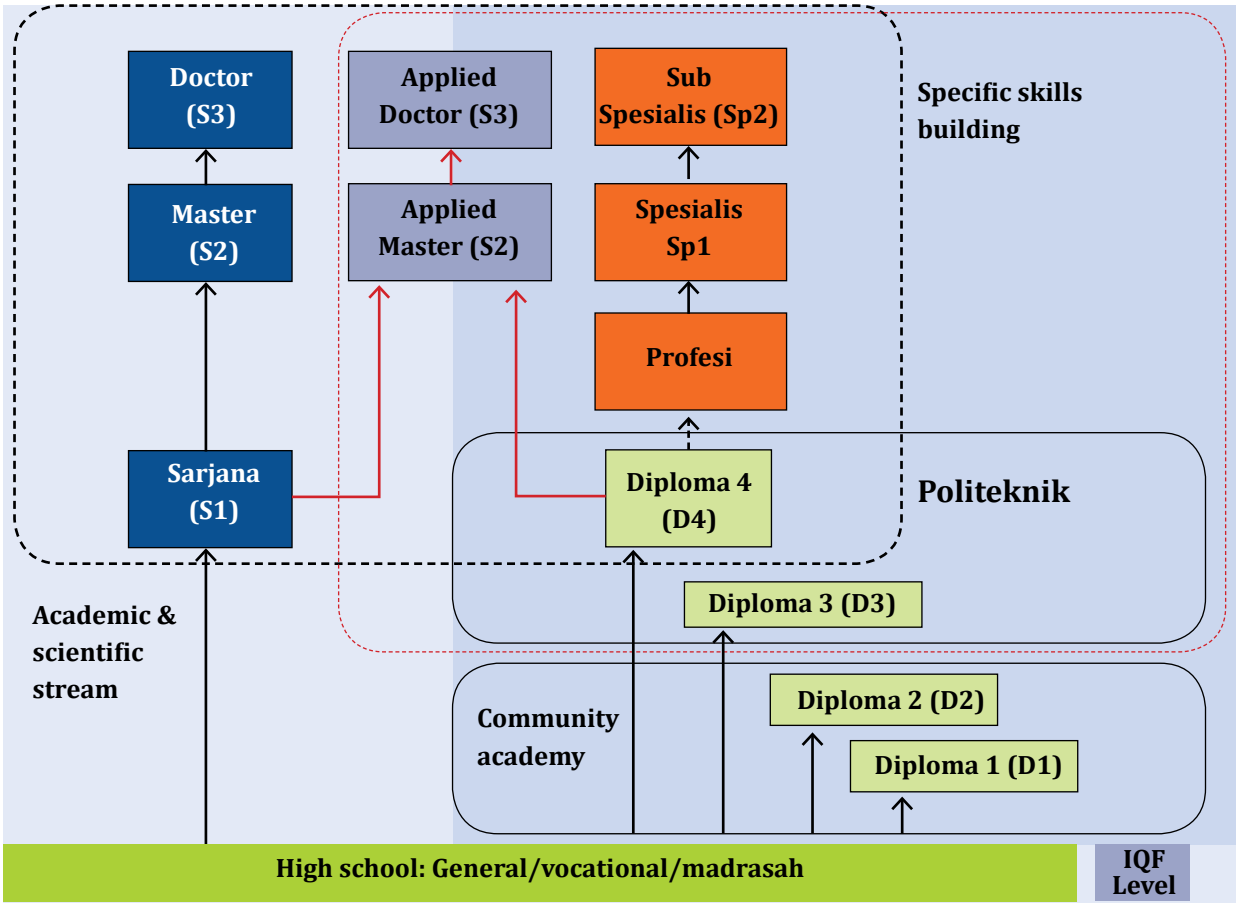
Level of study	No. of study programs
D1	121
D2	160
D3	4,479
D4	638
Profession	486
S1	14,681
S2	2,613
S3	586
Sp-1	267
Sp-2	14
Total	24,045

Appendix 3: Definitions of Various HEIs in Indonesia

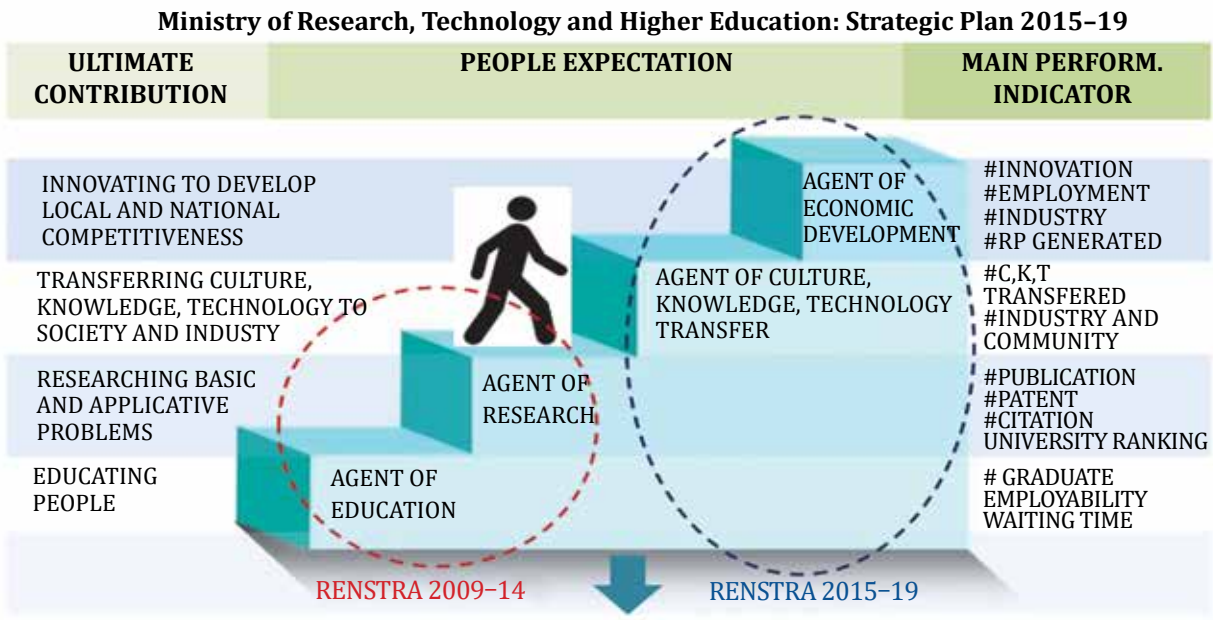
1. University is a tertiary education institution, which provides academic education and may provide vocational education in various clusters of science and/or technology and, if eligible, may provide professional education.

2. Institute is a tertiary education institution, which provides academic education and may provide vocational education in some particular clusters of science and/or technology and, if eligible, may provide professional education.
3. College is a tertiary education institution, which provides academic education and may provide vocational education in one particular cluster of science and/or technology and, if eligible, may provide professional education.
4. Polytechnic is a tertiary education institution, which provides vocational education in various clusters of science and/or technology and, if eligible, may provide professional education.
5. Academy is a tertiary education institution, which provides vocational education in one or several particular branches of science and/or technology. Meanwhile, community academy is a tertiary education institution, which provides vocational education equivalent to a one-year or two-year diploma program in one or several particular branches of science and/or technology based on local advantages or for the purpose of meeting special needs.

Appendix 4: Higher education system in Indonesia



Appendix 5: MORTHE's 2015–19 Strategic Plan



HEIs produce innovation that would increase competitiveness and contribute to the welfare of the nation

Appendix 6: List of sampled HEIs

No.	Sampled HEI
1	Universitas Sebelas Maret (Public)
2	Universitas Andalas (Public)
3	Universitas Negeri Surabaya (Public)
4	Universitas Syiah Kuala (Public)
5	Politeknik Negeri Ambon (Public)
6	Universitas Jember (Public)
7	Universitas Trunojoyo (Public)
8	Universitas Negeri Yogyakarta (Public)
9	Universitas Bangka Belitung (Public)
10	Politeknik Negeri Jember (Public)
11	Universitas Maritim Raja Ali Haji (UMRAH) (Public)
12	Akademi Akuntansi PGRI Jember
13	Akademi Analis Farmasi & Makanan Putera Indonesia
14	Akademi Analis Kesehatan 17 Agustus 1945 Semarang
15	Akademi Farmasi Bina Husada Kendari
16	Akademi Farmasi Sandi Karsa
17	Akademi Farmasi Santo Fransiskus Xaverius
18	Akademi Farmasi Surabaya
19	Akademi Kebidanan Bhakti Putra Bangsa Purworejo
20	Akademi Kebidanan Budi Mulia Palembang

(continued on next page)

(continued from previous page)

No.	Sampled HEI
21	Akademi Kebidanan Bunga Bangsaku Bangka
22	Akademi Kebidanan Griya Husada
23	Akademi Kebidanan Ibrahimy Situbondo
24	Akademi Kebidanan Keris Husada
25	Akademi Kebidanan Prestasi Agung
26	Akademi Kebidanan Tunas Harapan Bangsa
27	Akademi Kebidanan Widya Karsa Jayakarta
28	Akademi Keperawatan Intan Martapura
29	Akademi Keperawatan Panti Rapih Yogyakarta
30	Akademi Keperawatan William Booth Surabaya
31	Akademi Keperawatan YKY Yogyakarta
32	Akademi Kesehatan John Paul II Pekanbaru
33	Akademi Kesehatan Yayasan Sapta Bakti Bengkulu
34	Akademi Manajemen Informatika Dan Komputer Garut
35	Akademi Manajemen Informatika Dan Komputer Mdp
36	Akademi Pariwisata 45 Jayapura
37	Akademi Pariwisata Bunda Mulia
38	Akademi Pariwisata Nasional Jakarta
39	Akademi Pariwisata Pertiwi
40	Akademi Pariwisata Stipary
41	Akademi Refraksi Optisi dan Optometry Gapopin
42	Akademi Statistika Muhammadiyah Semarang
43	Akademi Teknik Radiodiagnostik dan Radioterapi (ATRO)
44	AKTEK Radiodiagnostik & Radioterapi Patriot Bangsa
45	AMIK Ibrahimy
46	Politeknik Aceh
47	Politeknik Karya Husada
48	Politeknik Katolik Saint Paul
49	Politeknik Kesehatan Bhakti Setya Indonesia
50	Politeknik Poliprofesi Medan
51	Politeknik Sekayu
52	Politeknik Ubaya
53	Sekolah Tinggi Bahasa Asing Teknokrat
54	Sekolah Tinggi Desain La Salle
55	Sekolah Tinggi Ilmu Administrasi Pembangunan
56	Sekolah Tinggi Ilmu Ekonomi Ahmad Dahlan Jakarta
57	Sekolah Tinggi Ilmu Ekonomi Balikpapan
58	Sekolah Tinggi Ilmu Ekonomi Dharma Iswara
59	Sekolah Tinggi Ilmu Ekonomi Ichsan

(continued on next page)

(continued from previous page)

No.	Sampled HEI
60	Sekolah Tinggi Ilmu Ekonomi Jaya Negara
61	Sekolah Tinggi Ilmu Ekonomi Malangkucecwara
62	Sekolah Tinggi Ilmu Ekonomi Mars
63	Sekolah Tinggi Ilmu Ekonomi Nu Trate
64	Sekolah Tinggi Ilmu Ekonomi Nusa Megar Kencana
65	Sekolah Tinggi Ilmu Ekonomi Stmy
66	Sekolah Tinggi Ilmu Ekonomi Tri Dharma Nusantara
67	Sekolah Tinggi Ilmu Ekonomi Widya Manggalia
68	Sekolah Tinggi Ilmu Ekonomi Wirawacana
69	Sekolah Tinggi Ilmu Hukum Pertiba Pangkalpinang
70	Sekolah Tinggi Ilmu Kesehatan Mega Rezky
71	Sekolah Tinggi Ilmu Kesehatan Nani Hasanuddin
72	Sekolah Tinggi Ilmu Kesehatan Siti Khadijah
73	Sekolah Tinggi Ilmu Perikanan Malang
74	Sekolah Tinggi Ilmu Pertanian Amuntai
75	Sekolah Tinggi Kesenian Wilwatikta
76	Sekolah Tinggi Manajemen Asuransi Trisakti
77	Sekolah Tinggi Manajemen Informatika Komputer Stella Maris Sumba
78	Sekolah Tinggi Pariwisata Ampta Yogyakarta
79	Sekolah Tinggi Pembangunan Masyarakat Desa APMD
80	Sekolah Tinggi Perikanan Dan Kelautan Palu
81	Sekolah Tinggi Teknologi Bontang
82	STIE Graha Karya Muara Bulian
83	STIE Putera Sampoerna
84	STIK Trinita Manado
85	STIKES Al-Insyirah Pekanbaru
86	STIKES Bhakti Husada Mulia
87	STIKES Borneo Cendekia Medika
88	STIKES Insan Cendekia Medika Jombang
89	STIKES Karya Husada Kediri
90	STIKES Kusuma Husada Surakarta
91	STIKES Maranatha Kupang
92	STIKES Medika Nurul Islam
93	STIKES Muhammadiyah Palembang
94	STIKES Yarsi Mataram
95	STIMI Banjarmasin
96	STISIP Kartika Bangsa
97	STISIP Veteran Palopo
98	STKIP Bima

(continued on next page)

(continued from previous page)

No.	Sampled HEI
99	STKIP PGRI Pacitan
100	STKIP PGRI Sumatera Barat
101	STKIP PGRI Sumenep
102	STKIP PGRI Tulungagung
103	STKIP Tapanuli Selatan
104	STKIP YPUP Makassar
105	STMIK AKBA
106	STMIK Balikpapan
107	STMIK DCI
108	STMIK Indonesia Banjarmasin
109	STMIK ITMI Medan
110	STMIK Jakarta Sti&k
111	STMIK Pelita Nusantara Medan
112	STMIK Widuri
113	STMIK Widya Cipta Dharma Samarinda
114	Universitas 17 Agustus 1945 Surabaya
115	Universitas Al Asyariah Mandar
116	Universitas Andi Djemma Palopo
117	Universitas Antakusuma
118	Universitas Bunda Mulia
119	Universitas Dhyana Pura
120	Universitas Gunadarma
121	Universitas Ichsan Gorontalo
122	Universitas Islam Indonesia
123	Universitas Islam Jember
124	Universitas Islam Madura
125	Universitas Katolik Parahyangan
126	Universitas Merdeka Madiun
127	Universitas Muhammadiyah Malang
128	Universitas Muhammadiyah Pontianak
129	Universitas Muhammadiyah Purworejo
130	Universitas Muhammadiyah Sumatera Utara
131	Universitas Muhammadiyah Surabaya
132	Universitas Ottow Geissler Jayapura
133	Universitas Pakuan
134	Universitas Pancasakti
135	Universitas Paramadina
136	Universitas Pelita Harapan
137	Universitas Pelita Harapan Surabaya

(continued on next page)

(continued from previous page)

No.	Sampled HEI
138	Universitas PGRI Ronggolawe
139	Universitas Presiden
140	Universitas Ratu Samban
141	Universitas Sari Mutiara Indonesia Medan
142	Universitas Sarjanawiyata Tamansiswa
143	Universitas Satyagama
144	Universitas Stikubank
145	Universitas Surabaya
146	Universitas Telkom
147	Universitas Wanita Internasional
148	Universitas Wijaya Kusuma Purwokerto

Appendix 7: Indicators of HEIs' Productivity in Indonesia

Outcome: Education		Outcome: Research	
Coursework completions:	Number of graduates	Publications:	Number of international publications (Scopus and scimagojr); collaborative international publications
	Number of enrollments and student bodies	Citations:	International citation (Scopus & scimagojr)
	Graduate quality – GPA	Patents (+ royalty):	Number of patents per HEI per year
	Time of study	Research completions:	Number of research (research results),
Graduate employment:	% of graduates with employment under six months (waiting time)	Research funds:	Number of research down-streamed into commercialized amount of funds from other sources
Credit hours	Average credit hours earned by graduates; credit hours taken by students per semester and per year (HEI offerings)		

(continued on next page)

(continued from previous page)

Outcome: Education		**Outcome: Research**	
Learning outcomes	Competency exams: Teachers Nurses Midwife Medical doctor (GP)		
Input education		Input research	
Labor (academic) (75% from total)	Number of academic staff	Labor (academic) (25% from total)	Number of academic staff
Labor (non-academic) (75% from total)	Number of non-academic staff	Labor (non-academic) (25% from total)	Number of non-academic staff
Capital	Capital (budget + asset)	Capital: Research fund	Capital (asset) Budget – amount of funds from GOI (MORTHE)
Intermediaries / opex	Recurrent cost/ operational/lab	Intermediaries/ opex	Recurrent cost/ operational/lab

CHAPTER 6
MALAYSIA

Izhar Che Mee[1], Malaysian Productivity Corporation, Malaysia

EXECUTIVE SUMMARY

A research on the productivity measurement of 20 public universities in Malaysia was conducted. The research was part of the Government of Malaysia's first major initiative to measure the productivity of the public sector, in which three sectors namely education, health, and security were chosen. A performance indicators framework for a public university was developed. The framework encapsulates outputs and outcome indicators in measuring efficiency and effectiveness of the three programs, i.e. generation of knowledge (research and development)' knowledge dissemination (teaching and learning); and facilitation of knowledge (commercialization and consultancy).

Productivity indices and growth for each of the 20 universities were computed using the Laspeyres Index for the period from 2010 to 2014. The primary output of student full-time equivalent (FTE) was used. The inputs were academic staff, goods and services, and capital services. The aggregated productivity growth was calculated and is presented in this paper.

INTRODUCTION

The Government of Malaysia initiated a pioneering initiative to measure the productivity of the public sector in early 2014. The initiative was the first of its kind in Malaysia. Malaysia Productivity Corporation and Public Service Department were entrusted to carry out the exercise and report the findings to the senior members of the Government.

Three sectors were identified, namely education, health, and security. The main reason for the selection was that the sectors consumed about 70% of the annual government expenditure. For the education sector, pre-schooling, primary, secondary, and higher education sub-sectors were measured. The pre-schooling, primary and secondary education sub-sectors include more than ten thousand public schools in Malaysia. Meanwhile, the higher education sub-sector covers all 20 public universities that offer undergraduate and postgraduates programs.

The primary objective of the research is to measure the productivity of higher education for Malaysian public universities. The public universities were chosen due to the availability of data for the computation of productivity. Data for a period of five years, from 2010 to 2014, was gathered with the facilitation of the Malaysian Higher Education Ministry (MoHE). The private universities' productivity was not measured due to the unavailability of financial data, which is a key input to the research. This initiative is part of Government of Malaysia's initiative to measure performance and productivity of the public sector.

[1]The research was a pioneering exercise for measuring productivity of 20 public universities in Malaysia. The study was made possible due to contributions from many people from various departments under the Ministry of Higher Education, Government of Malaysia. Malaysia Productivity Corporation, which is a National Productivity Organisation of Malaysia, together with the Public Service Department, was instrumental in spearheading the research.

BACKGROUND

System Overview

Higher education is important to Malaysia. The Malaysian Government spends 7.7% of its expenditure on higher education. Higher learning institutions (HLIs) in Malaysia comprise public universities, polytechnics, community colleges, private universities, private university colleges, and private colleges. Statistically, in 2014, the number of HLIs was as shown in Table 20.

Table 20: Malaysian HLIs in 2014

Item	Type of HLIs	Number of HLIs
1	Public universities	20
2	Private universities	70
3	Private university colleges	34
4	Higher institutions centers of excellence	14
5	Polytechnics	33
6	Private colleges	410
7	Community colleges	91

In term of access, Malaysia's higher education enrollment was 48% or 1.2 million students by 2014. This enrollment was an increase of 70%, compared to the enrollment in 2004. The 20 public universities housed 545,000 students, while the private HLIs accommodated 455,000 students. International students enrollment was about 108,000 students.

Between 1990 and 2010, there was a six-fold increase in undergraduates and a ten-fold increase in postgraduates. Malaysia is planning to increase the enrollment to 70% by 2025, which would be about 2.5 million students. It is forecast that the private HLIs will accommodate more students than the public universities, that is 867,000 students compared to 764,000 students, respectively.

Between 2007 and 2012, the number of research articles published by Malaysian universities increased more than three-fold. The number of citations increased four-fold between 2005 and 2012. Also, the number of patents filed by Malaysian universities grew 11% per year between 2007 and 2011. The five Malaysian research universities generated RM1.25 billion in revenue from providing solutions to industries, agencies, and NGOs.

In 2014, the graduate employability stood at 75%. The government has set a target for graduate employability to be more than 80% by 2025.

In term of efficiency, the government spending per student is RM20,700 per student in public HLIs. It is targeted to maintain the spending per student, excluding the increase resulting from inflation.

The overall framework of Malaysia's education is as shown Figure 42.

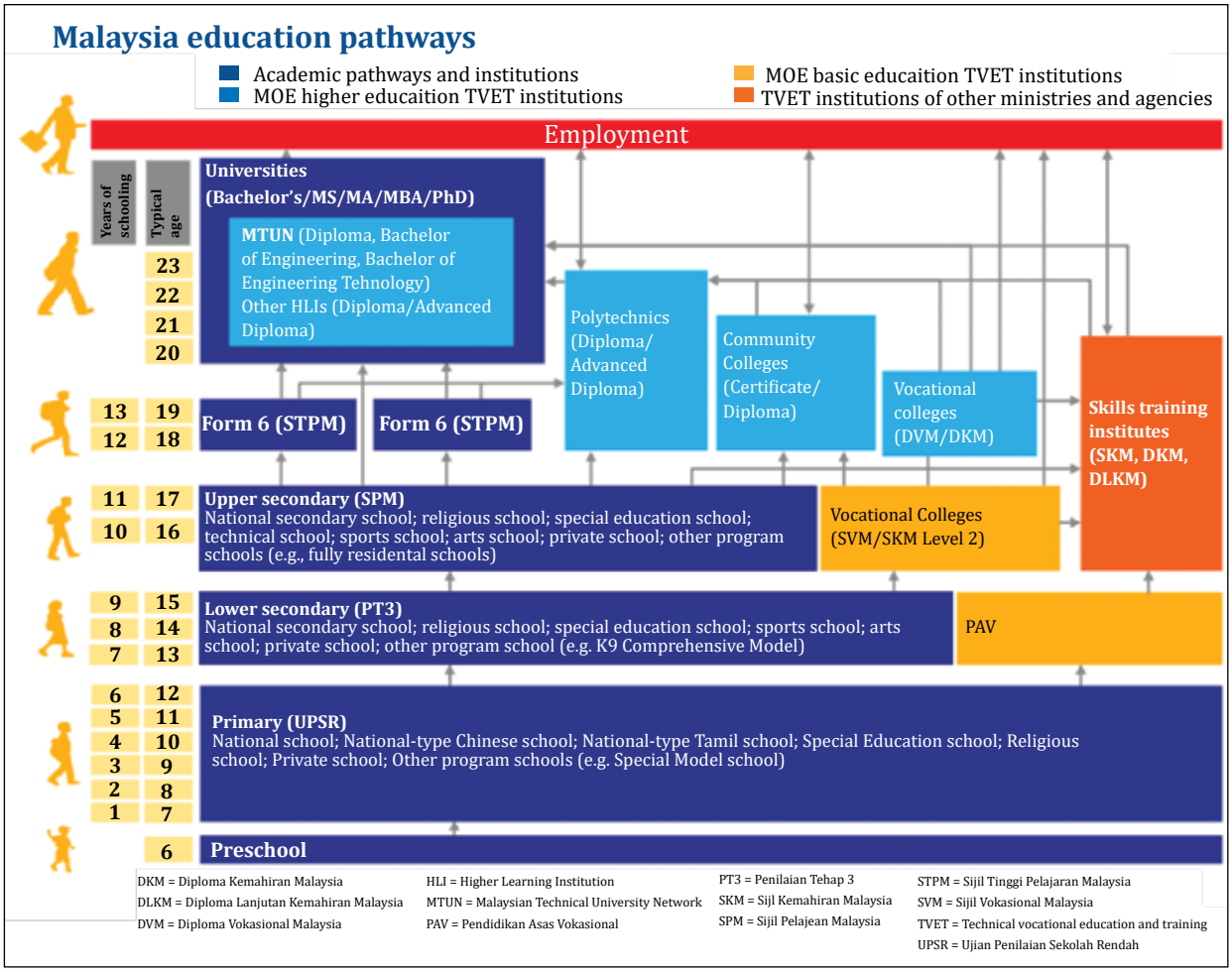


Figure 42: Malaysia's education framework

Source: PEMANDU-PADU TVET Lab, July 2014

Malaysian Public Universities

The Ministry of Education (MOE) oversees 20 public universities, which are grouped into two categories: Malaysian Research Universities (MRUs) and non-Research Universities (non-MRUs). All public universities carry out teaching and learning offering a variety of courses and research activities in various fields of study.

Five universities have attained the status of MRUs. As the name suggests, the primary focus of MRUs is on research and development in multidisciplinary areas. The inception of MRUs in 2007 has led to an exponential increase in the volume of research publications by HLIs during the 10th Malaysia Plan (2011–15).

The Ministry's report on "Impact of Malaysian Research Universities as the Engine of Growth for Nation Building" highlights the significant progress made. For example, in 2010, the high number of refereed scientific publications for Malaysia established Malaysia as a prominent center for scientific research in the ASEAN region. This reference is an excellent recognition of the collective efforts and research excellence of local HLIs and

local researchers. This growth in scientific research output demonstrates the continuing importance of MRU initiatives for Malaysian higher education talent and Malaysian HLIs[1].

The public universities in Malaysia provide tertiary education programs offering diploma and bachelor's degree courses in a wide range of subjects as well as master's degrees and PhDs at postgraduate levels. Master's courses are usually between one-and-a-half and two years while PhDs require at least three years to complete.

School leavers are the majority of undergraduate students. Sijil Pelajaran Malaysia or O-level equivalent is a prerequisite for their eligibility to apply for placement at the universities, especially for diploma courses. Admission to public universities is subject to their post-secondary qualifications such as Sijil Tinggi Pelajaran Malaysia or matriculation or foundation that they need to obtain upon completing the secondary school education.

Table 21: List of public universities and their years of establishment

Categories	University	Establishment year
Malaysian Research Universities (MRUs)	Universiti Malaya (UM)	1949
	Universiti Sains Malaysia (USM)	1969
	Universiti Kebangsaan Malaysia (UKM)	1970
	Universiti Putra Malaysia (UPM)	1973
	Universiti Teknologi Malaysia (UTM)	1975
Non-MRU Universities (non-MRUs)	Universiti Teknologi MARA (UiTM)	1956
	Universiti Malaysia Terengganu (UMT)	1979
	Universiti Islam Antarabangsa Malaysia (UIAM)	1983
	Universiti Utara Malaysia (UUM)	1984
	Universiti Malaysia Sarawak (UNIMAS)	1992
	Universiti Tun Hussein Onn Malaysia (UTHM)	1993
	Universiti Malaysia Sabah (UMS)	1994
	Universiti Pendidikan Sultan Idris (UPSI)	1997
	Universiti Sains Islam Malaysia (USIM)	1998
	Universiti Teknikal Malaysia Melaka (UTeM)	2000
	Universiti Malaysia Perlis (UniMAP)	2001
	Universiti Malaysia Pahang (UMP)	2002
	Universiti Sultan Zainal Abidin (UniSZA)	2005
	Universiti Pertahanan Nasional Malaysia (UPNM)	2006
	Universiti Malaysia Kelantan (UMK)	2007

Public universities are bound by the Universities and University Colleges Act 1971 (UCCA) (Act 30). The MOHE handles the general direction of higher education and administration of this Act.

RECENT ADVANCES

Sector Liberalization

In 1996, Malaysia established the Private Higher Education Institutions Act 1996. The act started an era of higher education liberalization. It also provided a legal framework for the establishment of twinning arrangements between public and private institutions, and foreign and local institutions; and the creation of private universities, branch campuses of foreign universities and other forms of private higher educational institutions (HEIs). The act also enabled the upgrading of existing colleges to universities. The liberalization was deemed necessary to meet the demand of higher education. By 2014, Malaysia had more than 500 private HEIs. A large number of public and private HEIs have played a significant role in the development of education services for Malaysian and international students. It is also contributing to Malaysia's initiatives of increasing the service industry to 58% by the year 2020.

Establishing Governance Agencies

Malaysia recognized the importance of research and development for the country's future development. Some ministries including the MOHE were allocated with research and development funds to support various research projects which were carried out by HEIs and businesses.

The MOHE has formulated performance- and outcome-based criteria for the different forms of institutional excellence. These are: excellence in overall research, excellence in niche areas of research, and excellence in teaching and learning [1]:

- The 'excellence in overall research' institutions are research universities with a high population of postgraduates. These universities place a high priority on research and development, engage in extensive research, and can adequately secure research funding from industry and other sources.
- The 'excellence in niche research areas' universities are focused research institutions that have joint investments with industries in specific research areas.
- The 'excellence in teaching and learning' universities are the ones with good track record in innovating, designing, and delivering undergraduate programs. They can also conduct fundamental or applied research, such as to help advance instructional quality, and to develop new and more efficient teaching methodologies, but are primarily focused on undergraduate and postgraduate instructions.

A research management system called Malaysian Research Assessment (MyRA) was established with the objectives to manage and assess the research and development works effectively [2].

Malaysia Qualifications Agency (MQA) was formed on 1 November 2007 to administer and enforce the Malaysia Qualifications Act 2007. The primary role of the MQA is to implement the Malaysian Qualifications Framework (MQF) as a basis for quality assurance

of higher education and as the reference point for the criteria and standards for national qualifications. The MQA is responsible for monitoring and overseeing the quality assurance practices and accreditation of national higher education. Primary functions of the MQA include [1]:

- Implementing MQF as a reference for Malaysian higher education qualifications.
- Developing standards as national references for conferment of degree awards.
- Evaluating quality assurance of Malaysian HLIs.
- Accrediting courses.
- Administering the Malaysia Qualification Register.

Focus on Size and Quality

The MOHE believes that all students should have the opportunity to attain an excellent higher education provided by the Malaysian HLIs that are comparable to high-performing education institutions globally. According to MOE [1], the Malaysian higher education is emphasizing on quality for three aspects, namely:

- The quality of the overall system.
  - Based on 2014's Universitas 21 (U21) Report, Malaysia ranks 36th out of 50 countries in term of research outputs.
  - It houses 108,000 international students.
- The quality of institutions.
  - Based on Quacquarelli Symonds (QS) World University Rankings, one Malaysian University is ranked within 200 globally.
- The quality of graduates.
  - Graduate employability rate was 75% as of 2014.

Malaysia aspires to provide an equitable higher education system for all Malaysians [1]. However, the differences in socioeconomic status remain one of the biggest determinants to the outcomes in higher education. The MOHE plans to ensure that students, regardless of their ethnicity, geographical location or socioeconomic background, have the opportunity to further their tertiary studies. The MOHE is actively gathering data to allow the measurement and comparison of student outcomes from various demographic groups. The MOHE will regularly review student outcome data for performance gaps, and will improve the enrollment rate and completion rate of students from socioeconomically disadvantaged backgrounds and communities.

ESTABLISHING A PRODUCTIVITY INDICATOR

The Research Method

The methods used for this research included:

- Developing a performance framework for the Malaysian public universities, which is endorsed by the management of MoHE.

- Gathering data on 20 public universities for various indicators as identified in the context.
- Reporting and analyzing the results.

Establishing an Indicator Framework

This analysis uses an indicator framework for measuring the performance of the twenty public universities. Performance can be defined regarding how well a service meets its objectives, given its operating environment. The measurements provide a concise set of information about performance against all identified objectives of the service. The information would indicate whether the objectives have been met.

The performance indicator framework focuses on outcomes. The resulting performance information is outcome-oriented, supplemented by information on outputs. The performance information is described regarding inclusiveness, effectiveness, and efficiency [3]. The general framework reflects the service process through which service providers transform inputs into outputs and outcomes, to achieve the desired program objectives.

For higher education at public universities, the MOE, on behalf of the government, has some goals that are intended as the desired outcomes. To achieve these objectives, the ministry funds the service providers, i.e. the public universities. The public universities transform resources (inputs) into services (outputs). The rate at which resources are used to make this transformation is known as technical efficiency.

Higher education at public universities is an essential government service. A significant number of post-secondary school leavers depends on it for the continuation of their studies at tertiary level. The higher education services delivered by public universities are derived from the following three programs, which form the basis for the performance measurements of the 20 public universities in the report:

- Generation of knowledge (research).
- Dissemination of knowledge (teaching and learning).
- Facilitation of knowledge (commercialization and extension of knowledge into the community and the industry).

The performance of the 20 public universities is reported against the indicator framework shown in Figure 43. The framework identifies the three programs as the core services of public universities, for which the performance is to be measured. The framework provides information on the inclusiveness, efficiency, and effectiveness; and distinguishes the outputs and the outcomes of the programs. It also shows which data are comparable in the report.

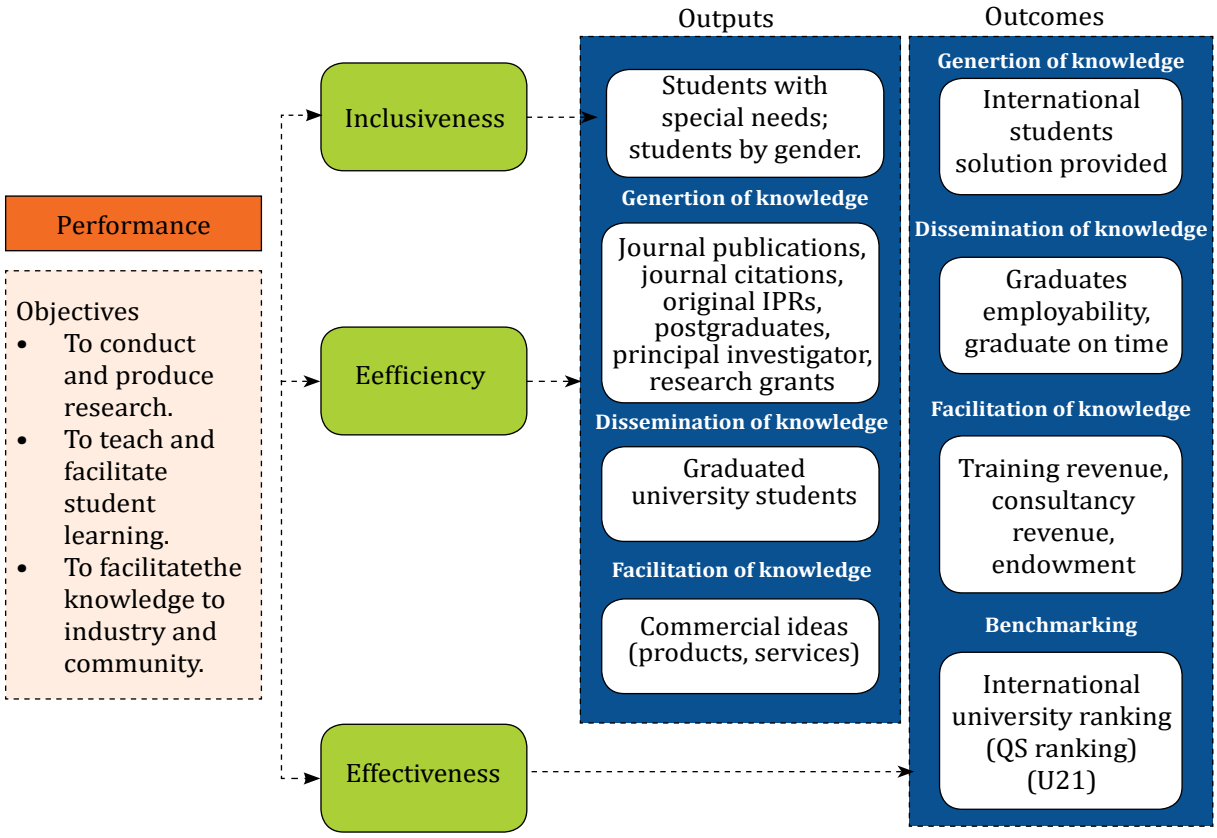


Figure 43: Performance indicator framework for public universities

The variables in this framework are defined by ROGS [3] as follows:

- Resources are the inputs to the programs to realize the delivery of the services, namely funding and staff.
- Outputs are the services delivered through each program. The output information is also critical for inclusive, efficient, and effective management of higher education at public universities. The performance indicator framework groups output indicators according to the desired programs. Examples of outputs are indexed journal publications and graduated university students.
- Outcome indicators provide information on the impact of these services on the status of an individual or a group. Outcomes are likely to be influenced by factors outside the control of the service providers. An example of outcome is, graduating on time.
- Efficiency is the actual output realized about the resources committed (output/input). Technical efficiency indicators measure how well services use their resources (inputs) to produce outputs for the purpose of achieving desired outcomes. An example of efficiency indicator is the number of research articles published by each academic staff.
- Effectiveness indicators are absolute measures of performance. They measure how efficiently the outcomes of a service were achieved. The actual position of a university in the QS ranking is one such example.
- Inclusiveness refers to the inclusion of all eligible students in higher education at the public universities, regardless of location, race, gender or socioeconomic background. Inclusiveness indicators in the report reflect inclusiveness of access, whereby access of eligible students to higher education at public universities is measured. Inclusiveness indicators focus on any gap in performance, for example, the proportion of female students to the total students enrolled at public universities.

Data and Algorithms

Data was mostly provided by the MOHE, and was continuously collected and verified. Some of the data on assets and financial expenditure was gathered from Malaysian National Account.

In the research, the multifactor productivity measures were chosen. The output selected was the number of full-time equivalent students, while the inputs were academicians, operating budget, and capital services. Intermediaries (goods and services) were measured indirectly using deflated expenditure, while assets (capital) were measured using the volume index of capital services (VICS). This represents the flow of services provided by the capital stock each year, which primarily comprises buildings. A three-year moving average of the constant price capital services index was taken, to smooth out some of the volatility in the series. This was converted to an index.

The Laspeyres Index was used for calculating the productivity index. In the Laspeyres Index, the base period's price provides the weights for the calculation of changes in an aggregate quality index.

As there is no effective price index for the selected sector, the research adopts a volume-based approach to the output activities of each sector's quantity. The methodology can be divided into several steps:

- Time series data identifies the level of expenditure for each of the output in each of the sector.
- A chain-linked Laspeyres volume index of output is produced for each output for the sector at the national level.

$$I_{i,t} = I_{i,t-1.} \left(\Sigma_j \left(\frac{a_{i,t} - a_{i,j,t-1}}{a_{i,t} - a_{i,j,t-1}} \cdot \frac{x_{i,t-1}}{\Sigma_{j\,xi,\,t-1}} \right) + 1 \right.$$

Where:

- i, and t are index outputs of the sectors and time, respectively.
- $I_{i,t}$ is a chain-linked Laspeyres index of output quantity.
- The term $a_{i,t}$ is the number of output by activity.
- $x_{i,t}$ is the level of expenditure in nominal price terms.
- Output in the initial period, t=0, is set equal to 100.

Overview of Key Features

Figure 44 shows the distribution of students by gender at 20 public universities in 2014. The combined total students were 577,988, which included local and international, and undergraduate and postgraduate students. Female students made up 61.5% of the total students, which reflects the pattern at 16 universities.

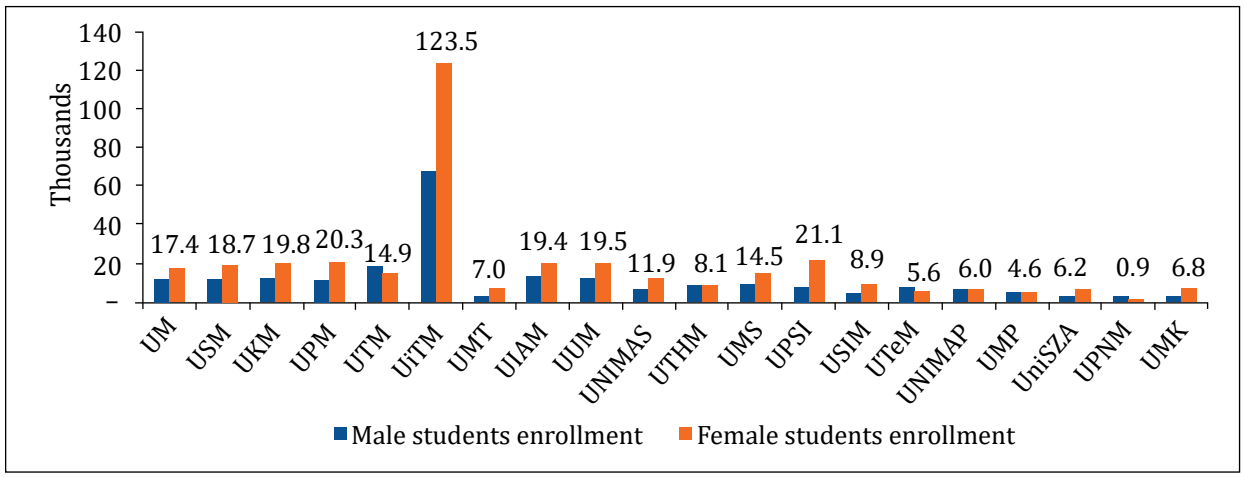


Figure 44: Student enrollments by gender, 2014

There are two categories of staff at the public universities. These are academic staff, involved in all the three programs; and non-academic staff, who carry out administrative work and other non-academic activities.

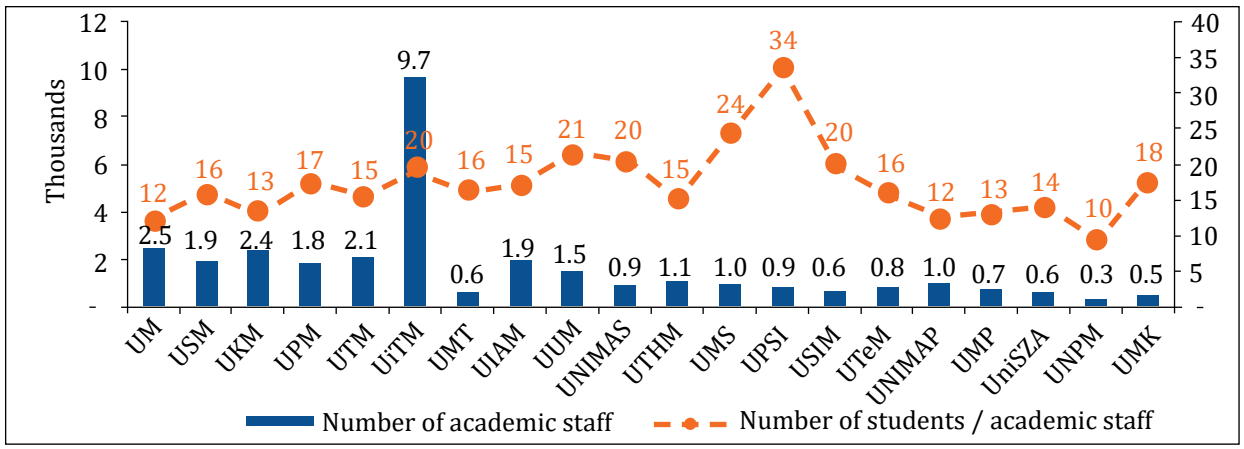


Figure 45: Total number of academic staff at public universities, 2014

The ratio of indexed journal publications per academic staff for all universities was 0.7 for the year 2014. The MRUs (A, B, C, D, E) exceeded that, with the highest ratio at 1.8. Most of the non-MRUs recorded lower than 0.7.

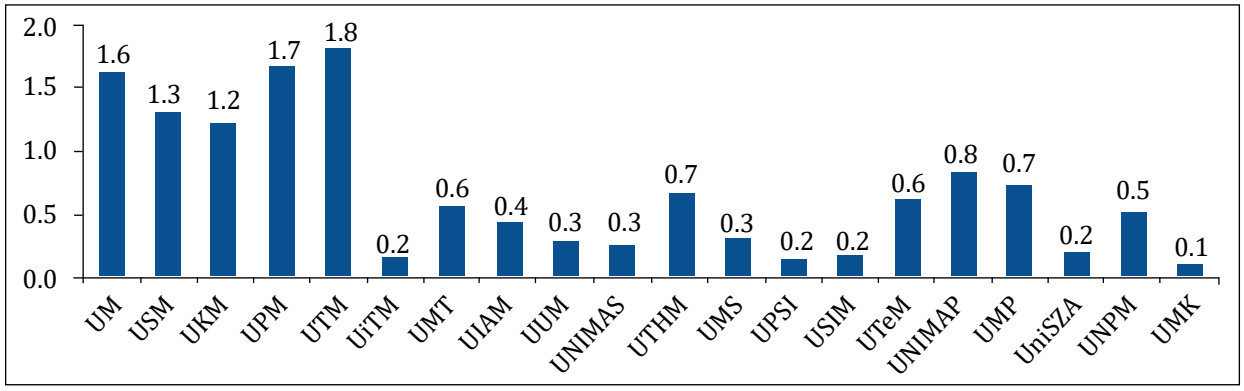


Figure 46: Total number of publications in indexed journals per academic staff, 2014
Source: www.scopus.com

The ratio of indexed journal citations per academic staff for all universities was 3.1 for the year 2014. The MRUs surpassed the 3.1 mark, with the highest ratio at 9.8. All non-MRUs recorded lower than 3.1. The majority of non-MRUs' key resources are focused on teaching and learning rather than research activities.

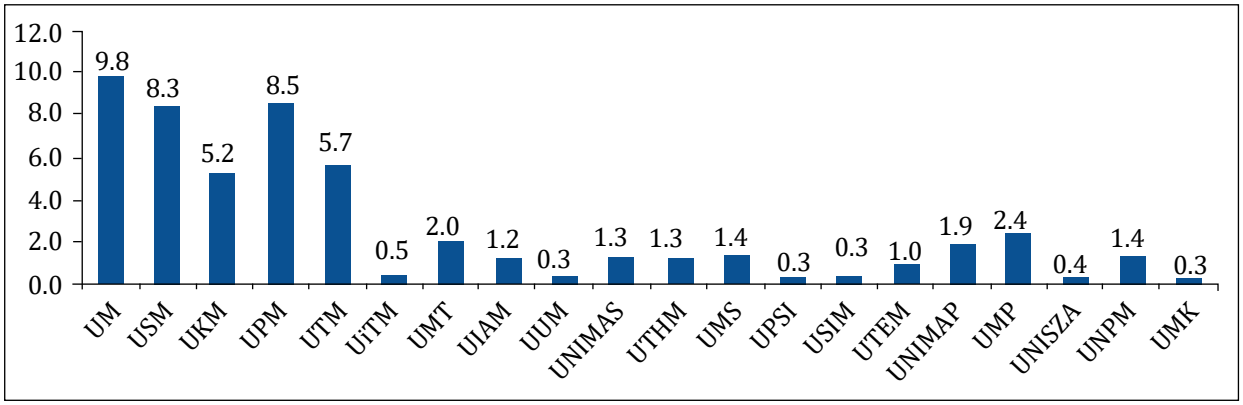


Figure 47: Total citations in indexed journals per academic staff, 2014

Source: www.scopus.com

Let's now look at the grants from the government or government agencies that were received by the universities in the evaluation year. Grants that were obtained as part of the operating expenditure were not considered [2]. A total of RM 768 million in research grants from government funding was secured by the public universities in 2014. RM 245 million or 32% of the total grants was realized by the five MRUs. The average research grant per academic staff was RM 23,000. All MRUs surpassed the average. Four non-MRUs also successfully exceeded the average.

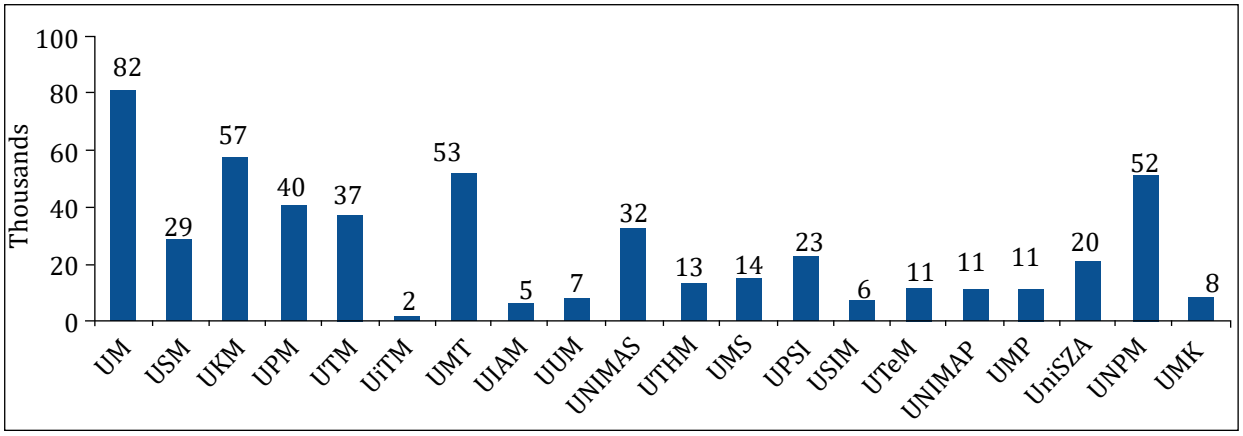


Figure 48: Research grants (government funding) per academic staff, 2014

Graduate employability measures the quality of teaching in terms of its effectiveness in preparing students for the workforce that meets the needs of the economy. This measure counts the number of graduates who are employed, self-employed, or in further education at the time of convocation, which is three to six months after one has completed one's studies [1]. The percentage of employability in 2014 was 75.4%, which was above the national graduate employability for national HLIs. Three universities recorded more than 80% graduate employability.

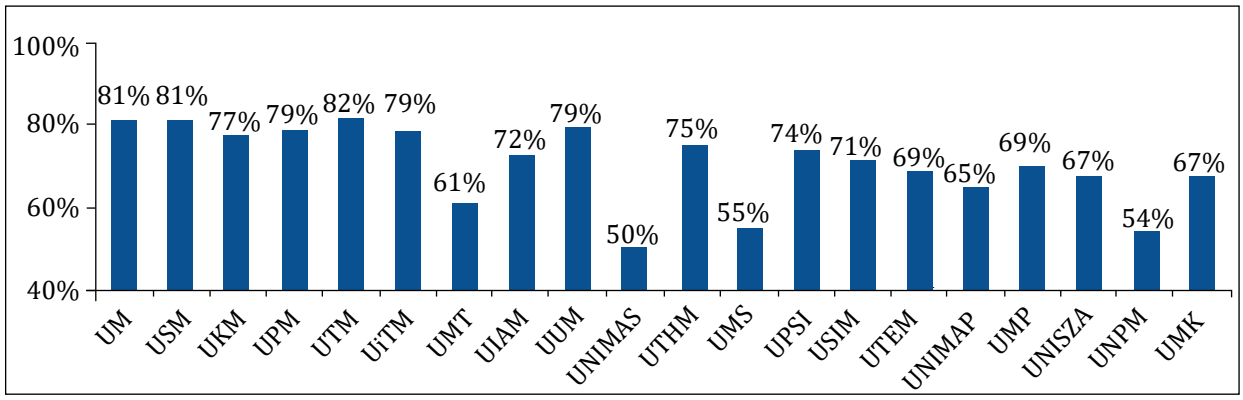


Figure 49: Percentage of graduate employability, 2014

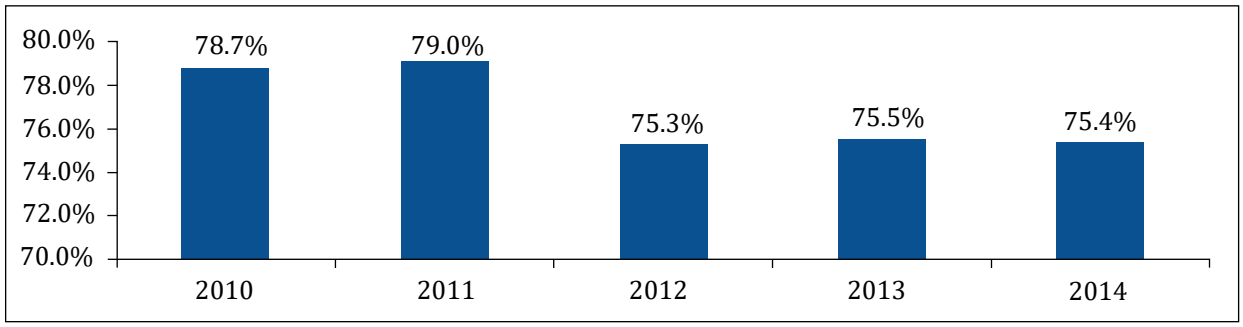


Figure 50: Annual combined average of graduate employability of public universities, 2010–14

Graduate on time (GOT) measures the percentage of students graduated within the scheduled duration of the study. Most undergraduate courses stated four-year periods for students to graduate. However, some undergraduate courses such as those in architecture and medicine are scheduled to complete in five years. The average GOT was 84% for undergraduates without diploma intake in 2009.

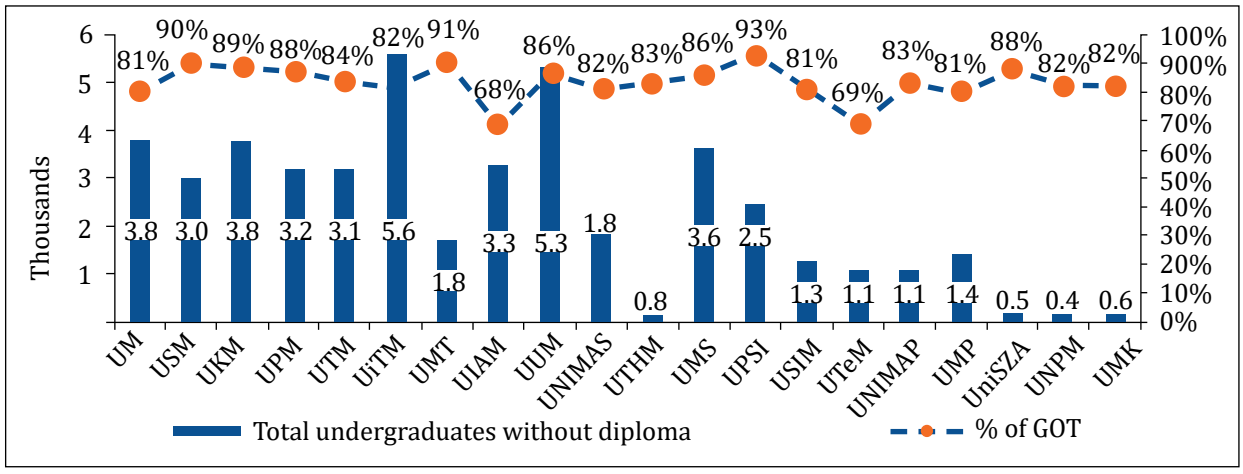


Figure 51: Percentage of graduates on time for degree programs without diplomas, 2014

Results from Productivity Analyses

The outputs of the study are presented in Figure 52 and Figure 53. Figure 52 shows the overall productivity growth for the 20 public universities. The negative growth was displayed

for the 2010–11 and 2011–12 periods. However, in the next two periods, the productivity growth was positive. This could be due to the government's five-year budgeting and spending. The year 2011 was the beginning of 10th Malaysian Plan and it lasted till 2015. Typically, at the beginning of the five-year period, government organizations are allocated more funds to procure capitals, goods, and services. The number of academic staffs and students do not change according to the spending. In the second half of the five-year plan, the amount of money allocated would be much lesser.

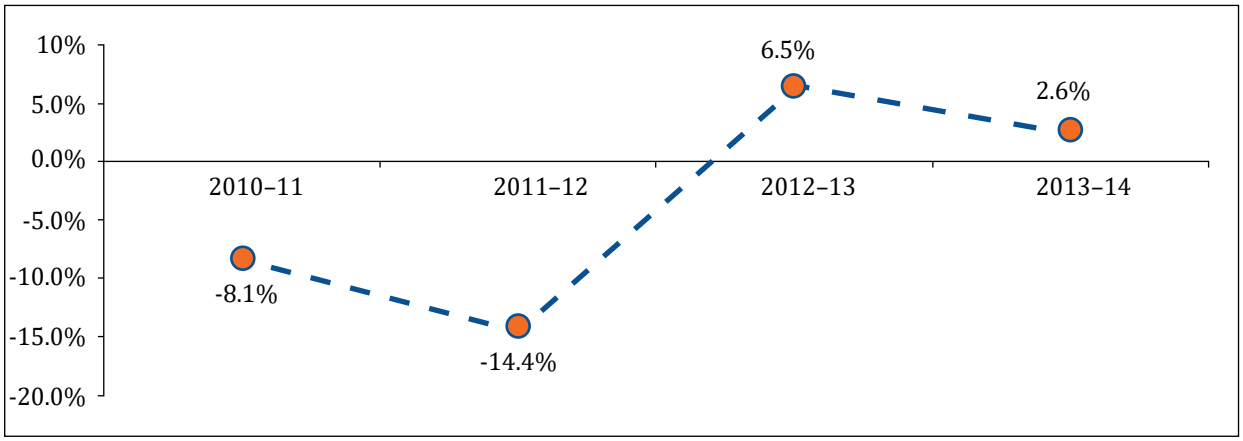
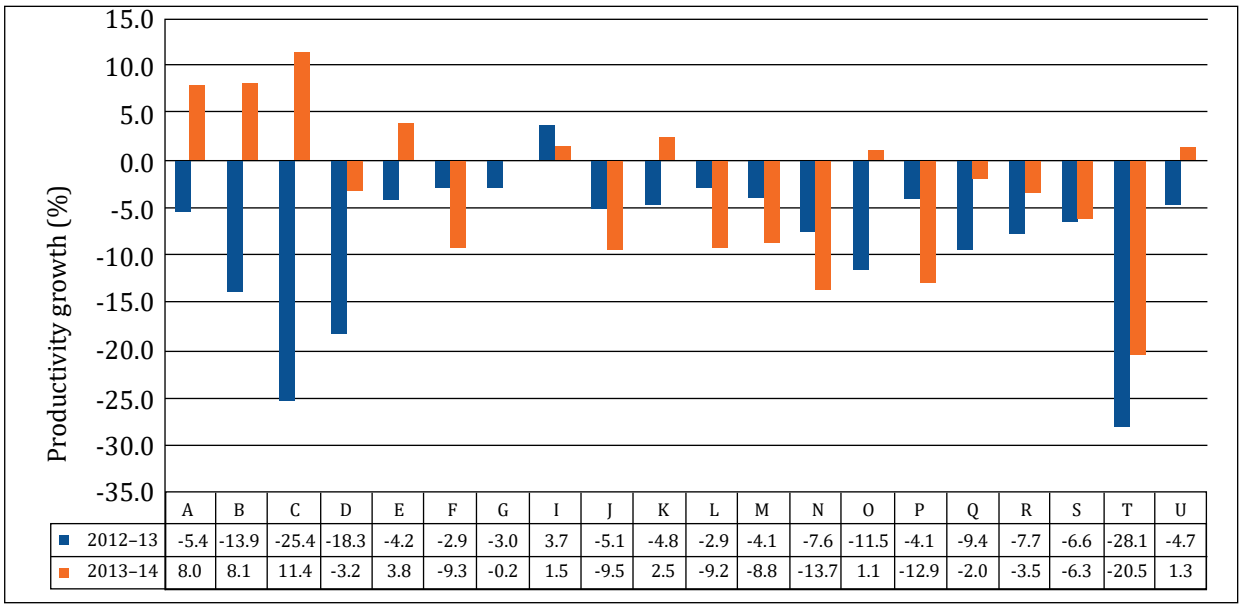


Figure 52: Overall productivity growth for the 20 public universities

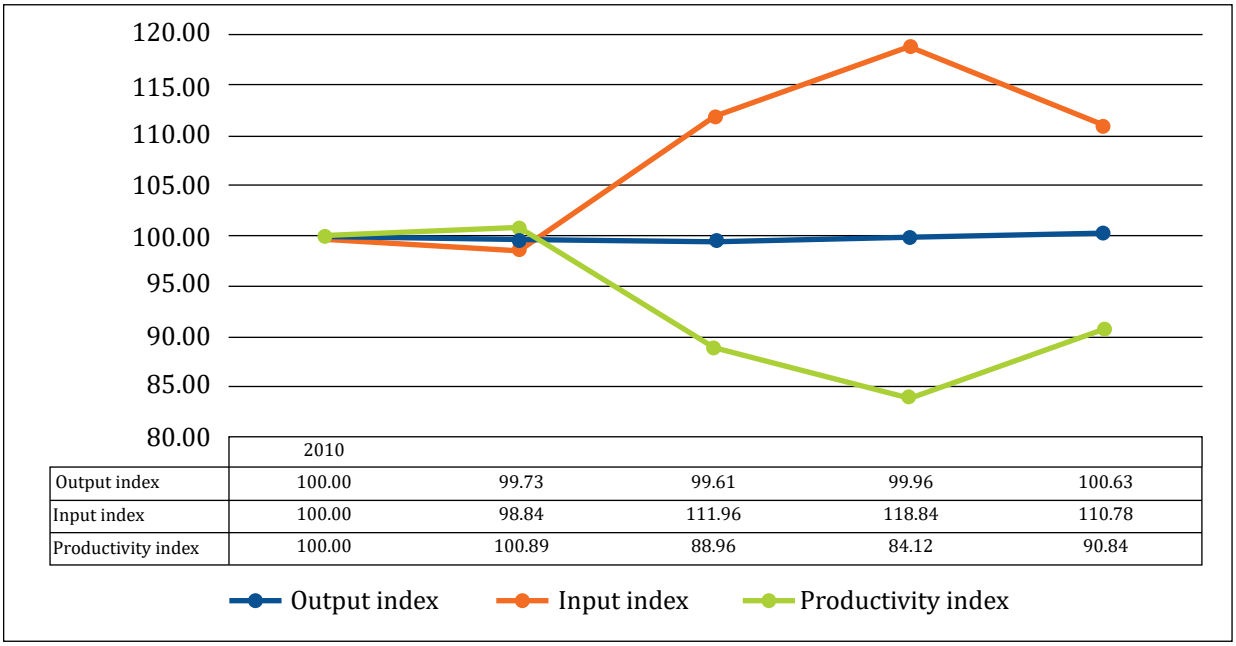
Figure 53 shows the productivity growth for an individual university for the 2012–13 and 2013–14 periods. The first five universities (A, B, C, D and E) are research universities. The research universities are also the older universities. From the graph, the productivity growths for the five research universities show similar trends. For the period 2012–13, all of them show negative growths. However, the productivity growth improved in the next period. The balance 15 universities, which are categorized as teaching universities, show mix trends of productivity growth.



	A	B	C	D	E	F	G	I	J	K	L	M	N	O	P	Q	R	S	T	U
2012–13	-5.4	-13.9	-25.4	-18.3	-4.2	-2.9	-3.0	3.7	-5.1	-4.8	-2.9	-4.1	-7.6	-11.5	-4.1	-9.4	-7.7	-6.6	-28.1	-4.7
2013–14	8.0	8.1	11.4	-3.2	3.8	-9.3	-0.2	1.5	-9.5	2.5	-9.2	-8.8	-13.7	1.1	-12.9	-2.0	-3.5	-6.3	-20.5	1.3

Figure 53: Productivity growth (%) for an individual public university for the 2012–13 and 2013–14 periods

Figure 54 show the productivity index, output index, and input index for one university, namely University A. From the figure, the productivity index demonstrates an inverse correlation to the input index due to an almost constant output index. 2010 is selected as the base year for the pricing.



	2010				
Output index	100.00	99.73	99.61	99.96	100.63
Input index	100.00	98.84	111.96	118.84	110.78
Productivity index	100.00	100.89	88.96	84.12	90.84

Figure 54: Productivity, output, and input indices for University A

Limitations of the Research

This research had a number of limitations:

- Productivity growth computation was done using 'Program 2: Dissemination of Knowledge.' Ideally all three programs should be used.
- Output = Total number of full-time equivalent (FTE) students.
- Inputs = Academic staff, expenditures (emoluments, supplies and services, assets).
- There is no detailed breakdown of academic staff and expenditures for generation of knowledge, dissemination of knowledge, and facilitation of knowledge.
- There is no specific emolument expenditure for academic and non-academic staff.

THE NEXT FIVE YEARS

Lifelong Learning

Lifelong learning (LLL) is identified as an enabler for Malaysians to meet the changing skills need of a high-income economy. The LLL should also maximize the potential of individuals who are outside the current workforce, through reskilling and upskilling opportunities. The MOHE has planned a few initiatives [1] to achieve the LLL outcomes, which include:

- Creating a framework for recognizing prior learning, which involves the establishment of clear pathways for reentry into the education system; establishing a national credit

system to enable accumulation of modular credits over time; and stimulating criteria for recognizing prior experience.
- Launching stakeholder engagement programs that incentivize participation. The MOHE plans to improve further marketing infrastructure or channels where it should embrace the development of new technologies with the objective of making it easier for public to search for information.
- Continuing to provide financial incentives to disadvantaged groups and tax reduction incentives to companies, and to work with financial institutions to create the financial assistance program for all groups.

Technology-enabled Blended Learning

Technology-enabled blended learning models with MOOCs would further enhance higher education. The MOHE plans to work with HLIs in building capabilities of academic staffs, and explore the establishment of a national e-learning platform to lead in contents development. Key initiatives include [1]:

- Launching MOOCs in subjects of distinctiveness for Malaysia such as Islamic banking and finance, together with high-profile MOOC consortium, so as to build Malaysia's global brand.
- Making online learning an integral component of higher education and LLL. The plan is to start with undergraduate courses and require 70% of programs to use blended learning models.
- Establishing the necessary cyber infrastructure and strengthening the capabilities of the academic staff to deliver online learning.

Earned Autonomy University Model

The earned autonomy universities will be empowered with greater decision-making rights to enhance their agility in responding to local and global trends. The universities also enjoy more streamlined regulatory processes that eliminate unnecessary regulatory burdens. Their success will be based on their performances. These universities are also expected to generate incomes and become less dependent on government funding. Several key initiatives according to MOE [1] include:

- Defining five-year outcome-based performance contract between the MOHE and universities.
- Strengthening quality assurance in the private higher education sector by requiring private HLIs to participate in enhanced national quality assurance framework for continued access to government funding such as government research grants and student study loans. The degree of access will be linked to the level of performance against the frameworks and standards.
- Moving decision rights from the MOHE to the leadership of the public universities, thus promoting governance effectiveness of HLIs. Also, the MOHE will build the capacities and capabilities of the universities' boards and leaders to take these increased responsibilities.

CONCLUSION

The pioneering research work on the productivity of higher education in Malaysia proved to attract the serious attention of the MOHE and the managements of the 20 public universities. Challenges in carrying out the research work included data gathering, validating data and coming out with a common performance framework for a university. The limited understanding of computing the productivity index and growth increased the challenges.

However, the output of the research provided the MOHE with an instrument to measure the performance of each university and compare that with similar universities. The research does identify limitations of the study due to non-readiness of the data, particularly pertaining to the financials. The financial data should be categorized according to the education program in each university to enable the productivity computation to be carried out at that level. Similarly, the input and output data should also be structured and made available at the education program level.

The research makes use of one output, which is the student FTE; and of one program, which is knowledge dissemination (teaching and learning). Subsequent research should make an attempt to compute productivity for the other two broad programs, namely research and development, and facilitation of knowledge. Multiple outputs for each program should also be considered in future research.

REFERENCES

[1] MOE. MOE Blueprint 2015–20. Putrajaya: MOE; 2015.

[2] MYRA. Malaysia Research Assessment Instrument II, Putrajaya: Ministry of Higher Education of Malaysia; 2014.

[3] ROGS. Report on Government Services 2015. Australia: Council of Australian Governments; 2015.

CHAPTER 7
PAKISTAN

Shakeel Ahmad[1], Fast School of Management, Pakistan

EXECUTIVE SUMMARY

This research project was started with an aim of developing a suitable productivity indicator that measures the productivity of academic activities of higher education institutes (HEIs), and subsequently applying that to the HEIs in Pakistan. For the purpose of the project, the productivity was defined as an academic output produced as compared to the input consumed by the HEIs. The academic output was further segregated into two distinct activities: education activities, and research activities. A variety of variables were considered for the purpose of the study that may capture not only the efficiencies of these activities but also their effectiveness. Here are the variables that were considered in the study:

The education activities' outcomes were measured through the following:
- Course work completed during a year.
- Graduate employment percentages within one year of graduation.
- Credit hours completed during the year.
- Learning outcomes achieved (%).

The research activities' outcomes were measured through the following:
- Number of publications.
- Number of citations.
- Number of patents.
- Research completions.
- Research funds.

The input was assessed through the three variables of labor, capital, and intermediaries.

We captured the data for the above-mentioned variables for six different universities in Pakistan and calculated the educational productivity index, the research productivity index, and the academic productivity index for the universities. At a later stage, we tried to analyze the factors that have helped improve the productivity of HEIs in Pakistan. We also examined the suitability of the productivity index in Pakistan's context and the factors that could help shape the productivity of the HEIs in Pakistan in future.

INTRODUCTION

In Pakistan, all education activity is under the control of Ministry of Federal Education and Professional Training at the federal level and the respective education ministries at the provincial levels. All of these ministries are responsible for educational activities conducted both at the federal level and the provincial levels.

[1]Dedicated to my lovely wife Sadia and kids Abdullah and Zainab.

The higher education sector is primarily controlled by Higher Education Commission of Pakistan (HEC) which is an autonomous and independent body created through a constitutional amendment. It is dependent on the federal government for funding but its functions are independent. The HEC was created in 2002, after it was converted from University Grants Commission (UGC), with a hope of bringing a revolutionary change to the higher education sector of Pakistan. The HEC is given the overall responsibility for the higher education sector of Pakistan with an aim to enhance the quality of graduates produced and that of the universities and colleges. Since its inception, HEC has brought about remarkable changes to the higher education sector of Pakistan with the support of the federal government. It has started many programs for upgradations of existing universities and establishment of new universities. It has adopted a more liberal policy regarding the involvement of private sector in higher education, and initiated quality-control procedures to enhance the quality of the education provided, apart from running faculty development programs and research grant programs. An overview of the Pakistan's education system is shown in Table 22.

Table 22: Education system in Pakistan

Grade	Level	Credential	Institution
I	Primary		School
II			
III			
IV			
V			
VI	Middle		
VII			
VIII			
IX	Secondary	Secondary school certificate called Matric	
X			
XI	Higher secondary technical	Intermediate certificate / secondary certificate	College
XII			
XIII		First-stage bachelor's degree: BA, BSc	University
XIV			
ONWARDS	Higher education	Second-stage master's degree: MA, MSc, LLB	
		Third-stage: MPhil, PhD	

Source: Federal Bureau of Education and Provincial Bureau of Statistics, 2004

Pakistan is the sixth most populated country in the world with a population of more than 200 million, with around 35% of its population being under the age of 15 [18–19]. Yet, the amount spent on the education sector is one of the lowest in the world. The government spends 2.5% of the nation's GDP on education, as compared to some developed countries spending more than 5% [18–19]. However, the students' enrollments in universities increased from 135,000 during 2001–02 to 400,000 during 2011–12, with the efforts of HEC and Government of Pakistan. The number of universities has also grown from 26 in 2001–02 to 72 in 2010–11 [6–7], [3].

The government has allocated generously, amidst a tight fiscal position, to higher education. The budget for higher education increased from PKR 22 billion in 2005 to PKR 43 billion in 2010, which was around 0.2% of the GDP. All of above discussions show that higher education has a great potential in the country but the resources allocated to the sector are minimum.

HIGHER EDUCATION IN PAKISTAN

This dimension of productivity explains the contexts that shape the productivity of higher education. Through this model, it is analyzed how government policies, commercial matters, and social factors affect the productivity of the higher education as a whole. These effects are analyzed at seven levels namely, international, national, sectoral, institutional, departmental, instructional, and individual. Here are the key preliminary findings based on our research on Pakistan's higher education sector.

Governmental Policies

Government Spending on Education

Budget for the education sector constitutes less than 3% of the GDP of Pakistan. This is less than the spending by some developed countries where the spend is more than 5%. It is the fiscal deficit run by the Government of Pakistan that has limited its ability to expand budgetary allocation to the education sector in general and the higher education sector in particular. Higher education gets its share from the total education budget allocated by the federal government. The following figure shows the trends in education spending by the government and the share of higher education:

Table 23: Government spending on education: 2005 to 2012

	2005 –06	2006 –07	2007 –08	2008 –09	2009 –10	2010 –11	2011 –12
Actual data	**FY 06**	**FY07**	**FY08**	**FY09***	**FY10***	**FY11***	**FY12***
GDP at current factor cost, in billion PKR	7,159	8,235	9,922	12,082	14,066	17,107	
GDP at constant factor cost, in billion PKR	4,860	5,192	5,383	5,448	5,681	5,817	
Exchange rates average	60	61	63	79	84		
Exchange rates Y/E	60	60	68	81	85		
GDP market price current	7,623	8,673	10,242	12,739	14,863	18,062	20,952
GDP market price constant	5,183	5,477	5,565	5,767	6,004	6,145	
Total govt. expenditure nominal	1,402	1,799	2,276	2,531	3,007	3,257	
Total education expenditure nominal	170	216	253	240	259	153*	
% of GDP nominal	2.20	2.50	2.50	1.90	1.70		
Expenditure on higher education	22	29	31	32	33	43	41
% of GDP nominal	0.29	0.33	0.30	0.25	0.22	0.24	0.19
% of educational expenditure	13	13	12	13	13	**	

Source: Economic Survey of Pakistan, State Bank of Pakistan

Provincial Government Spending

In addition to the allocation by the federal government, the provincial governments also allocate budgets for the education sector as the education has become a provincial business after the constitutional amendment in 2011.

Higher Education Commission

At a sectoral level, the HEC is responsible for the performance of the HEIs and the quality of higher education in Pakistan. For the fulfillment of this, HEC drafted a Medium Term Development Framework (MTDF) to plan its activity during 2005. Under the framework, the allocation to higher education was increased to PKR 20 billion and a strong emphasis was put on the development of the educational institutes, development of faculty, hiring of PhD faculty, tenure track system, and improvement in the overall quality of the HEIs [4]. This plan was considered too ambitious by a study conducted by World Bank [17]. Over the period, HEC has introduced many reforms in the area of higher education. Some of these reforms and their results are as under:

- HEC introduced a policy to encourage private universities to enter the domain of higher education, as a result of which the number of universities and degree-awarding institutes increased from 74 in 2001 to 161 in 2014 [14]. A majority of these are private universities.
- An increase in the number of PhDs, from both endogenous and international institutes through scholarships. The number of PhDs produced has increased from 178 in 2000 to 1,249 in 2014.
- An increase in the number of teachers in the HEIs and increase the percentage of PhD faculty. The number of teachers has increased from 5,160 in 2001–02 to 83,252 in 2014–15 [3]. The percentage of PhD faculty increased to 27% of the total faculty during 2012–13. [5–7]
- The number of enrollments at the university level increased from 124,000 in 2001–02 to 1.8 million in 2014–15 [3].
- The criteria for fund allocation to universities and degree awarding institutes (DAIs) changed and included diverse factors such as cost adjustment due to inflation and other factors; enrollments; HEI grading and performance; and adjustment for historic inequalities [17].
- Faculty development program and tenure track program were launched to boost the quality of the faculty targeting the improved performance of the faculty.
- There was boost to the research and development activities by increasing the research grants, travel grants, and research budgets.
- Quality Assurance Agency (QAA) was established to monitor the quality of higher education in Pakistan.
- Different accreditation councils have been established to provide minimum requirements for a degree program.

Pre-university Education

Pre-university education is plagued with inefficiencies, primarily due to lack of reforms and infrastructure at school and college levels; and ill trained teachers, especially in the

public sector. Over the years, this neglect by the government has created a huge vacuum that is partially filled by the private school and colleges. In recent years, it was observed that around 30% of the school goers attend private schools, which resulted in improvement in the quality of intake at the university level.

Complex Authority Structure of HEIs

The higher education sector consists of a variety of institutes, and many of these operate autonomously with little or no coordination among them[2]. Many of the institutes and public-sector university policies as well as the pre-university education policies are controlled at the federal level but there are some for which policies are controlled at the provincial level. This fact was duly acknowledged in a World Bank report in 1992; a Steering Committee report in 2002; and a Higher Education Task Force report in 2004. This situation creates a hindrance in reforming the sector as a whole and establishing the uniform measures to measure productivity of the HEIs.

Commercial Policies

Education Spending

Government spending on education is much less even when compared with other countries. Most of the developed countries across the world spend around 5% of their GDPs whereas Pakistan spends only 2.5% of its GDP on education.

When compared with the peer countries such as India, Bangladesh, Bhutan, Nepal, and the Philippines, Pakistan's spending on education is still less. The education spending of the selected countries is shown in the Figure 55.

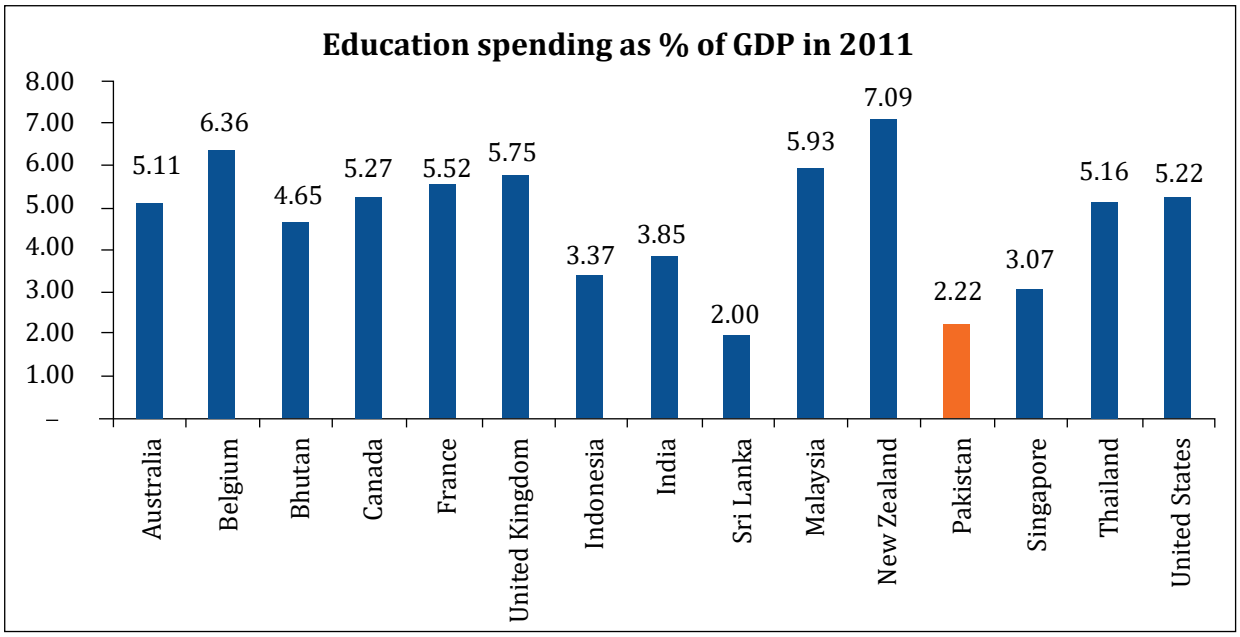


Figure 55: Education spending as a percentage of GDP by countries

[2]Raja, Selman Aram, Chapter 4 "Reform of University Legislations." Steering Committee Report, (2004), p. 1.

Trends in Higher Education Spending

Over the years, Pakistan has increased its spending on the higher education subsector by a huge amount. The budgeted allocation for higher education was around PKR 4 billion in year 2001 that increased to PKR 43 billion in year 2010, showing a growth rate of around 31% over the period. This shows that the government increased its attention on the higher education sector.

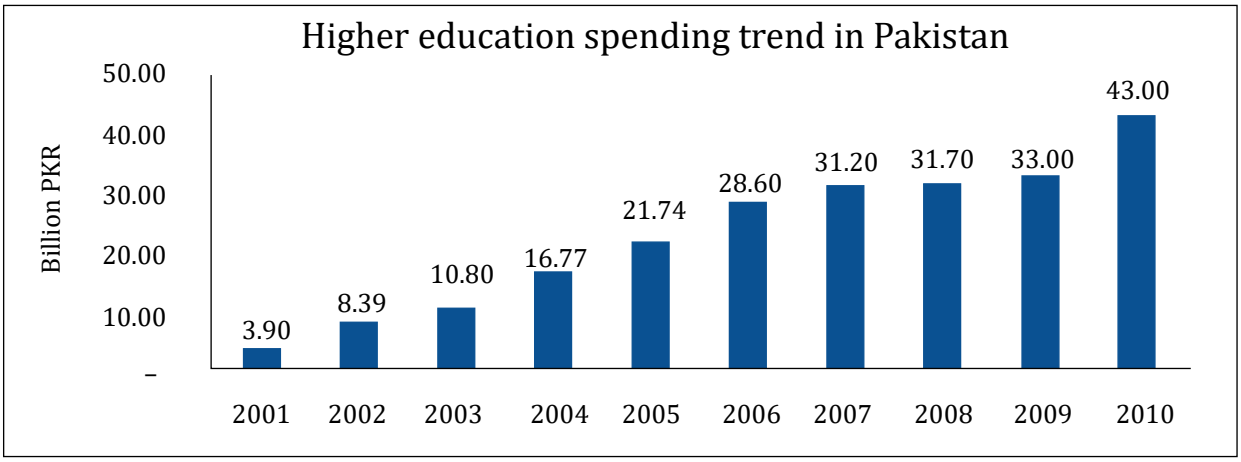


Figure 56: Higher education spending trend in Pakistan

Sources of Revenues of Public Sector HEIs

At a sector level, major sources for public-sector universities are the government grants, which constitute more than 90% of all public-sector universities' revenues. Historically, HEC has spent more than 90% of its higher education budget on university grants [17]. The amount of government grants has increased from PKR 3.33 billion in 2001–02 to PKR 7.2 billion in 2005–06 in real terms, thus showing a growth rate of 29%. This growth rate slowed down in subsequent years as the recurrent spending by the HEC was at 9.9 billion in year 2009–10 in real terms but the developmental budget increased by a huge margin for public-sector universities. The total amount of allocation by the HEC to public-sector universities was 18.5 billion in real terms in 2009–10 [5–7]. The total higher education spending by the HEC on public-sector universities is shown in Figure 57.

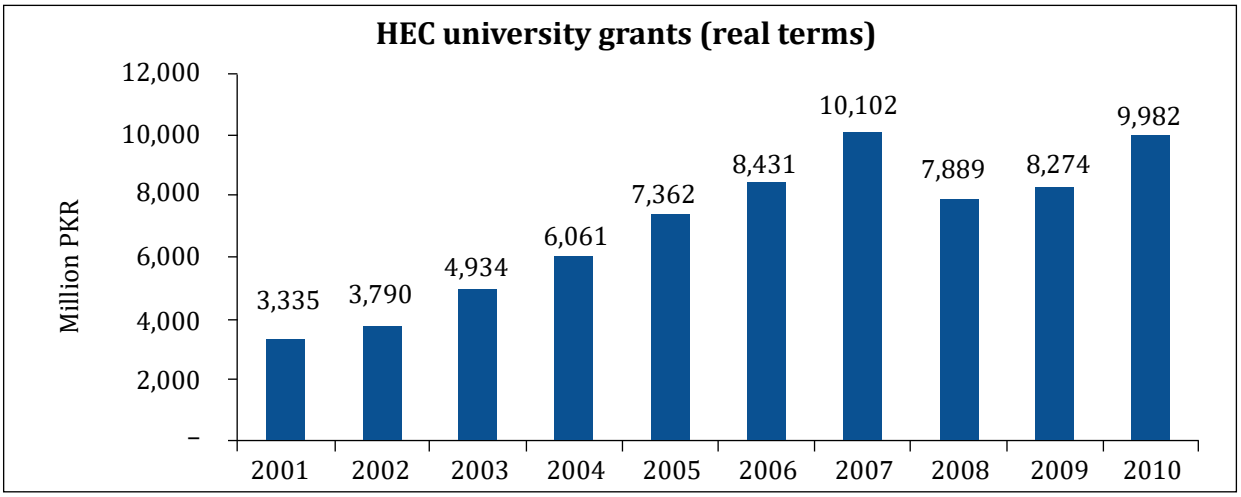


Figure 57: HEC university grants

Sources of Revenues of Private-sector HEIs

Major sources of revenue for private-sector HEIs are the fees collected by these institutes from the students. There is a wide range of fees charged by these institutes based on the discipline and the degree of the program. The ability to increase tuition fees is decreasing over time due to increased competition between these HEIs, which is putting pressure on the revenue streams of the private-sector HEIs.

Allocation of R&D Budgets

At a sector level, the HEC has increased its budgetary allocation for research and development activities. A record of PKR 20 billion budget was allocated to R&D activities primarily for the research of more than 12,000 enrolled PhD scholars in the year 2014 [13].

Social Factors

Overall Higher Education International Ranking

At an international level, only six Pakistani universities were placed among the top 800 universities in the world ranking published by Quacquarelli Symonds (QS) in 2014–15. All of these universities were ranked below 500, which shows a relatively lower quality of higher education in Pakistan.

Ranking on the Key Indices

Pakistan is ranked 126th out of 140 on the Global Competitiveness Index; 131st out of 141 on the Innovation Index; and 146th on the Global Human Development Index. These ranking indicate very poor quality of human resource developed by the education system of Pakistan.

Population Increase and Demographics

Pakistan is the sixth most populated country in the world with an estimated 200 million people. Currently, the population is increasing at a rate of 2% per annum. The literacy rate of Pakistan increased from 44% in 1998 to 57% in 2009. Literacy rate among the female population was 45%, which was much less than that for the male population (69%), showing gender disparity to a large extent. Internationally, Pakistan was ranked 180th in the world ranking of literacy rate in the year 2013. More than 40% of the population is below the age of 24, and around 40% of its population lives in the urban areas, as compared to 33% in 2001. This increase in population, the increased literacy rate, and the increased urbanization will together lead to increased demand for education, especially for higher education in Pakistan in future.

Enrollment Projections for HEIs

Historically, Pakistan's enrollments increased from 124,000 in year 2001 to 1.8 million in 2014, posting a staggering growth of 21% during the period [3]. This increase in enrollments

reflects the increased interest of the Pakistani people in education, especially in high education, and was possible due to educational reforms. The data on the enrollments in HEIs is shown in Figure 58.

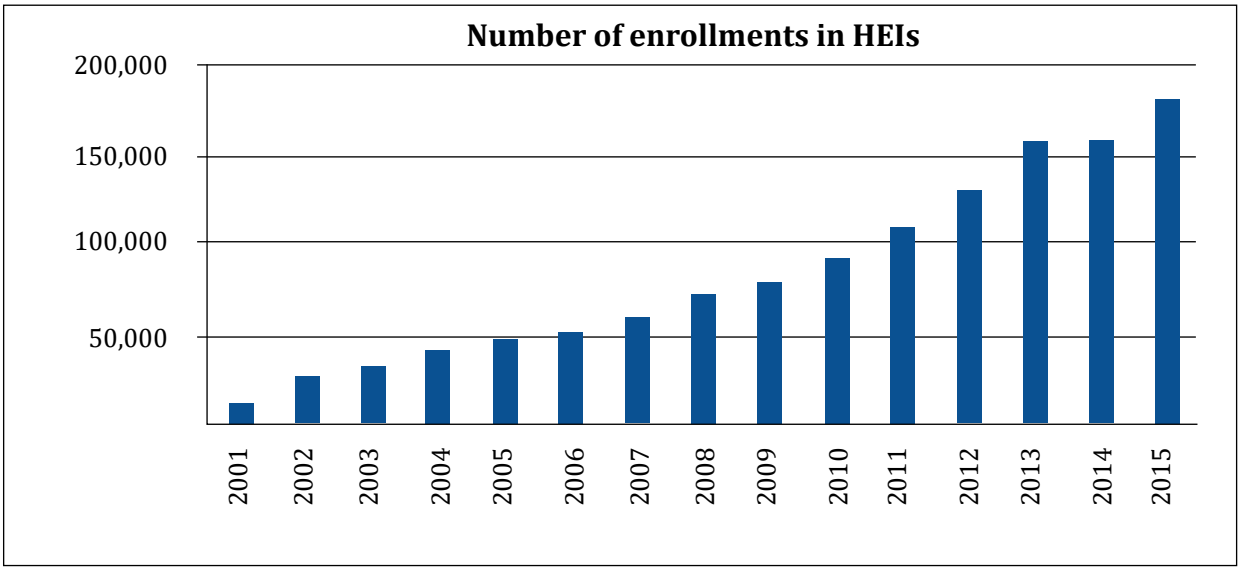


Figure 58: Enrollments in HEIs

The growth rate of enrollments is expected to continue in future as more and more people in Pakistan are increasingly accepting the benefits of higher education.

Social Awareness and Increased Urbanization

In 2001, only 33% of the population lived in the urban areas. This increased to 40% in 2014, which shows increased urbanization in Pakistan [3]. The per capita income has also increased from US$900 in 2005 to US$1,512 in 2015. The enrollments in education are increasing at a rate of more than 20%, reflecting that Pakistan is becoming more socially aware and responsible.

PRODUCTIVITY CONTEXTS AND CONSIDERATIONS

This model helps explain indicators that help define and operate productivity of higher education. Through this model, we analyzed the inputs that are provided in the higher education; the processes that are adopted during the course of higher education; and the outcomes that are affecting the productivity of the higher education sector in Pakistan. These affects are analyzed at international, national, sectoral, institutional, departmental, instructional, and individual levels. Here are the key preliminary findings based on our research:

Inputs

Following are the input factors that directly affect the productivity of higher education with reference to Pakistan.

Institutional Classification

The institutional classification factor is related to types of HEIs such as public sector, private sector, distance learning, formal education institutes, and federal and state-level institutes. In Pakistan, there were only two educational institutes, out of 161, involved in distance learning in 2014–15. The ratio of public-sector and private-sector universities was around 50:50 in 2005–06, based on the data available. Similarly, the number of universities specifically for women increased to six in 2005–06. The administrative policies of universities are controlled at both federal and provincial levels for a large number of universities. The growth in number of universities and DAIs, both in public and private sectors, is shown in Figure 59.

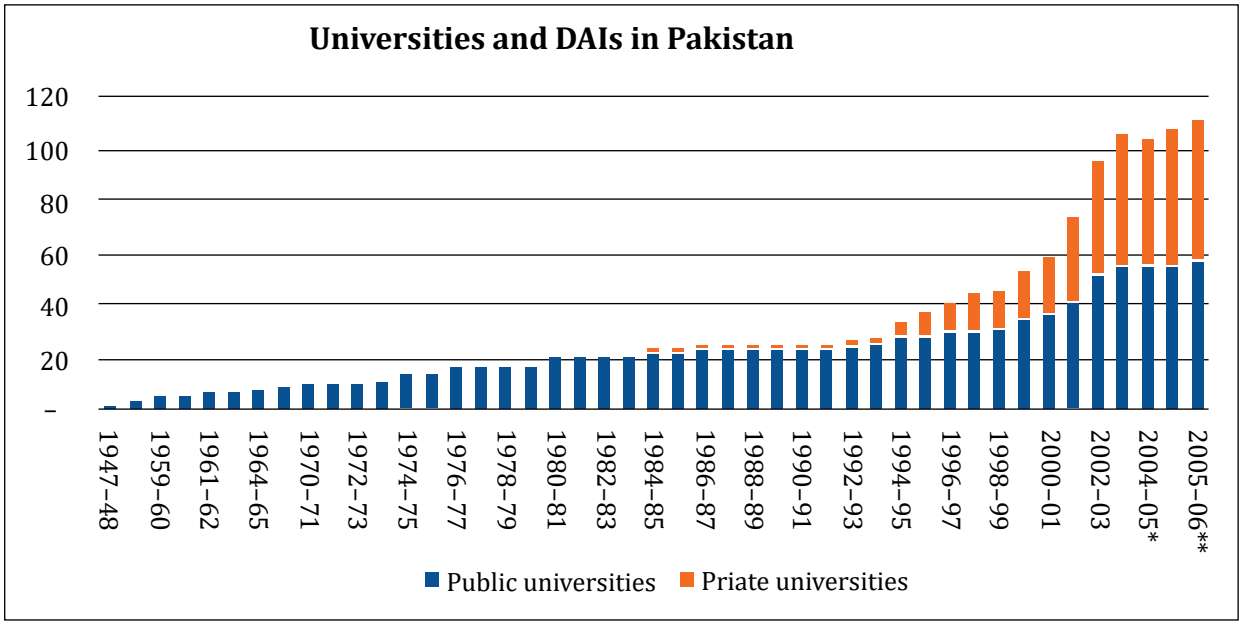


Figure 59: Growth in the number of universities and DAIs in Pakistan

System Regulations

Almost all the universities are controlled by HEC which is a functionally autonomous body created through the constitutional amendment. The power of the HEC comes from the HEC Ordinance 2002 and the Federal Universities Model Ordinance 2002. The HEC has the power to make, modify, and update the rules and regulations applicable to the higher education subsector and universities all over Pakistan. It has drafted rules regarding quality assurance, minimum criteria for the faculty, entry requirements for students, and minimum capital and manpower requirements, which are applicable to all the universities whether in public sector or private sector.

Government Income versus Private Income

These are input resources available at an institutional level. As discussed earlier, all the public-sector universities are dependent on government funding but there is no such facility for the private-sector universities. The revenue structure of the public sector HEIs is shown in Table 24.

Table 24: Revenue structure for public-sector HEIs

Spending indicator	Fiscal year				
	2002	2003	2004	2005	2006
Total revenues (PKR million)	6,653	7,731	10,800	13,394	18,644
HEI government revenues (PKR million)	3,513	4,104	6,285	7,948	11,716
HEI non-government revenues (PKR million)	3,140	3,627	4,516	5,446	6,928
Nominal revenue per student (PKR)	50,309	49,557	59,857	65,641	82,219
Real revenue per student (PKR 2001/02)	50,309	48,066	55,521	55,718	65,749
Government revenues/total revenues (%)	53%	53%	58%	59%	63%
Non-government/total revenues (%)	47%	47%	42%	41%	37%

Source: World Bank [17]

Resource and Capital Requirements

At the department level, the HEC has laid down detailed capital and human resource requirements for establishing a new university or a DAI in Pakistan. The salient features of these requirements are as below:

- For a new university having more than four departments:
  - The capital required is PKR 200 million, of which PKR 50 million is for endowment fund; PKR 100 million is for physical assets; and PKR 50 million is for working capital.
  - At least 24 full-time faculty members should be there, of which six should be PhDs.
  - The student-teacher ratio should be 1:20 in case of science subjects and 1:30 for all other subjects.
  - The administrative staff ratio should be 1:2
  - 10% of the budget should be for research activities.
  - 10% of the budget should be for scholarships.
  - A gross area of at least 10 acres and covered area of 100 sq. ft. per student is required.
  - The library should have at least 1,500 books, along with subscriptions to a minimum of 15 journals having impact factors of at least 1.0
  - Requirements regarding labs, workshops and internet services should be met.
  - A rating system (star rating) for public awareness of the HEIs should be in place.

- For DAIs:
  - The capital required is PKR 50 million, of which PKR 15 million is for the endowment fund; PKR 25 million is for physical assets; and PKR 15 million is for working capital.
  - At least six full-time faculty members should be there, of which five should be PhDs.
  - The student-teacher ratio should be 1:20 in case of science subjects and 1:30 for all other subjects.
  - The administrative staff ratio should be 1:2
  - 10% of the budget should be for research activities.
  - 10% of the budget should be for scholarships.

- A gross area of at least 3.33 acres and a covered area of 100 sq. ft. per student is required.
- The library should have at least 1,500 books, along with subscriptions to a minimum of 15 journals having impact factors of at least 1.0
- Requirements regarding labs, workshops and internet services should be met.
- A rating system (star rating) for public awareness of the HEIs should be in place.

Teaching and Support Costs

These input factors include the cost of teaching and related support activities in the HEIs. At this moment no tangible data is available from the public sources. The student-teacher ratio has improved a bit over the years, which was around 23 students per teacher in 2001–02 and became 19 students per teacher in 2011–12. The student-teacher ratio history is provided in Figure 60.

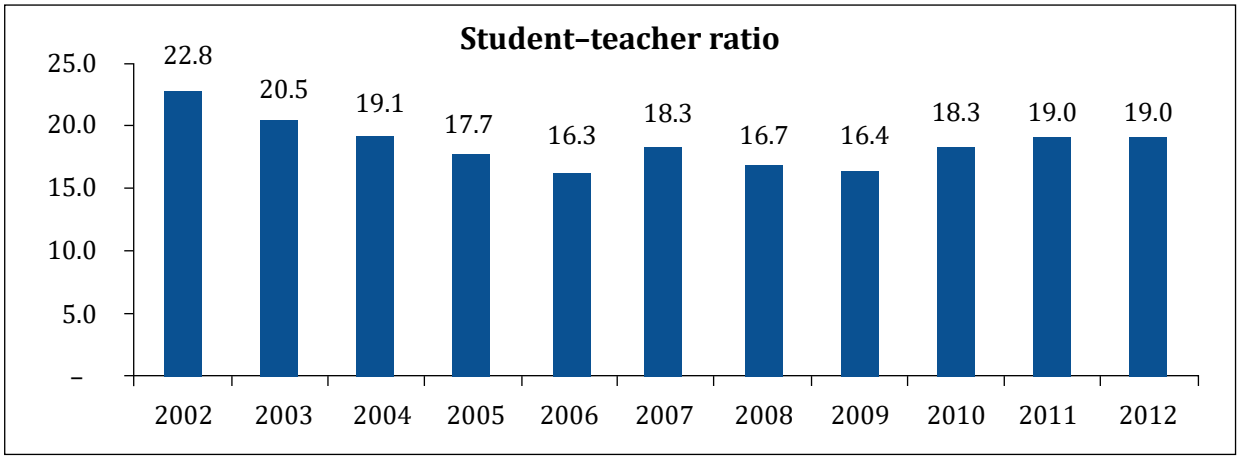


Figure 60: Student–teacher ratio

Teacher Characteristics

This input factor discusses the quality and attributes of the faculty e.g. ratio of full-time and part-time faculty; qualification of faculty such as PhD, MS, and Master's; and experience of the faculty. Based on data provided by the HEC, the ratio of PhD faculty was around 27% in the year 2013. This ratio was less for the private-sector universities in particular. The data related to full-time faculty, part-time faculty, and experience of the faculty was not readily available. Table 25 summarizes the data related to qualification of the faculty.

Table 25: Ratio of Phd and Non-PhD faculties in HEIs in Pakistan in 2013

University	Faculty			PhD (%)
	PhD	Non-PhD	Total	Faculty
Public	7,449	16,891	24,340	31%
Private	1,804	8,300	10,104	18%
Overall	9,253	25,191	34,444	27%

Source: HEC

Student Preparedness and Ability

Students are required to fulfill a minimum set of criteria in order to be eligible for admissions in HEIs. This criterion varies based on the level of a degree program. Table 26 summarizes the criteria set by the HEC in the Pakistan Qualification Framework document for each level of a degree program.

Table 26: HEC qualification criteria: Pakistan Qualification Framework - entry requirement for higher education

Degree	Entry requirement	Level	Duration (years)	Credit hours	System
Two-year Bachelor's (Pass) Degree	HSSC/FSc/FA/A' level. (Level-04)	5	Two		Annual
Three-year Bachelor's (Hons) Degree	HSSC/FSc/FA/A' level. (Level-04)	5	Three		Annual
Associate Degree	HSSC/FSc/FA/A' level. (Level 04)	5	Two	64	Semester
Bachelor's Degree	HSSC/FSc/FA/A' level. (Level 04)	6	Four to five	120	Semester
Bachelor's Degree (One to two years MA/MSc)	BA, BSc, Bcom, BBA (three years), BCS	6	One to two		Annual
Master's Degree (MS, M-phill)	124 credit hours after HSSC	7	1.5 to two	30	Semester
Doctoral (PhD)	Minimum CGPA 3.0 out of 4 in Masters Degree	8	Minimum four to five		

Source : HEC, Pakistan Qualification Framework

Student Entry Pathways

A number of higher education qualification options are available to students in Pakistan. Higher education is considered from Level 5 Bachelor's degree as per the Pakistan Qualification Framework developed by the HEC. This includes Level 5 Associate Bachelor's degree with a study duration of two years; Level 6 Bachelor's degree with duration of four years; Level 7 Master's degree with a duration of four years; and Level 8 Doctoral degree with a minimum duration of four to five years. The following figure provides a snapshot of the qualification framework in Pakistan.

	Years	Levels	Award type	Award example
Primary level		1	Primary (1–5 years)	
		2	Middle (Three years)	
Matriculation level	9	3	Secondary School Certificate (SSC)	Matric
	10			
Intermediate level	11	4	Higher Secondary School Certificate (HSSC)	F.A, F.Sc, ICS, I.Com, DBA, D.Com etc
	12			
Higher education level	13	5	Associate Ordinary Bachelor	BA/BSc (Pass), ADE, Associate Degrees, etc.
	14			
	15	6	Bachelor's	BS, BE, BArch, BSc (Engg.), BSc (Agri), MA/MSc (16 year), LLB, BCom (Hons) MBBS, DVM, PharmD, etc.
	16			
	17	7	Master's	MPhil/MS/MBA, MSc (Engg.), ME
	18			
	19	8	Doctoral	PhD
	20			
	21			

Source : HEC, Pakistan Qualification Framework

Figure 61: Entry pathways for higher education in Pakistan

The Processes

Quality Assurance

As discussed earlier, the HEC introduced the QAA for the purpose of improving the quality of education by HEIs at a sectoral level during 2005. The main objective of the agency is to improve the compatibility and competitiveness of the existing programs run by the HEIs at international levels. The system of quality assurance is implemented at the following two levels:

Internal quality assurance: All the HEIs are required to have Quality Enhancement Cells (QECs) that are responsible for monitoring the quality of the programs run by the HEIs on a periodic basis. For this purpose, a quality assurance manual has been developed by the HEC

that has been followed to generate the quality-related reports. The HEIs are encouraged to perform their quality evaluation on self-assessment basis and identify the deficiencies.

External quality assurance: For the purpose of external quality assurance, the HEC has formed different accreditation councils that are responsible for external evaluation of the programs run by HEIs. Some of these councils are discipline-specific, such as:

- National Computer Education Accreditation Council (NCAEAC), which is responsible for monitoring all programs relating to computer education run by all HEIs.
- National Business Education Accreditation Council (NBEAC), which is responsible for monitoring all programs relating to business education run by all HEIs.
- National Accreditation Council for Teacher Education (NACTE), which is responsible for monitoring all programs relating to teachers' education run by all HEIs.
- Pakistan Engineering Council (PEC).
- Pakistan Medical and Dental Council (PMDC).
- National Agriculture Education Council (PAEC).
- Pharmacy Council of Pakistan (PCP).
- PhD Review Committee, which is responsible for monitoring the quality of the PhD programs run by the HEIs.

Technology System

Since its inception, the HEC has invested a huge amount in the technological improvements. The Pakistan Research repository was established in 2004; a plagiarism detection tool was implemented during 2007; National Data Center and Enterprise Resource planning was established in 2008; Pakistan Educational and Research Network (PERN) was launched in 2009; and educational web TV was launched in 2016 [8]. All public and private universities are provided with broadband internet that can be used for education and research activities.

Credit Hours per Qualification

A national qualification framework has been defined by the HEC that specifies the minimum credit hours required for different degree programs [12]. Following are some examples:

- PhD programs require 18 credit hours of course work with dissertations.
- MS programs require 30 credit hours of course work with thesis.
- BS programs require 124–140 credit hours of course work.

The Outcomes

International Ranking

Despite all of the inputs and strengthening of the processes, none of the HEIs are included among the top 500 universities in the world university ranking for 2015–16. Only five universities are among the top 800, which signifies a lower outcome when compared with other HEIs in the world [2].

National Ranking

The HEC started ranking the universities based on predefined criteria during 2010. The universities are ranked based on their educational and research activities. The objective of the ranking is to start a competitive culture that would help project the Pakistani universities in the international environment [9]. This initiative can help improve the quality of activities as undertaken by the HEIs in the long run.

Accountability Instrument

Pakistan is one of those countries where the accountability and governance structure is weak. It was ranked 117th out of 168 on the Corruption Perception Index 2015 [15]. Many of the public-sector universities are plagued with the same problem and there is an excessive amount of political intervention that leads to a poor governance structure [10].

Financial Position

As discussed above, the budget allocation for higher education increased from PKR 22 billion in 2005 to PKR 41 billion in 2012, resulting in more allocation to the HEIs for the purpose of improving the quality of higher education. Similarly, the assets of the HEIs have also increased, thus reflecting the improved financial health of the public-sector institutes. The situation for the private sector universities is not that good, as they are dependent on the private parties for the funds. However, the minimum capital requirement and minimum endowment fund requirements are there to improve the situation. All the universities are subject to financial audits so that compliance can be assured.

Graduate Numbers

Over a period of time, the graduate numbers have improved a lot as there is little attrition. The employment rate for graduate students is relatively high and there is an increased demand for the higher education in Pakistan (Naeem ur Rehman Khattak, et al., 2012).

MODELING PRODUCTIVITY IN SELECTED INSTITUTIONS

Analytical Approach

Generally, productivity can be measured by the output produced by the entity against the input that has been deployed for the purpose of generating that output. The outputs of the HEIs can be measured in terms of two activities:

- Education outcomes, which are related to the efficiency and effectiveness of the delivery of knowledge.
- Research outcomes, which are related to the efficiency and effectiveness of the creation of knowledge.

So for the purpose of this research, we have focused on both and tried to capture these output variables as effectively as possible. The relevant time period for which this data was collected was 2010–15. The education outcomes were measured through the following:

- Course work completed during a year.
- Graduate employment percentage within six months to one year of graduation.
- Credit hours completed during the year.
- Learning outcomes achieved (%).

The variables were selected such that the efficiency and effectiveness of the knowledge delivery process could be determined. The variables regarding the course work and credit hours completed during the year measure the efficiency of the education activities undertaken by the HEI. The effectiveness of the education process was gauged through the graduate employment percentage and percentage of learning outcomes achieved (measured through the learning goals achieved for each program divided by the number of learning goals defined for the program). Higher percentages indicate higher degrees of effectiveness of the educational activities.

The research outcomes are measured through the following:

- Number of publications.
- Number of citations.
- Number of patents.
- Research completions.
- Research funds.

The above-mentioned variables are selected to gauge the efficiency and effectiveness of the research activities undertaken by the HEIs. The number of publications and research projects completed are used to measure the efficiency. More number of publications and more number of research completions will indicate the higher efficiency of research activities. On the other hand, the number of citations, the number of patents and the amount of research funds secured are used to gauge the effectiveness of the research activities, as more number of citations and patents indicate the superior quality of the research work undertaken by the HEIs.

The input variables are measured through:

- Labor cost, which is measured through the nominal amount paid to the faculty and the related teaching staff in terms of salaries, allowances, and honorarium during a year.
- Capital cost, which is measured through the value of infrastructure as defined in the balance sheet for the year. It includes the value of land, building, equipment, and other infrastructures.
- Intermediaries cost, which includes the reoccurring overhead cost for support activities spent by the HEIs, such as utilities, maintenance, repairs, and all other support function costs incurred during a year.

Data regarding these input and output variables was difficult to obtain as the universities across Pakistan are not required to make this information public. While some of the universities, both public and private, publish this information in their annual reports on a voluntary basis, that is not good enough. A variety of techniques were used to assemble information for the purpose of this research. There are a significant number of estimates involved that may lead to an incorrect inference and misleading conclusion. The assumptions, the data used, and the degree of estimates are discussed as under:

- Course work completed is the number of graduates produced by the HEI and this information is declared in the annual reports of some of the HEIs.
- Graduate employment rate is an approximate rate that is provided by the HEIs in their annual reports or on their websites.
- Credit hours delivered is an estimate as no university has declared this information, and it is calculated based on the following assumptions:
  - The number of students that are enrolled in the university during a year as declared in the annual report.
  - The number of courses that are required to be taught in a university program during a semester as fixed by the HEC. There are estimated to be four courses in a semester for a standard undergraduate degree program.
  - A normal course is assumed to be of three credit hours but there are instances where some universities offer four credit-hour courses as well.
  - The total number of credit hours are computed as a product of the number of students enrolled during the entire year, the estimated number of courses taught by the university during a semester, and the assumed credit hours per course.
- There was no data provided on the percentage of learning outcomes completed during the year.
- The number of publications included the research papers and conference papers, as declared in the annual report or on the website of the HEI.
- There was no data available regarding the number of citations.
- No information was provided regarding the number of patents registered by the HEIs.
- The number of research projects undertaken was declared in the annual report but the data was missing for some years for different universities.
- The research funds included the amount secured from the government, other non-governmental agencies and endogenous funds generated by the HEIs as declared in the annual reports. The data was missing for some years for different universities.

The methodology used for calculating the productivity index can be explained with the help of Table 27.

Table 27: Details of productivity calculations

Composite	Data element	Unit	Ref No.	Calculation steps	Notes
Education outcomes	Coursework completions	Number	1		Raw data collected from primary or secondary sources
	Graduate employment	Percent	2		Raw data collected from primary or secondary sources
	Credit hours	Hours	3		Raw data collected from primary or secondary sources
	Learning outcomes	Percent	4		Raw data collected from primary or secondary sources
Research outcomes	Publications	Number	5		Raw data collected from primary or secondary sources
	Citations	Number	6		Raw data collected from primary or secondary sources
	Patents	Number	7		Raw data collected from primary or secondary sources
	Research completions	Number	8		Raw data collected from primary or secondary sources
	Research funds	PKR	9		Raw data collected from primary or secondary sources
Inputs	Labor	PKR	10		Raw data collected from primary or secondary sources
	Capital	PKR	11		Raw data collected from primary or secondary sources
	Intermediaries	PKR	12		Raw data collected from primary or secondary sources
	Total	PKR	13	Ref 10+11+12	Raw data collected from primary or secondary sources

(continued on next page)

(continued from previous page)

Composite	Data element	Unit	Ref No.	Calculation steps	Notes
Inputs	Labor	Weight	14	10/13	Weights pooled across years for each income stream
	Capital	Weight	15	11/13	Weights pooled across years for each income stream
	Intermediaries	Weight	16	12/13	Weights pooled across years for each income stream
Education outcomes	Coursework completions	Indicator	17	Current year value/ previous year value of ref # 1	Calculates index for year-on-year change.
	Graduate employment	Indicator	18	Current year value/ previous year value of ref # 2	Calculates index for year-on-year change.
	Credit hours	Indicator	19	Current year value/ previous year value of ref # 3	Calculates index for year-on-year change.
	Learning outcomes	Indicator	20	Current year value/ previous year value of ref # 4	
Research outcomes	Publications	Indicator	21	Current year value/ previous year value of ref # 5	Calculates index for year-on-year change.
	Citations	Indicator	22	Current year value/ previous year value of ref # 6	
	Patents	Indicator	23	Current year value/ previous year value of ref # 7	
	Research completions	Indicator	24	Current year value/ previous year value of ref # 8	Calculates index for year-on-year change.
	Research funds	Indicator	25	Current year value/ previous year value of ref # 9	Calculates index for year-on-year change.
Inputs	Labor	Indicator	26	Current year value/ previous year value of ref # 10	Calculates index for year-on-year change.
	Capital	Indicator	27	Current year value/ previous year value of ref # 11	Calculates index for year-on-year change.
	Intermediaries	Indicator	28	Current year value/ previous year value of ref # 12	Calculates index for year-on-year change.

(continued on next page)

(continued from previous page)

Composite	Data element	Unit	Ref No.	Calculation steps	Notes
Education outcomes		Indicator	29	Average (17,18,19,20)	Assumes equal weighting of data elements in each of the composite indicators
Research outcomes		Indicator	30	Average (21,22,23,24,25)	Assumes equal weighting of data elements in each of the composite indicators
Inputs		Indicator (weighted)	31	Weighted geometric average of input weights ref 14,15,16 and indicator values of ref 26,27,28	Weighted geometric average
	Proportion inputs to education		32	Default assumption of 85%	Default assumption is 50% (0.50)
Education productivity		Ratio	33	Ref 29 / (31*32)	Calculates productivity ratio index
Research productivity		Ratio	34	Ref 30 / (31*(1-32))	Calculates productivity ratio index
Academic productivity		Ratio	35	Average (33,34)	Calculates productivity ratio index
Education productivity		Percentage	36	Current year value/ previous year value of ref # 33	Calculates productivity change index
Research productivity		Percentage	37	Current year value/ previous year value of ref # 34	Calculates productivity change index
Academic productivity		Percentage	38	Current year value/ previous year value of ref # 35	Calculates productivity change index

Below is a list of HEIs for which data was available:

1. Comsats Institute of Information Technology (CIIT).
2. Institute of Management Sciences (IMS).
3. University of the Punjab.
4. Lahore university of Management Sciences (LUMS).
5. Institute of Business administration (IBA).
6. Institute of business administration Sukkar.

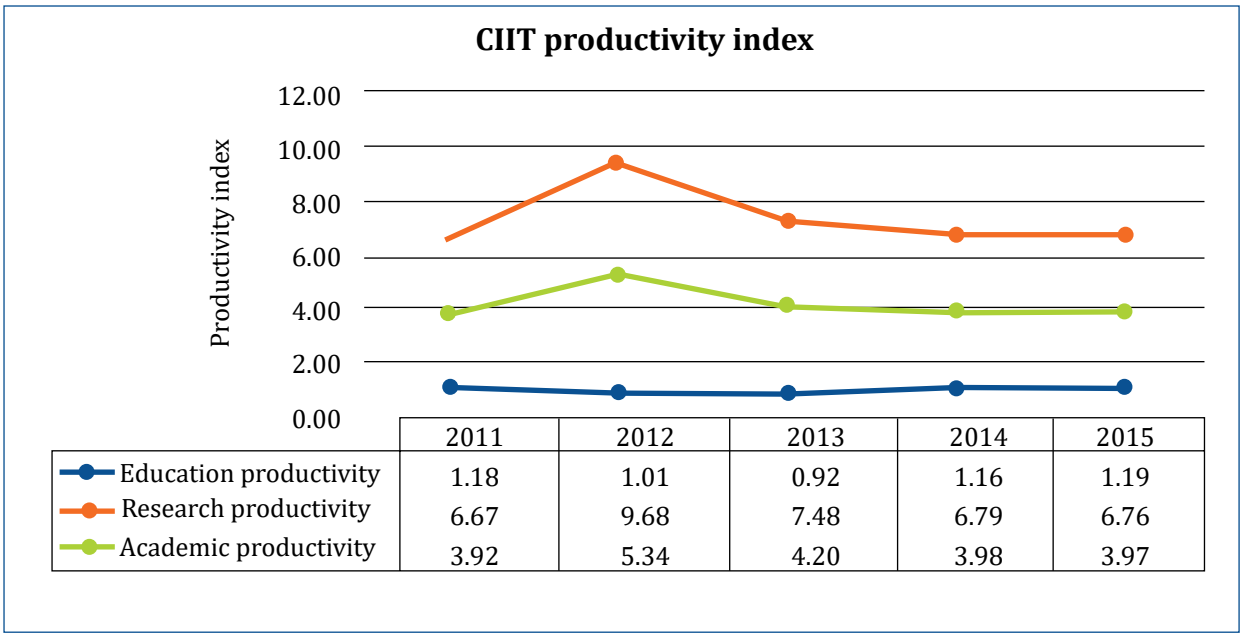
We considered these HEIs as the representative institutes from Pakistan and the conclusion about Pakistan's higher education progress will be discussed based on this. Our key findings regarding the productivity of the HEIs, based on the proposed productivity indicator, are discussed in the following sections.

Comsats Institute of Information Technology

CIIT is a multi-campus university and was established in 1998 as a project of Commission of Science and Technology for Sustainable Development in South (COMSATS). It was awarded the charter of university in 2000. Currently, the university has eight campuses all over Pakistan and has around 37,570 registered students and 3,118 faculty members. The total number of graduates produced was 34,144 as of 2015 including 119 PhD students [1]. For the purpose of our research, we collected CIIT data from 2010 to 2015 as shown in Table 28. Figure 62 shows the trends in the proposed productivity indicator for CIIT.

Table 28: CITT productivity data

Data element	Unit	2011	2012	2013	2014	2015
Coursework completions	Number	5,621	5,729	4,551	3,741	4,859
Graduate employment	Percent	85	85	85	85	85
Credit hours	Hours	224,532	228,828	274,320	352,296	450,876
Learning outcomes	Percent					
Publications	Number	321	703	611	945	874
Citations	Number	-	-	-	-	-
Patents	Number	-	-	-	-	-
Research completions	Number	4	7	15	18	11
Research funds	PKR	150,000,000	180,000,000	234,000,000	105,260,000	216,700,000
Labor	PKR	1,684,195,000	2,212,729,000	2,632,460,000	3,013,780,000	3,627,969,000
Capital	PKR	3,500,000,000	3,884,525,827	5,155,509,844	5,244,109,866	5,798,732,576
Intermediaries	PKR	909,246,000	1,094,914,000	1,429,539,000	1,389,655,000	1,981,228,000
Total	PKR	6,093,441,000	7,192,168,827	9,217,508,844	9,647,544,866	11,407,929,576

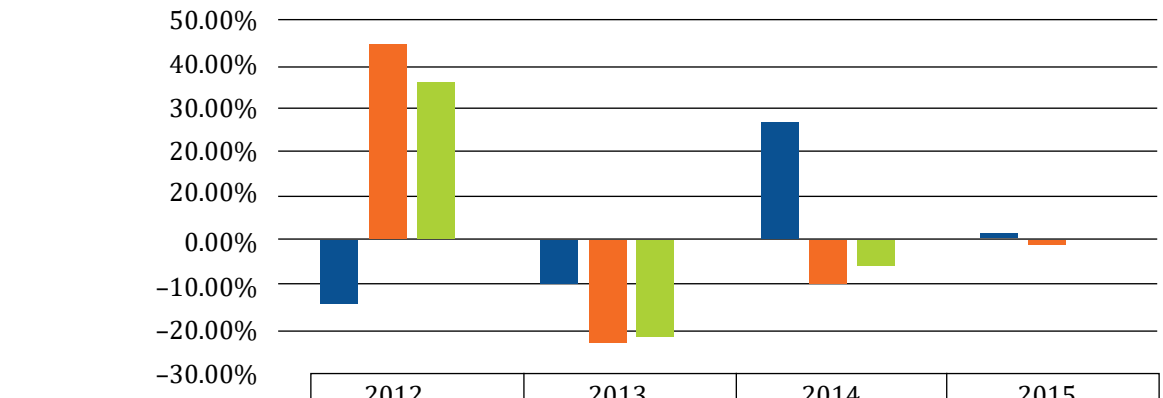


	2011	2012	2013	2014	2015
Education productivity	1.18	1.01	0.92	1.16	1.19
Research productivity	6.67	9.68	7.48	6.79	6.76
Academic productivity	3.92	5.34	4.20	3.98	3.97

Figure 62: Productivity indicators for CIIT

The data analysis shows that the education productivity of the institute was relatively stable (1.18 in 2011 and 1.19 in 2015), though a decline was observed in 2012 and 2013, when the education productivity was 1.01 and 0.92, respectively. As discussed earlier, the education productivity index shows the relationship between the education outcome in relation to the inputs dedicated for the education activities. The sudden drop in education productivity in 2012 is because the education output increased by 1% as measured through education outcome indicators, whereas the inputs increased by 18% as measured through education input indicators. Similarly, in 2013, the education outcome indicator has shown no growth even though the decrease in course work completed was outweighed by the increase in credit hours completed. This was because the overall education input indicators showed a growth of 28%. Overall, the course work completed decreased from 5,729 in 2012 to 4,551 in 2013, whereas the credit hours increased steadily from 228,828 in 2012 to 274,320 in 2013 mainly due to opening of the new campuses of the university in different cities. However, the input variables showed an increase in inputs from PKR 7 billion in 2012 to PKR 9.2 billion in 2013. This increase in inputs and decrease in outputs resulted into an overall decrease in the education productivity of CIIT in 2013. The situation, however, improved in the subsequent years.

Similarly, the research productivity peaked in 2012 to 9.68 as compared to 6.67 in 2011, but then declined to 6.76 in 2015. The reason behind the increase in research productivity in 2012 was the increase in research publications from 321 in 2011 to 703 in 2012, apart from the increase in number of research completed from four in 2011 to seven in 2012. This also pushed the overall academic productivity to a high level in 2012 as both educational and research productivity have equal weights in overall academic productivity. The research productivity deteriorated gradually in the following years due to the fact that inputs dedicated to research (assumed to be 15% of the total inputs) increased steadily but the research output did not increased at same pace. This resulted in the overall decrease in academic productivity. The overall increase or decrease in the education and research productivity can be observed in Figure 63.



	2012	2013	2014	2015
Education Productivity	–14.20%	–9.27%	27.07%	1.97%
Research Productivity	45.16%	–22.74%	–9.23%	–0.46%
Academic Productivity	36.25%	–21.47%	–5.27%	–0.11%

Figure 63: Productivity status of CIIT

As discussed earlier, the education productivity decreased in 2012 due to greater increase in inputs and lesser increase in outputs. Both education and research productivity decreased in 2013 as there was 28% increase in inputs but a corresponding increase in output was not there. The overall research productivity also dropped due to the decrease in number of publications. In 2014, the major factor behind the increase in education productivity was the increase in credit hours completed, while the research productivity decreased due to a smaller increase in output as compared to the rise in input.

Institute of Management Sciences

IMS was established in 1995 with a strength of 195 students and was awarded the university status in 2002. The main strength of the institute is its business school but the institute also provides education in the areas of computer science, engineering, and economics, among others. In 2013, the institute had around 2,800 students registered with it and had 90 faculty members. IMS offers both undergraduate programs and graduate programs to the students. Table 29 shows data collected for the period of 2010 to 2013 for IMS. Figure 64 shows the trends in the productivity indicators for IMS.

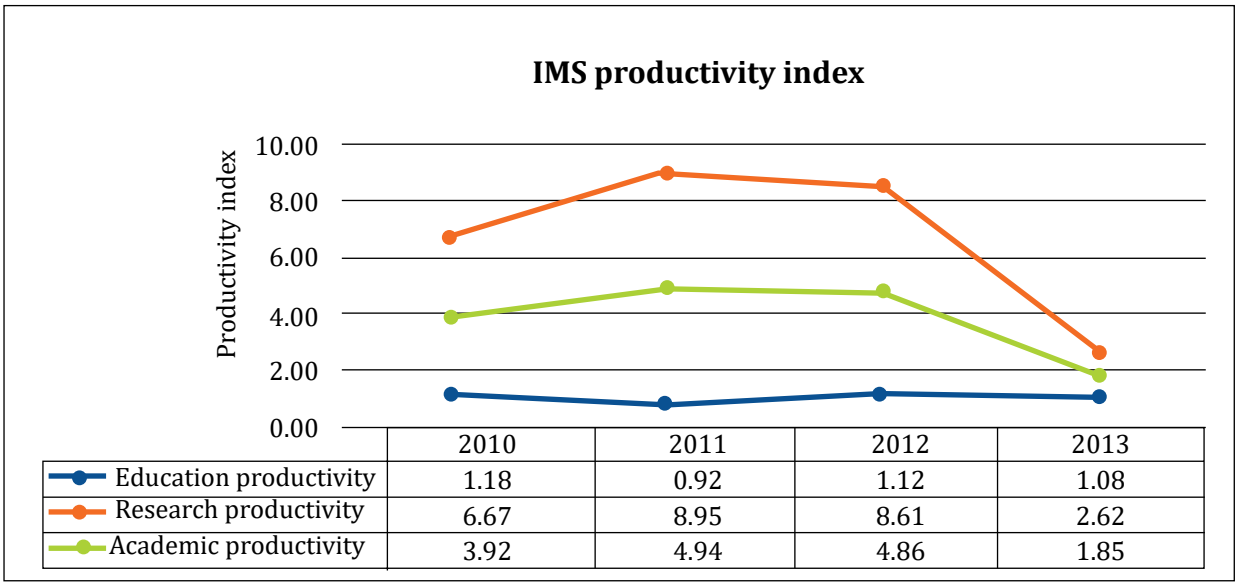
Table 29: IMS productivity data

Data element	Unit	2010	2011	2012	2013
Coursework completions	Number	830	853	862	833
Graduate employment	Percent	80	80	95	95
Credit hours	Hours	33,216	34,116	34,488	33,324

(continued on next page)

(continued from previous page)

Data element	Unit	2010	2011	2012	2013
Learning outcomes	Percent				
Publications	Number	72	62	59	57
Citations	Number				
Patents	Number				
Research completions	Number	8	14	23	4
Research funds	PKR	28,359,000	74,500,000	130,270,000	15,400,000
Labor	PKR	54,156,267	86,407,020	110,313,059	132,322,576
Capital	PKR	439,038,054	606,525,430	649,506,452	667,048,856
Intermediaries	PKR	75,265,437	48,252,805	71,297,753	89,024,126
Total	PKR	568,459,758	741,185,255	831,117,264	888,395,558

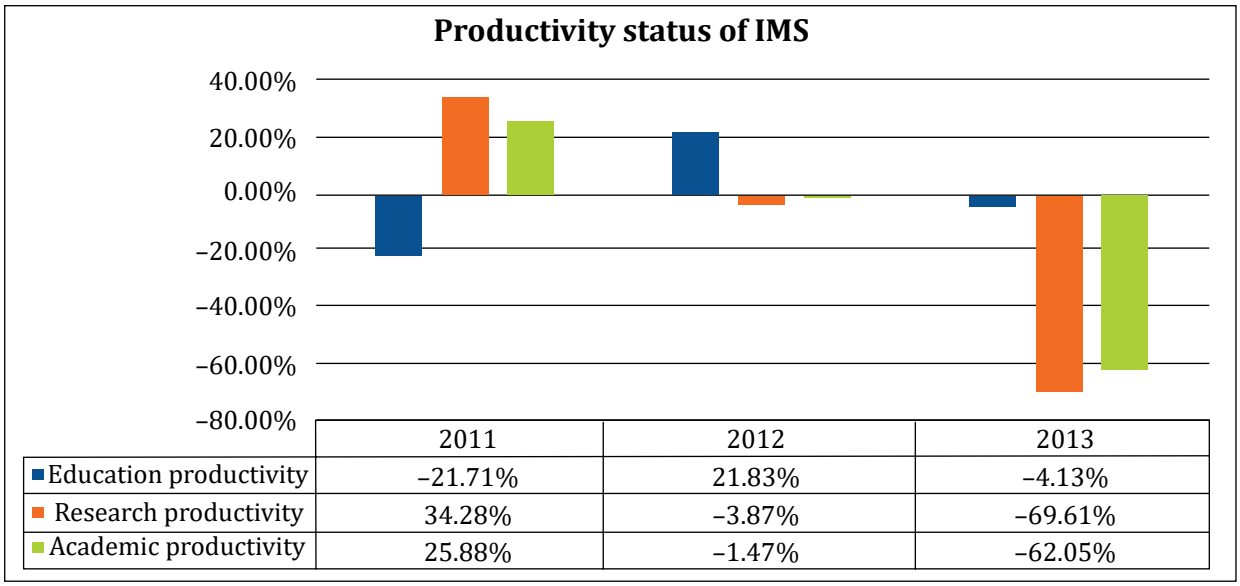


	2010	2011	2012	2013
Education productivity	1.18	0.92	1.12	1.08
Research productivity	6.67	8.95	8.61	2.62
Academic productivity	3.92	4.94	4.86	1.85

Figure 64: Productivity indicator for IMS

It may be observed that the education productivity of the IMS is relatively stable during the period 2010 to 2013. The value of inputs increased from PKR 568 million in 2010 to PKR 888 million in 2013, which amounts to posting an increase of around 45% over the period. However, the increase in the number of graduates was not in the same proportion. The number of graduates increased from 830 in 2010 to 862 in 2012 but again dropped to 833 during 2013. Similarly, the credit hours completed increased from 33,216 in 2010 to 34,448 in 2012, but came down to 33,324 in 2013. The major reason behind the relative improvement in productivity during 2012 over 2011 was the increase in graduate employment percentage which improved from 85% to 95%, as claimed by the university. The positive effect created by graduate employment percentage outweighed the negative impact created by all other factors in education productivity index resulting in the seemingly stable overall index.

On the research side, the overall research productivity showed a declining trend as the index dropped from 6.67 in 2010 to 2.62 in 2013. This was because the number of research publications decreased from 72 in 2010 to 57 in 2013, while the number of research completed decreased from eight in 2010 to four in 2013, even though it had gone up to 23 in 2012. The overall research productivity index decreased as the inputs of the university increased but there was a comparative decrease in the output. The overall increase or decrease in education productivity and research productivity can be observed from Figure 65.



	2011	2012	2013
Education productivity	–21.71%	21.83%	–4.13%
Research productivity	34.28%	–3.87%	–69.61%
Academic productivity	25.88%	–1.47%	–62.05%

Figure 65: Productivity status for IMS

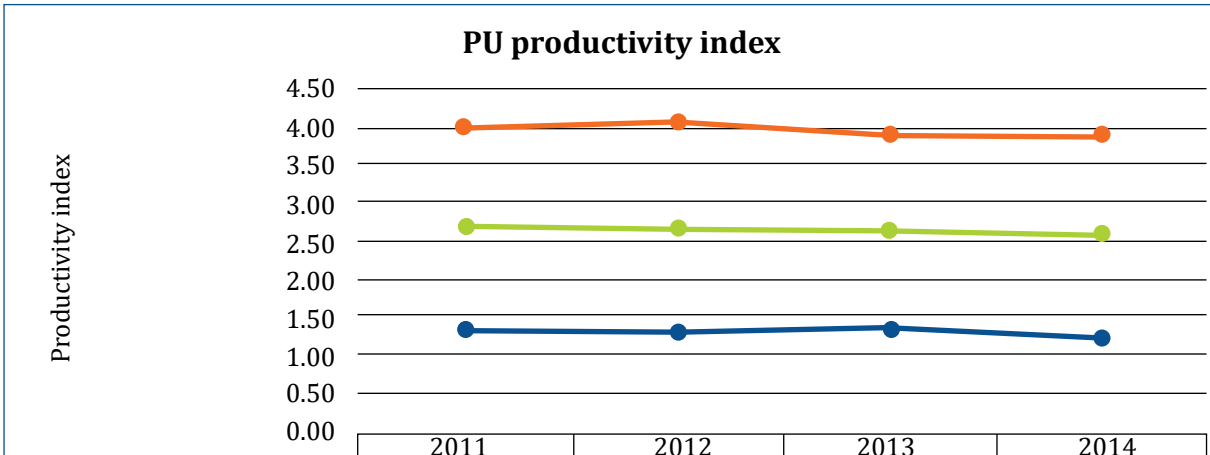
In 2011, the education output indicator index showed an increase of 2% whereas the inputs increased by 30%, which led to a decline in the educational productivity percentage. However, the research productivity increased by 75% in the same period, resulting in an increase in overall academic productivity. This led to an increase in the education and research productivity ratios to 0.92 and 8.95, respectively, as shown in Figure 64. Similarly, in 2012, the educational productivity ratio increased to 1.12, from 0.92 in 2011 but the research productivity ratio dropped to 8.61 as compared to 8.95 in 2011. This resulted in a substantial increase in educational productivity but a marginal decrease in research productivity. In 2013, the research productivity dropped to 2.62 from 8.61 because of the reasons stated earlier, which resulted in a huge decrease in the research productivity percentage by 69.61%. This resulted in a decrease of the overall academic productivity as well.

University of the Punjab

The University of the Punjab (PU) is one of the oldest and largest public HEIs of Pakistan, established in 1882 in the city of Lahore. The university has five campuses, 13 faculties, five colleges, 73 departments, and 614 affiliated colleges. It provides educational facilities to both on-campus and off-campus students and has more than 800 full-time faculty and researchers as well as over 36,000 registered on-campus students [16]. The university offers a wide range of higher education programs at undergraduate, graduate, and postgraduate levels. Table 30 shows data for the period 2011–14 collected for PU. Figure 66 shows the trends in the proposed productivity indicators for PU.

Table 30: PU productivity data

Data element	Unit	2011	2012	2013	2014
Coursework completions	Number	7,655	8,315	9,237	9,778
Graduate employment	Percent				
Credit hours	Hours	367,416	399,096	443,376	469,356
Learning outcomes	Percent	0	0	0	0
Publications	Number	916	1,087	1,009	1,176
Citations	Number	0	0	0	0
Patents	Number	0	0	0	0
Research completions	Number	300	313	351	396
Research funds	PKR	70,000,000	85,000,000	100,000,000	100,000,000
Labor	PKR	5,030,000,000	5,500,000,000	6,093,000,000	6,093,000,000
Capital	PKR	3,800,000,000	4,000,000,000	4,000,000,000	4,900,000,000
Intermediaries	PKR	0	0	0	0
Total	PKR	8,830,000,000	9,500,000,000	10,093,000,000	10,993,000,000

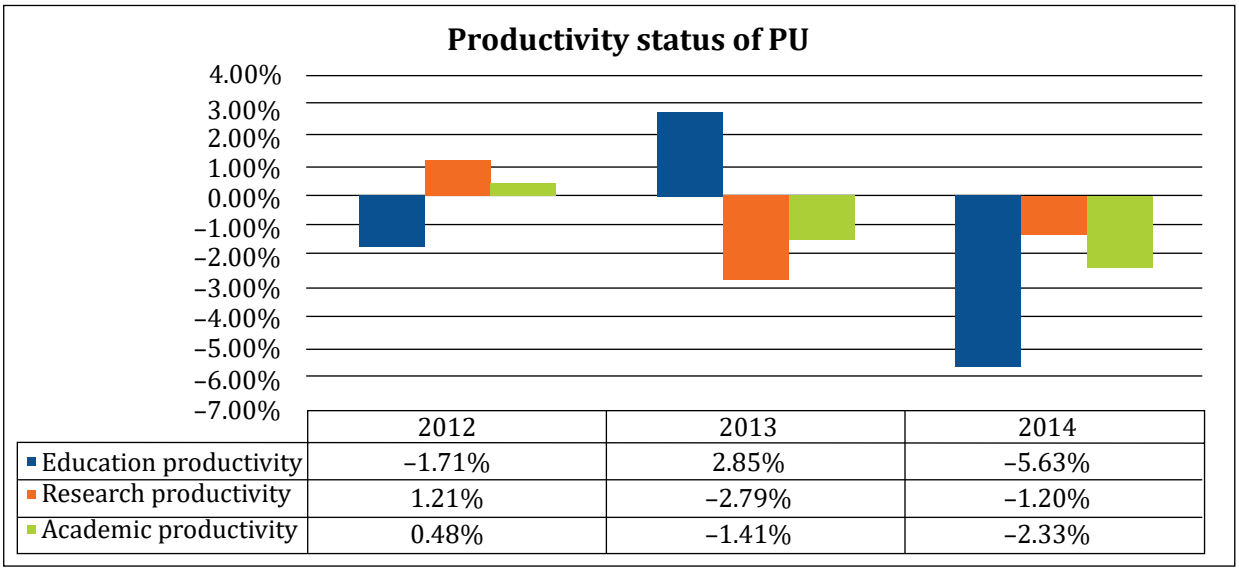


	2011	2012	2013	2014
Education productivity	1.33	1.31	1.35	1.27
Research productivity	4.00	4.05	3.94	3.89
Academic productivity	2.67	2.68	2.64	2.58

Figure 66: Productivity indicator for PU

The education productivity index has shown overall stable results for PU. The value of the inputs has increased from PKR 8.8 billion in 2011 to PKR 10.9 billion in 2014, thus posting an increase of 25% over the period of four years. The educational output of the university increased in line with the input. The number of credit hours increased from 367,416 in 2011 to 469,356 in 2014, thus posting an increase of around 28%. The number of course work completed also increased at the same rate, thus contributing to the overall stable rates of PU's education productivity index. On the research side, the number of publications increased from 916 in 2011 to 1,176 in 2014, thus posting an increase of 28% during the

said period. The number of research completed increased from 300 in 2011 to 396 in 2014, which amounted to an increase of 32%; whereas the overall research fund increased from PKR 70 million to PKR 100 million during the same period, thus posting an increase of 42%. PU is oldest institute in Pakistan with well-developed faculty and a culture of research. The university also has its own research fund, which gives ground to the assumption that the university is dedicating much higher resources to the research activities. Due to this very reason, we have assumed that 25% of the total inputs are dedicated to research activities as compared to 15% in all other cases. The overall increase or decrease in the education and research productivity can be observed from Figure 67.



	2012	2013	2014
Education productivity	–1.71%	2.85%	–5.63%
Research productivity	1.21%	–2.79%	–1.20%
Academic productivity	0.48%	–1.41%	–2.33%

Figure 67: Productivity status of PU

Lahore University of Management Sciences

LUMS was awarded the charter in 1985 and is considered a top-ranking private business school in Pakistan. Currently, LUMS has five schools providing education in the fields of management, computer sciences, engineering, humanities, and law. Around 3,600 students were registered in LUMS, based on an annual report. LUMS offers undergraduate, graduate and postgraduate programs in these fields. The university provides information to the public on voluntary basis in the form of annual reports, which, however, were available only from 2010 to 2014. The first batches of humanities and social sciences graduated only in 2012, while the school of law was inaugurated during 2015, which resulted in a sudden increase in the registered number of students. Table 31 shows data collected for LUMS from 2010 to 2014. The overall academic performance can be analyzed with the help of Figure 68.

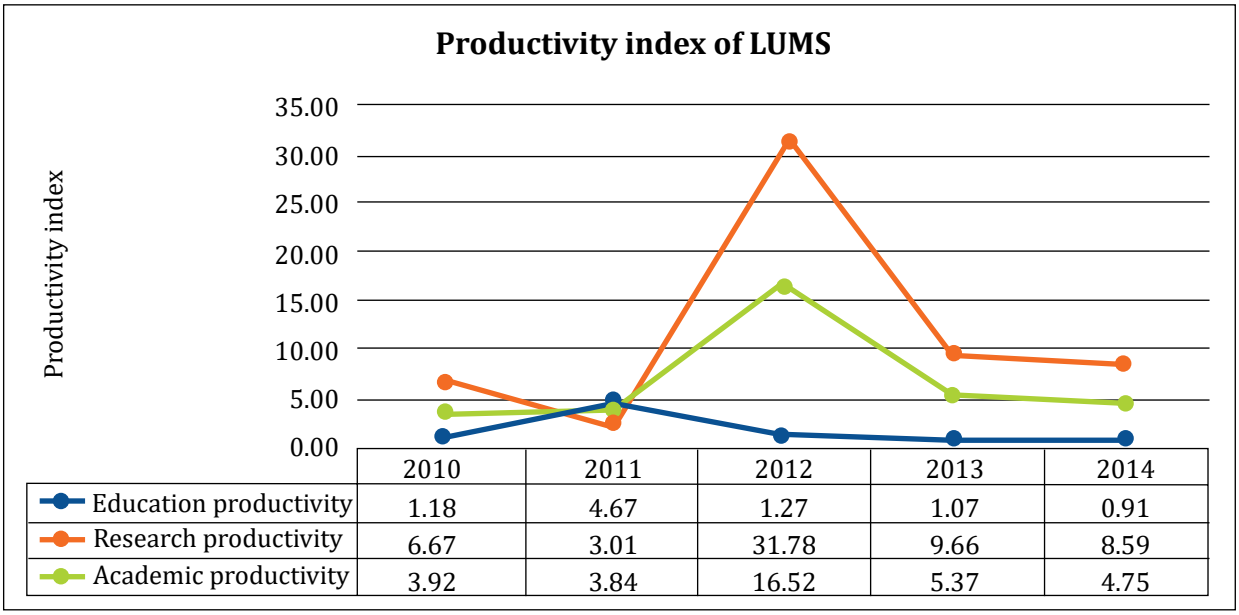
Table 31: LUMS productivity data

Data element	Unit	2010	2011	2012	2013	2014
Coursework completions	Number	128	746	933	1,126	1,078
Graduate employment	Percent	99	99	99	99	99

(continued on next page)

(continued from previous page)

Data element	Unit	2010	2011	2012	2013	2014
Credit hours	Hours	5,112	29,856	37,320	45,024	43,128
Learning outcomes	Percent					
Publications	Number	25	12	62	112	181
Citations	Number	-	-	-	-	-
Patents	Number	-	-	-	-	-
Research completions	Number			35	-	57
Research funds	PKR			410,680,000	-	169,976,294
Labor	PKR	604,196,000	693,742,000	789,000,000	975,000,000	1,152,000,000
Capital	PKR	2,000,000,000	2,000,000,000	2,171,000,000	2,611,000,000	3,372,000,000
Intermediaries	PKR	846,045,000	976,339,000	1,018,000,000	1,374,000,000	1,697,000,000
Total	PKR	3,450,241,000	3,670,081,000	3,978,000,000	4,960,000,000	6,221,000,000

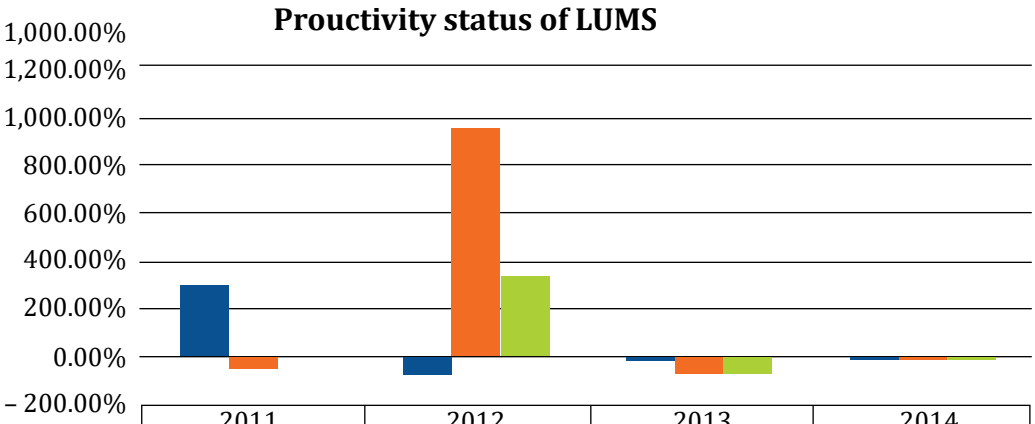


	2010	2011	2012	2013	2014
Education productivity	1.18	4.67	1.27	1.07	0.91
Research productivity	6.67	3.01	31.78	9.66	8.59
Academic productivity	3.92	3.84	16.52	5.37	4.75

Figure 68: Productivity indicators for LUMS

The overall education productivity index shows a mixed performance with a slight increase in 2011 but an overall decreasing trend till 2014 when the index dropped to 0.91. The value of the inputs increased from PKR 3.4 billion in 2010 to PKR 6.22 billion in 2014, thus posting an increase of 80% during this time period. The educational output also improved considerably as the number of students registered increased from 3,110 in 2012 to 3,594 in 2014. This number was very low in 2010, which was due to the introduction of new disciplines in the university. While the number of graduates produced also increased considerably during the said period, the overall education performance of the university went down because the increase in inputs was greater than the increase in output. The number of graduates finally decreased in 2014 to 1,078 from 1,126 in 2013, resulting in a decline in the educational productivity in 2014.

The research performance of the university as shown by the research productivity index is not reliable, as the reports only provide data for years 2012 and 2014 regarding number of research completion and research funds. This data is missing for the rest of the years, which results in a high research productivity during 2014. If we consider overall research publications as only research productivity factor, then the number of research publications has increased from 25 in 2010 to 181 in 2014, thus posting an increase of more than 700%. The overall increase or decrease in the education and research productivity can be observed from Figure 69.



	2011	2012	2013	2014
Education productivity	297.37%	–72.91%	–15.23%	–15.07%
Research productivity	–54.88%	956.35%	–69.61%	–11.06%
Academic productivity	–2.04%	330.09%	–67.52%	–11.46%

Figure 69: Productivity status of LUMS

The overall increase in the educational productivity of the LUMS in 2011 is due to the increase in the course work and credit hours completed as a result of the introduction of new disciplines as cited above. Similarly, in 2012, a huge growth in research productivity was due to a significant increase in research funds and research projects completed, which also led to an overall increase in the academic productivity. However, the education productivity decreased by 72.91% as the education productivity index came down to 1.27 in 2012 from 4.67 in 2011.

In 2013, the research productivity decreased by almost 70% as research productivity index slid to 9.66 in 2013 from 31.78 in 2012, since there were no research funds and research projects completed. In 2014, the education productivity decreased by 15% while research productivity decreased by 11% because there was a decrease in education output as measured through the education output index (from 1.07 in 2013 to 0.91 in 2014). This was attributed to the slight decrease in the number of course works and the number of credit hours completed.

Institute of Business Administration

IBA was established in 1956 as a part of the Karachi University, and was given the status of a degree awarding institute in 1994. IBA is considered to be one of the premium institutes for

business education in Pakistan but now offers undergraduate, graduate, and postgraduate programs in mathematics, business studies, and computer sciences. As per the available reports, IBA had around 2,000 students registered with it at the end of 2013. For the purpose of our research, we have collected the data of IBA from 2010 to 2013, as reproduced in Table 32. The overall academic productivity index, along with the education productivity index and the research productivity index, is shown in Figure 70.

Table 32: IBA productivity data

Data element	Unit	2010	2011	2012	2013
Coursework completions	Number	662	525	291	283
Graduate employment	Percent	75	75	85	85
Credit hours	Hours	24,084	25,020	23,652	20,376
Learning outcomes	Percent				
Publications	Number	11	80	106	64
Citations	Number		-		
Patents	Number		-		
Research completions	Number		-		
Research funds	PKR		-		
Labor	PKR	295,944,000	339,973,000	436,167,000	457,115,000
Capital	PKR	651,000,000	432,000,000	776,000,000	953,000,000
Intermediaries	PKR	269,865,000	412,597,000	511,575,000	689,819,000
Total	PKR	1,216,809,000	1,184,570,000	1,723,742,000	2,099,934,000

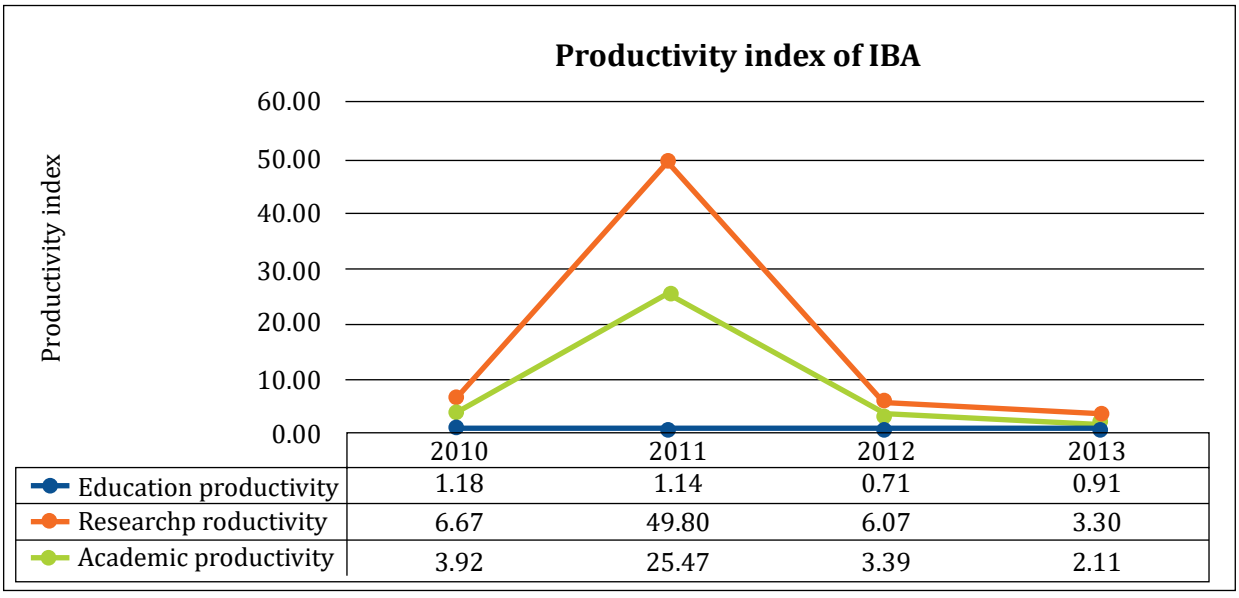
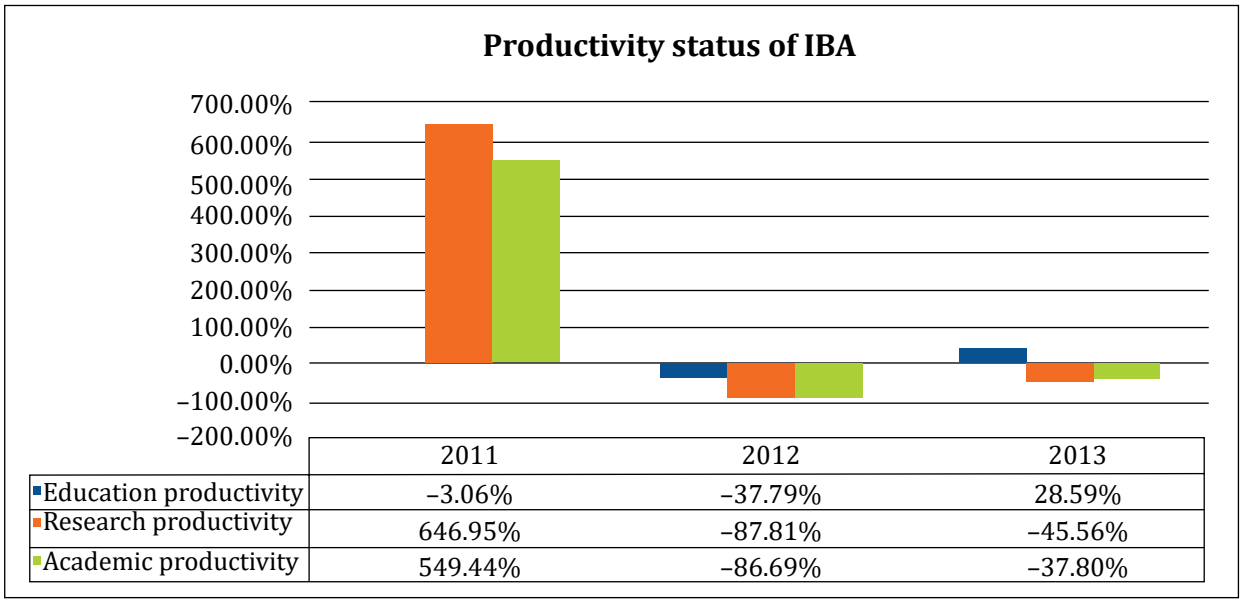


Figure 70: Productivity indicators of IBA

The education productivity index showed a negative trend as it decreased from 1.18 in 2010 to 0.91 in 2013. The major reason behind this decrease in productivity was that the value of inputs increased from PKR 1.2 billion in 2010 to PKR 2.1 billion in 2013, thus posting an increase of 73% whereas the educational output decreased over the same time period. The number of graduates decreased from 662 in 2010 to 283 in 2013, while the number of credit hours completed decreased from 24,084 in 2010 to 20,376 in 2013. The only factor that created a positive effect on educational productivity was that the graduate employment rate increased from 75% in 2010 to 85% in 2013.

This increase in inputs and decrease in outputs created a negative effect on the educational productivity. Considering the research productivity index, it can be observed that the research productivity increased from 6.67 in 2010 to 49.80 in 2011 but after that there was a sharp decline in research productivity to 3.30 in 2013. This movement in research productivity can be attributed to the fact that while the input increased (assuming that 15% of the total inputs are dedicated to research activities), the overall research output decreased. The number of research publications increased from 11 in 2010 to 80 in 2011 but decreased to 64 in 2013. There was no data available on the research funds secured by the university. The overall increase or decrease in education and research productivity can be observed from Figure 71.



	2011	2012	2013
Education productivity	-3.06%	-37.79%	28.59%
Research productivity	646.95%	-87.81%	-45.56%
Academic productivity	549.44%	-86.69%	-37.80%

Figure 71: Productivity status of IBA

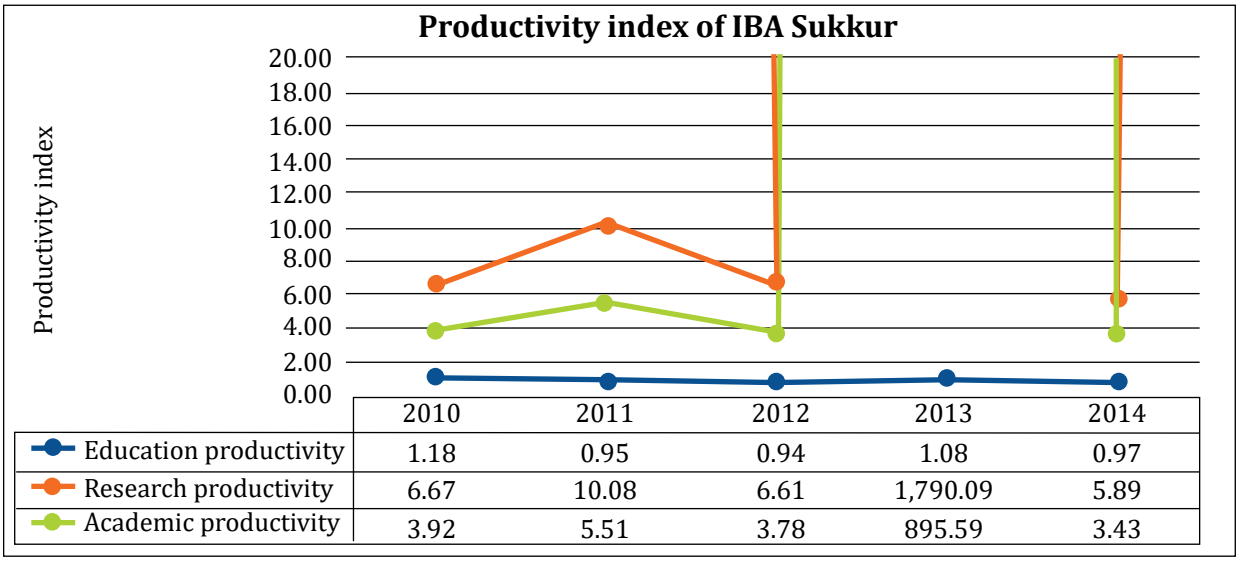
The huge increase in research productivity growth in 2011 was due to an increase in number of publications from 11 in 2010 to 80 in 2011, as cited above. The huge decline in education productivity in 2012 was due to the decrease in number of course work and credit hours completed. Research productivity change showed a negative trend due to the slow pace of research as compared to the previous year where the index declined to 1.33 in 2012 from 7.27 in 2011. In 2013, the overall education index increased from 0.71 in 2012 to 0.91 in 2013, thus resulting in a positive change in the education productivity index. On the other hand, the research output index decreased from 6.07 in 2012 to 3.30 in 2013, resulting in a decrease in the research productivity index by 45.56%.

Institute of Business Administration Sukkur

IBA Sukkur was established as an affiliated college of IBA Karachi in 1994. This college was promoted to a degree-awarding institute afterwards when the provincial government awarded the charter to the institute. IBA Sukkur has more than 3,400 students registered with it, and initially it provided business education in Pakistan but now offers undergraduate, graduate, and postgraduate programs in mathematics, business studies, and computer sciences. Table 33 shows data collected for IBA Sukkur from 2010 to 2013. The overall academic productivity index, along with the education productivity index and research productivity index, is shown in Figure 72.

Table 33: IBA Sukkur productivity data

Data element	Unit	2010	2011	2012	2013	2014
Coursework completions	Number	676	707	751	891	1,019
Graduate employment	Percent	90	90	90	90	90
Credit hours	Hours	27,036	28,296	30,048	35,652	40,752
Learning outcomes	Percent					
Publications	Number	27	52	67	63	107
Citations	Number					
Patents	Number					
Research completions	Number	-	-	2	16	12
Research funds	PKR	-	-	200,000	195,000,000	211,310,000
Labor	PKR	43,800,000	81,320,000	121,670,000	163,410,000	248,380,000
Capital	PKR	100,000,000	100,000,000	100,000,000	100,000,000	100,000,000
Intermediaries	PKR	92,710,000	119,840,000	169,580,000	214,550,000	288,870,000
Total	PKR	236,510,000	301,160,000	391,250,000	477,960,000	637,250,000

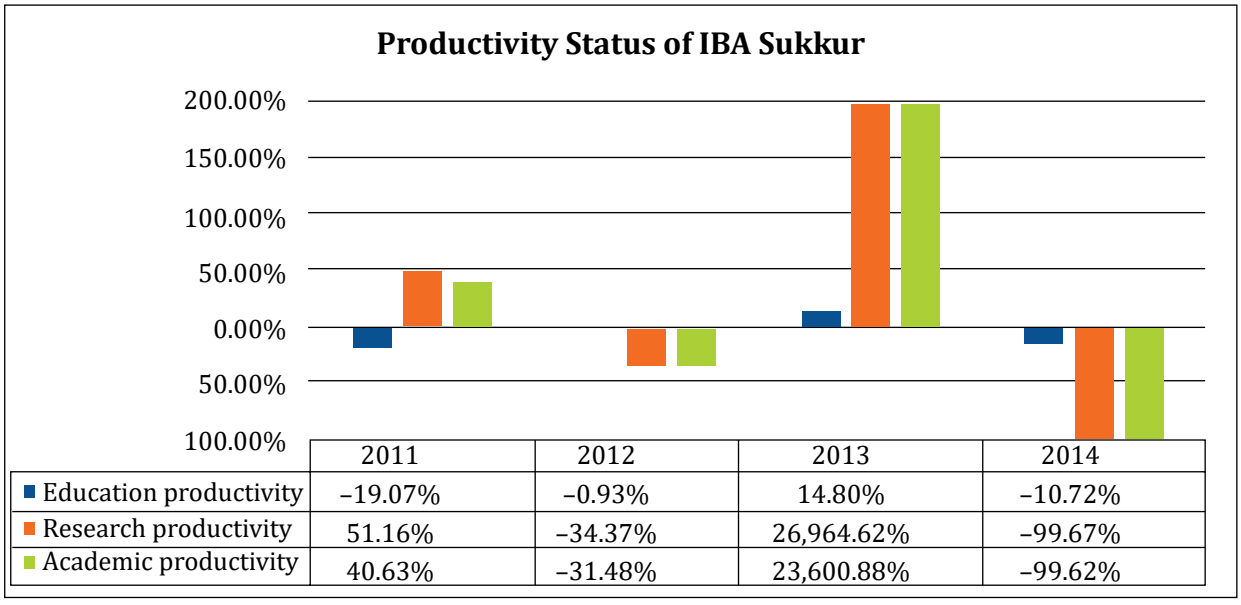


	2010	2011	2012	2013	2014
Education productivity	1.18	0.95	0.94	1.08	0.97
Research productivity	6.67	10.08	6.61	1,790.09	5.89
Academic productivity	3.92	5.51	3.78	895.59	3.43

Figure 72: Productivity indicators for IBA Sukkur

It can be observed that the overall productivity of the educational activities decreased from 1.18 in 2010 to 0.97 in 2014. The reason behind this decrease was that the amount of inputs increased from PKR 236 million in 2010 to PKR 637 million in 2014, thus posting an increase of around 170% during the period. However, the educational output did not increase by a comparable extent. The credit hours completed increased from 27,036 in 2010 to 40,752 in 2014, posting an increase of 50%, and the number of course work completed also increased from 676 in 2010 to 1,019 in 2014. This huge increase in inputs and relatively less increase in outputs resulted in a decrease in overall productivity in educational activities. The research productivity index shows a humongous increase from 6.67 in 2010 to 1,791 in 2013 but it subsequently declined to 5.89 in 2014. The huge surge in research activities was due to the factor that IBA was able to secure a research fund for 'carrying out standardized student achievement test Phase 2' from the education department of the Government of Sindh. The grant was of PKR 172 million in 2014 and 124 million in 2013. This increase in research fund in 2013 led to the increase in productivity index for research activities to 1,791 which is quite abnormal. The number of publications has also increased from 27 in 2010 to 107 in 2014.

The overall increase or decrease in education and research productivity can be observed from Figure 73. The huge positive change in research productivity in 2013 was due to the huge increase in research fund from PKR 200,000 in 2012 to PKR 195 million in 2013, but the pace slowed down in 2014, as the increase was limited to PKR 211 million in the year, as cited above.



	2011	2012	2013	2014
Education productivity	–19.07%	–0.93%	14.80%	–10.72%
Research productivity	51.16%	–34.37%	26,964.62%	–99.67%
Academic productivity	40.63%	–31.48%	23,600.88%	–99.62%

Figure 73: Productivity status of IBA Sukkur

THE NEXT FIVE YEARS

Overview

Our research focused on identifying and measuring the overall productivity indicators and utilizing those to formulate a productivity indicator index in a way that it could help us in measuring the overall educational productivity and research productivity. We defined

productivity in terms of output produced as against the input consumed. So far, from the previous discussion, it can be observed that the productivity of the educational institutes declined at bit when measured in terms of the index, even though there was a substantial growth in all the institutes in terms of course work completed, credit hours delivered, and graduate employment. This implies that these institutes consumed more amount of inputs but output production was relatively less.

This proposed educational productivity indicator measures the cost efficiency and effectiveness of the educational activities, which is a major point of concern for educational institutes around the world, both public and private. The cost efficiency and effectiveness was not considered a good thing for educational institutes. However, a harsh economic reality has forced the educational institutes to be both cost efficient and cost effective, as budgetary allocations are becoming scarce in the era of economic downturn and governments are continuously pushing the institutes to generate funds from their own sources. The private institutes don't enjoy the luxury of public funds allocations as they are either dependent on the revenues generated from their own operations or the funds raised through the donor agencies, which are also limited.

Historically, it has been observed that Pakistan has made a tremendous progress in higher education. The number of HEIs has increased during the last 10 years; the number of enrolled students has gone up; and the existing HEIs have enhanced their capacities. Still, there is a huge potential for further growth as Pakistan is a country with a population of more than 200 million and growing, with low literacy rates. The major hindrance in the growth in the higher education sector is the high poverty rate, as around 40% of the people are living below the poverty line and there is a low per-capita income of around $1,400. On the other hand, the higher education costs are ever increasing. This situation can only be handled in either of the two ways:

1. The government provides subsidies or loans for higher education in Pakistan, as is done by the USA and other western countries, which may be a difficult thing to do in the era of economic hardship.
2. Educational institutes become economical for the public in a way that a large part of the population can afford higher education.

The second option can be achieved more easily if these educational institutes become cost-efficient and cost effective. A well-defined productivity indicator can help us to achieve this objective. The following factors can be considered as critical in driving the productivity in future years.

Increasing the HEI Enrollments

The increase in the number of enrollments can have a huge positive impact on the educational productivity index. This can be achieved through the following actions:

- Providing access to higher education for students in less developed areas. This program has already been adopted by some of the universities in Pakistan. For

example, LUMS has launched the National Outreach Program (NOP) to attract students form the underdeveloped areas, which has yielded good results. The scope of the program can be increased to other universities if sponsored by the donor agencies and governments.

- Increasing the diversity of the students that are enrolled in HEIs.
- Giving access to scholarships to students from underdeveloped areas.
- Encouraging existing and new universities to open new campuses in areas where HEIs are not available.
- Increasing the student entry pathways to give better access to students for higher education.
- Improving the social image of the graduates produced by the universities, as some people might think universities as graduate-producing factories that add little value to the lives of graduates if the quality of education is not controlled and effectiveness of the higher education is undermined. If students are prepared in better ways and higher education helps them to improve their standards of living, then people will be more attracted to higher education. This can also be achieved by defining higher programs in ways that these are as per the requirements of the industry.
- Increasing spending in higher education and budgetary allocation for higher education activities.
- Improvements in overall education system, particularly at secondary school and college levels, so that students may be prepared for higher education in a better way. This involves improvements in gross educational infrastructure at the initial education level.

Improving Quality to Meet Industry Needs

The quality of education is a major output that can ensure its cost effectiveness. It can be improved by realigning the degree programs in a way that they can cater to the needs of the industry. This can be achieved in the following ways:

- By getting better understanding of the current industry requirements.
- By improving the industry-academia relationship.
- Developing strong relationships with the alumni as they are the ones who are currently working in the field and understand the requirements of the industry. At the same time, they know the education processes of the HEIs, so they are in a better position to guide the improvements in different areas.
- Obtaining formal feedback from the industry representatives for the HEIs regarding the degree of preparedness of the graduates produced by the HEIs for the purpose of the industry.
- Tracking the current trends, norms and requirements of the industry.

Strong Quality Assurance Process

A strong quality assurance process is necessary to ensure that what is being claimed by the HEIs is actually being done. It also helps to improve the effectiveness of the academic activities. Quality of the HEIs can be managed at the different levels.

At the sectoral level, the quality of the higher education sector can easily be controlled by running a suitable program to monitor the entire system. In Pakistan, QAA has been established to fulfill the purpose. This agency was established to ensure the minimum level of quality for the HEIs. However, the agency is relatively new and is in its learning phase, which leaves room for improvement. If this agency is adequately managed, it can improve all the academic activities performed by the HEIs, including educational activities and research activities.

At the HEI level, the quality enhancement cells are established to ensure the quality of the educational and research activities by HEIs. The scope of this program can be improved in more robust ways so that the ultimate objective of quality education and research activities can be achieved.

At the program level, different accreditation councils are established for accreditation of the programs run by the universities. For example, the Pakistan Engineering Council is responsible for ensuring quality of engineering programs; and Pakistan Medical and Dental Council is responsible for accreditation of the medical schools and colleges. The need of the hour is that the processes remains objective and transparent so that real problems can be identified properly.

It is critical to ensure the quality of the input resources that are being utilized by the HEIs. The most crucial of these is the quality of teachers that are being employed by the HEIs. For this purpose, minimum qualification and work experience can be defined. Similarly, the maximum cap on student-teacher ratio should be defined so that students get proper attention from the teachers. A minimum requirement for infrastructure such as the building, information technology, library, and research tools should also be defined so that students may have access to a minimum standard of facilities at the HEIs.

The quality of education at the secondary school and college levels in also necessary, so that students are properly prepared for higher education. If this is not monitored properly, then the ultimate objective of producing graduates that are suitable for the needs of the industry and feel satisfied with the HEIs, can be difficult to achieve.

Governance and Cost Controls

A strong governance structure is required to ensure that all the input resources are used for the ultimate objectives and are not wasted on extravagant projects that are unnecessary or counterproductive. A strong governance system will ensure the cost efficiencies of the HEIs, and will help control the cost of inputs that ultimately affect the productivity measures such as the ones defined in this research. During the course of research, it was observed that many HEIs are using far more resources, if calculated on per registered student basis, as compared to some others. The cost structure can be improved through economies of scale, so that more number of students are provided educational services by using same level of input resources.

There is also a strong need for accountability instruments and internal control systems to act as deterrents against any misuse of input resources.

Strong Pedagogical Reforms

Pedagogical reforms are necessary for defining the ultimate goals that are to be achieved through a program. This requires defining the learning outcomes for the programs and courses that are being conducted. Currently, Pakistan doesn't have a system that can help improve the programs on these lines. It would help to align the programs run by the local universities with the programs that are considered of international standards, thus resulting in better international recognition, image, and ranking. This can also help in defining learning outcomes at individual course levels, which, in turn, would help in achieving the objective of effectiveness of both the educational and research activities.

Research Rewards, Funds and Grants

Traditionally, the HEIs have focused on the educational activities and not much attention was given to the research activities. This has resulted in very low research output and poor quality of research activities. In recent years, the HEC has asked universities to establish an Office of Research, Innovation and Commercialization (ORIC) at the university level for encouraging research innovation and commercialization of research in the form of patents and other intellectual property rights. The HEC has developed several research funds to support the research activities, and a national research repository has also been established. Till date, there have not been suitable rewards for conducting research activities and very few universities have established research funds of their own, thus resulting in an overall small scale of research activities. This is also evident from data from the HEIs in Pakistan as there was no patent registered by the universities or the faculties during the last ten years. Also, Pakistan's raking in international innovation index is not good.

Improving the rewards in research activities and setting up appropriate research funds can help HEIs to improve their research productivity, which would help in the improvement of the overall academic productivity.

CONCLUSION

Our research focused on developing an appropriate productivity index that could help us in defining the productivity of the HEIs. During the course of this research we tried to develop a productivity index that would help us measure the productivity of the HEIs in terms of the academic productivity index as the indicator of the overall productivity. This academic productivity index was subdivided into two parts, namely the educational productivity index that covers the educational activities, and the research productivity index that covers the research activities. We tried to capture both the efficiency and effectiveness of the academic activities, which helped us to understand the drivers of productivity in a better way. If these drivers are properly monitored and controlled, then it would help to enhance the productivity to even better levels. During the course of the research, we tried to address the following points:

- Why is productivity necessary for the management of educational institutes? The answer is that the harsh economic realities and limited resources forced the HEIs to consider productivity enhancement, otherwise considered a 'no-go area.'

- Is there a single source of productivity? Well, productivity is derived from different sources and there is no single factor that is responsible for productivity improvement. That is precisely the reason why we considered a wide range of factors for a comprehensive indicator. These factors can be controlled at the national level through measures such as quality enhancement, and overall education policies; at the institutional level through governance policies, cost structures, quality enhancement policies, and research policies; and at the program level through program objectives, pedagogical reforms, and learning outcome statements. If a country wants to improve the productivity of its higher education sector, then it has to control all these factors. This can be done through a well-coordinated effort involving all the stakeholders.
- Is quality assessment a key to productivity? The importance of quality can never be underemphasized as without adequate quality controls the whole system of higher education would be like a manufacturing process producing a product in terms of graduates and research that have no value to the economy and the society. This would lead to wastage of resources, which would amount to low productivity. In order to achieve higher productivity in academic activities, the quality of these activities should be measured, controlled, and enhanced. For this purpose, an adequate quality-control plan is very much necessary at various levels of the education system. The measures would include quality policies at the national, institutional, and program levels.

During the course of the project we defined the term productivity and tried to define a suitable productivity indicator. We collected sample data for different HEIs and tried to calculate the productivity index to measure the productivity of the same institutes to get insights into Pakistan's higher education sector. We have analyzed that Pakistan has come a long way forward when we talk about the progress of higher education, but the overall productivity of HEIs has decreased. This is because while more and more inputs have been consumed in terms of costs of labor, capital, and intermediaries, the outputs produced in terms of educational activities of HEIs have not been matching the inputs. While considering the research activities, the overall research productivity index has shown mixed results. There were some years in which the productivity of research activities increased by a huge amount but there were some other years when there was a major decrease as well.

The biggest limitation in this research was the non-availability of data for different factors for measuring the outputs of educational and research activities. These included data about learning outcomes completed; number of patents registered; and the number of citations, among others. This could make it difficult to compare this productivity index to that of some other countries.

REFERENCES

[1] CIIT. (2016). https://comsats.edu.pk. Retrieved Aug 01, 2016, from https://comsats.edu.pk/AboutCIIT/history.aspx

[2] Daily Tribune. (2015). http://tribune.com.pk/story/957651/heres-how-6-pakistani-universities-ranked-worldwide/. Retrieved May 1, 2016, from http://tribune.com.pk/story/957651/heres-how-6-pakistani-universities-ranked-worldwide/

[3] Economic Survey of Pakistan. (2015). Economic Survey of Pakistan,. Islamabad.: Ministry of Finance.

[4] HEC. (2005). hec.gov.pk. Retrieved November 1, 2015, from hec.gov.pk/InsideHEC/Documents/MTDF%202011-15%20FINAL.pdf

[5] HEC. (2015). hec.gov.pk. Retrieved November 1, 2015, from hec.gov.pk

[6] HEC. (2015). hec.gov.pk. Retrieved November 1, 2015, from www.hec.gov.pk/InsideHEC/Divisions/QALI/Others/Pages/StatisticalInformationUnit.aspx

[7] HEC. (2015). hec.gov.pk. Retrieved November 10, 2015, from www.hec.gov.pk/InsideHEC/Divisions/Finance/Documents/TREND%20ANALYSIS%20OF%20TOTAL%20SPENDING%20IN%20HIGHER%20EDUCATION%20SECTOR%20(2006%20-%202010).pdf

[8] HEC. (2016). http://hec.gov.pk/english/pages/home.aspx. Retrieved May 1, 2016, from http://hec.gov.pk/english/pages/home.aspx

[9] HEC Ranking. (2015). www.hec.gov.pk/english/services/universities/Ranking/Pages/Ranking-of-Pakistani-HEIs.aspx. Retrieved May 1, 2016, from www.hec.gov.pk/english/services/universities/Ranking/Pages/Ranking-of-Pakistani-HEIs.aspx

[10] MMS Akhtar. (n.d.). Issues of Universities' Governance in Pakistan. Journal of Elementary Education, 22(2), 81-94.

[11] Naeem ur Rehman Khattak et al. (2012). An Analysis of The Demand For Higher Education in Pakistan With. City University Research Journal, 3(1), XX.

[12] National Qualification Framework. (2015). http://hec.gov.pk/english/services/universities/pqf/Documents/National%20Qualification%20Framework%20of%20Pakistan.pdf. Retrieved May 1, 2016, from http://hec.gov.pk/english/services/universities/pqf/Documents/National%20Qualification%20Framework%20of%20Pakistan.pdf

[13] Onepakistannews. (2014). http://pakistan.onepakistan.com.pk. Retrieved November 10, 2015, from http://pakistan.onepakistan.com.pk/news/city/islamabad/339430-rs-20-bln-allocated-to-hec-for-rdna-told.html

[14] Pakistan Bureau of statistics. (2014). Pakistan Statistical Year book 2013. Islamabad: Government of Pakistan.

[15] Transparency International. (2015). www.transparency.org/country#PAK. Retrieved May 1, 2016, from www.transparency.org/country#PAK

[16] University of Punjab. (2016). http://pu.edu.pk. Retrieved Aug 1, 2016, from http://pu.edu.pk/page

[17] World Bank. (2006). Pakistan: An assessment of Medium Term development Policy Framework. Islamabad: World Bank.

[18] World bank. (2015). worldbank.org. Retrieved October 10, 2015, from http://data.worldbank.org/indicator/SE.XPD.TOTL.GD.ZS

[19] World Bank. (2015). worldbank.org. Retrieved October 10, 2015, from http://data.worldbank.org/indicator/SP.POP.0014.TO.ZS/countries

[20] World bank. (2016). http://data.worldbank.org. Retrieved Aug 1, 2016, from http://data.worldbank.org/indicator/SP.POP.GROW

CHAPTER 8
PHILIPPINES

Conrado E Inigo, Jr[1], Lyceum of the Philippines University, Philippines

EXECUTIVE SUMMARY

The Philippines' higher education sector has too many institutions, predominantly private, which enrolled 3.8 million students and produced 650,000 graduates in 2014. Symptoms of low and uneven quality of educational output include the phenomenon of the educated unemployed in the Philippines labor market and the deskilling of overseas Filipino workers in the global market.

To explain variability in educational productivity, an econometric model is formulated, with quality process as predictors. Alternative models allow for single-period and multi-period analyses, as well as varying specifications of dependent and independent variables. Quality metrics are important determinants of productivity. Output is determined by faculty (quantity, teaching quality, and research quality); and quality processes (licensure performance, accreditation, program excellence, and level of autonomy). However, the level of significance changes with each model specification.

Computation of a three-year total-factor productivity for public higher education institutions (HEIs) is due to the availability of financial data. Productivity is defined as the ratio of output change to input change. States, colleges, and universities (SUCs) experienced a decline in productivity for the three-year period, with the input index growing faster than the output index in the third period.

There is a trend toward the internationalization of program quality assurance. The Commission on Higher Education (CHED) is now developing the Philippine Qualifications Framework (PQF) as a prelude to its entry to the worldwide National Qualification Framework network. This initiative would hasten the internationalization of HEIs and facilitate international mobility of students, workers, and professionals. In contrast, the CHED initiatives toward the advancement of research and innovation among HEIs have a low impact on the higher education research productivity.

Summing up, while the Philippines has a highly-developed quality assurance mechanism for academic programs, there is a need to come up with quality assurance tools for research

[1]I would like to thank my colleagues Dr. Victorina H. Zosa from Lyceum of the Philippines University and Anthony R. Zosa from Ateneo de Manila University for their expertise, support, and assistance in finalizing the data and statistical analysis; Leslie C Magsino, Commission on Higher Education for data collection; and Frida Festejo, Lyceum of the Philippines University for research assistance. I would like to express my sincerest appreciation and heartfelt gratitude to Antonio D. Kalaw Jr., President of Development Academy of the Philippines for my nomination as the national expert for the Philippines for the APO project on Measuring Productivity in Higher Education. Likewise, I am immensely grateful to our Chief Expert, Prof. Hamish Coates, Centre for the Study of Higher Education, University of Melbourne, Australia for his technical expertise in setting directions for this project and his comments on my initial draft. I also thank Jose Elvinia, APO Program Officer for his guidance and moral support in the preparation of the research paper. Thanks and appreciation are also due to my wife, Mayette, my son Christian and my daughter Charmie who patiently endured the preparation of the manuscript in deference to the usual family life.

productivity. As the major players in the knowledge economy, HEIs are compelled to train knowledge workers who can create, invent, and innovate new products and processes. These new products and processes shall be the engines for the nation's growth and sustained development.

One recommendation is that internationally-aligned accreditation be made a minimum requirement for all HEIs. This implies that the various agencies in charge of accreditation (external accrediting bodies, Professional Regulation Commission, and CHED technical panels) are PQF-compliant. A five-year development plan for non-compliant HEIs could be drawn, detailing the roadmap for the adoption of a culture of quality and accreditation in HEIs.

Research should be emphasized in the graduate programs and in the hiring of faculty. Periodic certification of faculty research competence could be considered to ensure continuous skills upgrading. A discipline-based consortium of centers of development (CODs) and centers of excellence (COEs) could replace the Philippine Higher Education Research Network (PHERNet). Also, the Higher Education Regional Research Center (HERRC) could expand its advisory committee to include regional offices of knowledge-generating and knowledge-using national agencies, all PhD researchers, and representatives of local government units to develop and implement region-directed researches. The Department of Science and Technology's regional research consortia could serve as a model.

INTRODUCTION

This research first presents the structure of the Philippines higher education system and then explores the link between the higher education sector and the macro-economy. In particular, it cites the phenomenon of the educated unemployed in the local labor market and deskilling effect of overseas Filipino workers in the global labor market as symptoms of a quality-deficient educational output.

An econometric model is specified to explain variations in educational productivity and output, using data readily available with the CHED. The determinants of productivity are quality process indicators, while faculty inputs and quality process indicators are predictors of educational output. Various specifications, such as the HEI type, presence of excellent programs, extent of autonomy, and use of single and multi-period data, are formulated to ascertain the significance of each productivity and output driver. The analysis, though, is limited to single-factor productivity. A sample computation for multi-factor productivity is presented for public HEIs, since financial data is available for this sector.

Effects of past, current, and future productivity initiatives in the higher education sector are discussed. These initiatives pertain to program accreditation and advancement of research. With the development of the PQF, program accreditation will now adopt international standards. CHED accredited HEI journals to control research quality. A package of research-directed initiatives is unveiled to boost research productivity and spur technological innovations among HEIs.

BACKGROUND

Structure of the Higher Education System

An HEI provides a crucial role in transforming human capital into a productive workforce, which, in turn, enhances the Philippines' global competitiveness. This section presents basic HEI data and its link to the macro-economy. Table A depicts the structure of the Philippines higher education system, comprising outputs, inputs, and processes.

Outputs

As of the academic year (AY) 2014–15, there were 2,388 HEIs, including satellite campuses, dominated by private HEIs (72%). Higher education output is measured either as graduates or the graduate-to-enrollment ratio. In terms of output, private HEIs claimed over half of the graduates (54%). This provides an insight that public HEIs (29%) train under half of the higher education students (44%) and certify about the same number (46.2%) as workforce-ready. The strain on the resources of public HEIs in educating the Filipino youth is evident from its enrollment density, which is double (2,477 per HEI) that of the private HEIs (1,246 per HEI). To relieve the enrollment pressure, public HEIs grant diplomas to their students within an average of 5.6 years vis-à-vis an average of 6.1 years for private HEIs. Thus, public HEIs grant the degrees a semester earlier than the private HEIs.

Inputs and Processes

Predictors of educational output broadly include faculty inputs and quality processes. Quality process indicators are, passing percentage in professional licensure examinations; accreditations; designation of programs as COD or COE; and the grant of autonomous and deregulated status for private HEIs. The entry-level requirement for a faculty to teach in higher education is not strictly enforced, as revealed in the data. Close to half (47%) of the faculty lack a master's degree, i.e. a certification that the faculty possesses a mastery of knowledge and skills. This may explain, in part, why only 40% of the college graduates pass the professional licensure examination, which is an indicator of the professional skill-readiness of graduates. The data set indicates that HEIs prefer quantity of graduates over their quality. For instance, only 25% of the HEIs have accredited programs. One-third of these programs have Level 1 status; under 40% have Level 2 status (a requirement for the designation as COD and deregulated status); one-fourth have Level 3 status (a criterion for COD designation); and roughly 4% of the programs have Level 4 status (a consideration for autonomous status). For private HEIs, only 4% are granted deregulated or autonomous status.

Higher Education and Macroeconomic Environment

The Educated Unemployed Phenomenon

Table B highlights the link between higher education and the macro-economy. In 2014, the estimated Philippines population was 100 million, with 10% belonging to the college-going age group of 15–19 years, and 9.4% to the first-job seeker age group of 20–24 years.

While 38% of the college-going group are enrolled in HEIs, only 7% of the first-job seekers graduated from HEIs. Thus, the first sign of trouble in the macroeconomic-education nexus is the low school-to-job transition rate. A parallel concern is the growing proportion of the educated unemployed. While the unemployment rate hovers around 7%, the educated unemployed grew from 41% in 2010 to 45% in 2014.

Is this a case of non-optimal decision of parents and students leading to job mismatch and oversupply of unwanted professional skills, or is it due to a sub-optimal education process producing skill-deficient graduates? Is it about a low absorption capacity of industries, or is it a case of public governance issues such as market failure, agency-coordination problem, and political will? These challenges should be resolved at the soonest since the educated unemployed phenomenon represents a high degree of economic inefficiency.

The Migration Phenomenon

A major dilemma is the Filipino perception that higher education is a public good, even if the Philippine Constitution only guarantees free basic education. This is validated by the double-density enrollment of public HEIs, low education spending (4%) of Filipino households, and the partial subsidy to private HEIs such as the grant of low (10%) to zero income tax exemption. If the graduates are locally employed, then the private benefits redound to societal good since they contribute to Philippines' production of goods and services and total productivity.

What happens if graduates temporarily work abroad as overseas Filipino workers (OFW) or they emigrate permanently with their families due to unfavorable labor market conditions? Although OFWs comprise merely 5% of employed workers, their contribution to 2014 gross domestic product is substantial at 24% (PHP 890,000 per worker). OFW labor productivity, which benefits the host country, is estimated to be 1.65 times and 3.32 times more than that of the home-based industry productivity (PHP 540,000) and service productivity (PHP 270,000), respectively.

On the other hand, Filipino emigrants, composed of household heads and their dependents, are beneficiaries of the Philippines education system, with 49% and 36% of them completing college and basic education, respectively. Their remittances tend to be smaller since their immediate family is with them. As immigrants, their productivity is counted in the host country.

In sum, the higher education system is both a boon and a bane to the Philippines economy. While its graduates enjoy the private benefits of global occupational mobility and the consequent higher income, the recovery of the public education costs, in terms of societal returns and grant-backs, is not put forth as a policy issue.

RECENT ADVANCES

Traditionally, institutions of higher learning enjoy both academic freedom and self-governance. Quality of educational outcome is checked largely by a guild system of self-regulation, which includes the peer faculty, peer researchers, and professional organizations,

among others. However, access to higher education was largely limited to children of high-income families, the gifted, and those who trained to become professionals [6].

Massification of higher education occurred when families across income groups realized the substantial private gains from college completion, and when economies transitioned from the agro-industrial to the service stage of development, necessitating jobs that required skilled college-trained workers [5]. To fill in the unmet demand for higher education, the state and the private sector established more schools. This resulted in the proliferation of 1,935 HEIs of uneven quality. These were, "dominated by private HEIs (88%), of which 18% is sectarian, as well as small institutions (50%) with less than 500 students" [1]. Inefficiency in the higher education market provides a strong case for government regulation.

The state rationalized the regulation of schools by creating the CHED (Republic Act 7722, 1994); and the Technical Education and Skills Development Authority (TESDA, RA 7796, 1994) to supervise HEIs and technical-vocational and middle education, respectively. The Department of Education, responsible for basic education, has undergone two reforms. The first reform provisioned for a governance framework for basic education (RA 9155, 2001), and the second increased the number of years of basic education to K–12 (RA 10533, 2013).

Table C lists the policy directions of the state and the corresponding powers granted by law to the CHED. Higher education policies include access to quality education, protection of academic freedom, advancement of learning and research, education of high- and middle-level professionals, honing of responsible and effective leadership, enrichment of historical and cultural heritage, and responsiveness to local, regional and national development needs. Specific powers and functions are matched with policy objectives.

Policy Initiatives as Productivity Drivers

Table D summarizes the results of a text analysis of the various CHED memorandum order (CMO) titles from 1994 to 2015. The CMO titles are first grouped according to the mandated CHED powers and functions. Then, they are broadly reclassified by productivity initiatives, viz., quality programs and accreditations (28%); advancement of research (22%); honing of responsible and effective HEI leadership (5%); and the improvement of CHED operational efficiency (45%).

The analysis of the productivity initiatives in the Philippines higher education sector focuses on quality programs and accreditation, and advancement of research. These CHED policy pronouncements, comprising 50% of total CHED issuances, steer the HEI operations toward the attainment of stated outcomes. HEIs are given incentives for compliance while there also are sanctions for non-compliance. The remaining 50% of the issuances promote changes in the CHED and HEI governance.

The low and uneven quality of academic programs, in a way, led to the phenomenon of the educated unemployed, which grew from 41% in 2000 to 45% in 2014. This outcome is analogous to a 45% product rejection rate for the higher education industry, indicating

an economic waste. Further, the deskilling of Filipino college graduates abroad is partly attributed to the shortened basic education program.

The CHED's response to the unfavorable higher education outcomes here and abroad is two-pronged. The first is to set minimum standards for academic programs and institutions, including guidelines for the creation of new HEIs and the conversion of existing educational institutions to HEIs. The second is to provide incentives for HEIs submitting themselves to voluntary accreditation. Accreditation is an important factor in the designation of private HEIs as deregulated and autonomous, as well as in awarding of the COE or COD status to public and private HEIs.

Accreditation or quality assurance in higher education "creates a culture of continuous organizational and professional self-development and self-regulation that will provide a better value-for-money service that is compatible with the needs of the global (post)modern knowledge economy and learning society." [18].

Cross-country data shows the three levels of quality assurance, namely direct state regulation, professional self-regulation, and market regulation [4, 14]. Accreditation is carried out by the CHED and external accrediting bodies; professional self-regulation is reflected in the HEI's passing percentage; and market regulation refers to the Graduate Tracer Study and to the Employers' Survey.

The three accreditation levels spearheaded by the CHED through its advisory technical panel per discipline, Professional Regulation Commission, and external accrediting agencies are vanguards of quality tertiary education in the Philippines. While CHED's objective is to have a critical mass of non-regulated HEIs, Table E discloses that only 5% of private HEIs are granted autonomous or deregulated status, based on the Institutional Sustainability Assessment of institutional quality and program excellence. The privileges for autonomous HEIs include the offering of new programs to achieve global competence without securing the CHED permit, offering extension classes to expand access to education, establishing linkages with recognized foreign HEIs, increasing tuition without CHED permit, priority in the grant of subsidies and financial incentives, and authority to grant an honorary degree to deserving individuals. Further, autonomous HEIs are exempted from regular CHED monitoring and evaluation and the issuance of Special Order for their graduates (CMO 2016-09).

Another quality assurance tool is the program evaluation of the CHED technical panels to nominate COEs and CODs. Only 15% of Philippines HEIs are designated as either COE or COD for 11 program groups, viz., agriculture, business and management education, criminal justice education, engineering, health professions education, humanities, information technology, library and information science, science and mathematics, social sciences and communication, and teacher education. Till date, COD and COE programs are dominated by private HEIs (82%), partly due to their advanced accreditation levels (87% of Level 4 programs are offered by private HEIs; Table 6). The licensure performance indicates that 38% of board takers were admitted to professional practice, 64% of whom graduated from private HEIs.

A summary of changes in HEI indicators reveals that from 2010 to 2014, enrollments and graduates increased by 23%, although the opening of new schools slowed down to 6% (Table A). Improvement is low in faculty qualification (3%) and performance in licensure examinations (6%), but there is an upsurge in HEIs seeking accreditations (26%) and a remarkable leap in the number of accredited programs (50%). Level 1 and Level 4 programs jumped by 57% and 94%, respectively, while Level 2 and Level 3 programs grew at 43% and 41%, respectively.

The race toward external accreditation is evident in Table F. The modal group for accredited programs is Level 2 (32%), followed by Level 1 (27%) and candidate status (20%). Sixty-four percent of the candidates correspond to public-HEI programs. On the other hand, 20% of accredited programs belong to Level 3 and Level 4 categories. Since 61% of the accredited programs, including candidate status, are public-HEI programs, the dominant accrediting agency is Accrediting Agency of Chartered Colleges and Universities in the Philippines (61%), followed by the Philippine Association of Colleges and Universities Commission on Accreditation (20%). The Philippine Accrediting Association of Schools, Colleges and Universities and the Association of Christian Schools and Universities evaluated the remaining 19% of the HEI programs.

Advancement in Research

HEIs play an important role as producers and transmitters of knowledge. Instruction is the process of transmitting knowledge, while research is the knowledge-generator. While professional licensure, external accreditation, CHED assessment, and employers' feedback are quality assurance tools for the delivery of instruction, there is no research assessment tool for the knowledge-generation process. The amorphous role of HEI research is discussed later, including the insight into the factors that inhibit PHEIs from becoming engines of "innovation, creativity, and economic growth" [9].

In 2009, the CHED established a Journal Accreditation Service as a national standard for peer review and journal refereeing system. Accredited journals are categorized as A-1, or the journals listed in Thomson Reuters and Scopus database; A-2, or the journals credited as international publications; and B, or the journals considered as national publications. Incentives to A journals include an annual grant of PHP 200,000, and a recognition as international publication. Table G gives an overview of the CHED-accredited research journals. From a total of 88 accredited journals, 84%, 7%, and 12% are published by HEIs, research and development institutes (RDIs), and professional associations, respectively. Roughly half (49%) are accredited as national journals, with one-fourth listed in Thomson Reuters and Scopus database. Over a six-year period, the number of HEI research journals grew by 208% from 24 in 2010 to 74 in 2015, followed by professional journals registering a growth of 175% from four in 2010 to 11 in 2015.

Quality research at the HEIs, defined as outputs published in Thomson-Reuters or Scopus database, is in its inchoate state. Only 24% of the HEIs (32 out of 134) with COD or COE programs have researchers who published in international peer-reviewed journals. Two-thirds of the research publications emanate from NCR schools, and three-fifths are written by

researchers from state universities (Table H). The HEI research performance is a persistent issue in the higher education system, characterized by the:

> poor quality graduate programs and inadequate attention to research and technological innovations... (This, in turn) results in insufficient research output and a limited range of grounded solutions for intractable problems that have further reinforced as deficient science and technology culture and lack of interest among young Filipinos in pursuing scientific, engineering and technical fields (CHED, 2016: 12)

A closer look at the data (Table A) reveals that while 89% of HEI enrollments are in baccalaureate programs, 6% of the students enroll in pre-baccalaureate programs, and only 5% go for graduate programs. The Philippines education system is clustered into basic education, technical-vocational, and higher education. Estimates show that Philippines HEIs absorb some 230,000 pre-baccalaureate students, which should have been retained either in basic education or technical-vocational schools. These students are enrolled in programs that do not require teachers to have a master's degree. A consequence is that 57% of HEI teachers are merely baccalaureate degree holders. In addition, resources, such as classrooms, laboratories, equipment, physical facilities, and libraries, utilized by pre-baccalaureate students could have been diverted to high value-added programs like baccalaureate and graduate programs. It is possible that opening baccalaureate programs could have, inadvertently, led to inefficient operations, sub-optimal returns on investment, and productivity decline.

ESTABLISHING PRODUCTIVITY AND OUTPUT INDICATORS

Overview

Productivity relates to the production of outputs with a given set of inputs, labor, and capital. In its simplest form, the quantity of tertiary graduates is determined by the quantity of teachers and capital usage. One can then measure productivity by tracking and comparing the changes in the ratios between the real values of outputs and inputs (Sullivan et al., 2012). A limitation of this approach is the emphasis on quantity, with its assumption that all tertiary graduates possess the same quality of attributes.

Philippines higher education is characterized by uneven quality. To address this gap, layers of quality assurance tools are instituted by professional associations, external accrediting bodies, and the CHED. For instance, the passing performance of academic programs is a necessary condition for its external accreditation. Program accreditation, in turn, is a requirement for the designation of an institution as a COE or a COD. Compliance of private HEIs to these quality assurance tools is one of the criteria in the designation of private HEIs as regulated, deregulated or autonomous institutions. Those HEIs with excellent programs and quality institutional attributes enjoy incentives such as the privilege of opening new programs and priority in the allocation of CHED funds.

Harvey and Green [12] view quality as "exceptional, perfection or consistency, fitness for purpose, value for money, and transformative". In the educational setting, this implies that

HEIs transform the 'raw' labor of students into high-level skilled graduates through some quality assurance mechanism. The definition of quality is categorized into three dimensions, namely presage, process, and product [2, 10]. These dimensions are used in the formulation of the empirical model.

> Presage variables are those that exist within a university context before a student starts learning..., and include resources, the degree of student selectivity the quality of the students, the quality of the academic staff and the nature of the research enterprise. Process variables are those that characterize that is going on in teaching and learning and include the class size, the amount of class contact, and the extent of feedback to students. . . Product variables concern the outcomes of the educational processes and include student performance, retention and employability [2].

Within the context of quality management in education, process goes beyond the narrow confines of teaching and learning interaction in the classroom between students and the teacher. The variation in the quality of educational outcomes led to quality control mechanisms in the educational process. These are: passing percentage in professional exams, external accreditation, and CHED recognition of program and institutional excellence. Deming [3] and Juran [15] estimated that 85% to 95% of poor organizational results are due to ill-designed processes, while only 5% to 15% are attributable to competencies and skills of the people who use the processes [8]. Variations in educational output can then be explained by the variations in predictor variables, such as inputs (faculty quantity, and quality) and quality indicators. Hence, educational output is largely dependent on inputs (quantity and quality of faculty) and quality process indicators.

Productivity is commonly measured as a ratio between output and input. Specifically, it is defined as the ratio of graduates to faculty. The model explains the dependent variable, productivity, in terms of quality process. The model is empirical, with data sourced from the CHED. The limitation of the data is the time lag of the dependent variable. While the process variables reflect current levels of passing percentage, the number and levels of accreditation, and the number of COD and COE programs, data for the productivity variables is available only for the previous year. To address this limitation, alternative specifications for the dependent variables (total graduates and total enrollments during 2010–14) and independent variables (inclusion of faculty inputs and qualifications) are presented. Alternative measures for PRC passing performance incorporates this longer timeframe. Accreditations and COD/COE designations are usually given for a period of three to five years, depending on the level. Hence, these measures are unchanged.

There are four model specifications, with the first three focusing on partial factor productivity. The first specification considers the determinants of educational productivity, defined as the ratio of graduates to faculty; the second explains the variation in educational output in terms of faculty input and quality process indicators; the third describes the predictors of educational demand in private HEIs; and the fourth computes for public HEI productivity, using the total productivity approach.

Table 34: Model and data for specification 1: single-period

Model	Data
Dependent: Productivity	
Graduates/faculty	Number of graduates for 2014 ÷ No. of faculty for 2014
Independent: Quality process	
PRC passing percentage	Passing percentage for licensure programs: 2015
Accreditation	Weighted index of number of accredited programs, by Level: 2015 $WI_1 = \Sigma w_i x_i$, where w_i = weights of accreditation level i, x_i = number of accredited program for level i, w_i=0.5 (candidate status); w_i=1 (Level 1); w_i=2 (Level 2); w_i=3 (Level 3); and w_i=4 (Level 4)_
COD/COE	Weighted index of number of programs designated as COD and COE: 2015. $WI_2 = \Sigma w_j y_j$, where w_j = weights of COD/COE status j, y_j = number of COD/ COE programs for status j, w_j=1 for COD, and w_j=2 for COE

Specification 1: Single-period Productivity

Overall HEIs

Table 35 gives the results of the multiple linear regression, with productivity as the dependent variable and quality process indicators as the independent variables. The parameter estimate of each independent variable is analogous to the single-factor productivity measure due to the ceteris paribus assumption inherent in regression models. The data refer to 1,795 HEIs with licensure programs. The findings indicate that the significant determinants of educational productivity are PRC and accreditation. For instance, a 1% increase in board passing percentage would lead to a productivity decline by 1.60. Thus, if the average productivity of HEIs is 3.63 (one faculty services 3.63 graduates), then a 1% increase in PRC would depress productivity to 2.03 (one faculty would now service 2.03 graduates). This reflects either student selectivity or an increase in faculty input.

Table 35: Determinants of educational productivity

Independent	Overall			Private			Public		
	Parameter estimate	t Value	Pr > |t|	Parameter estimate	t Value	Pr > |t|	Parameter estimate	t Value	Pr > |t|
Intercept	3.96761	14.46	<.0001	3.80750	12.69	<.0001	3.88941	6.25	<.0001
PRC	-1.60286	-2.25	0.0108	-2.78267	-4.11	<.0001	3.00022	1.960	0.0501
Accreditation	0.07671	6.33	<.0001	0.20157	8.78	<.0001	-0.00212	-0.140	0.8868
COD/COE	-0.07603	-1.210	0.2247	-0.35563	-3.800	.0001	-0.09006	-1.000	0.3160
	Adjusted R^2 = 0.0239			Adjusted R^2 = 0.0623			Adjusted R^2 = 0.0084		
	F-value	Pr > F	N	F-value	Pr > F	N	F-value	Pr > F	N
	14.63	<.0001	1795	28.75	<.0001	1302	1.390	0.2464	493

Note: Dependent variable: Graduates / faculty

On the other hand, increasing the number of accredited programs by one unit would enhance productivity by 0.08. This is translated into an increase of educational productivity from 3.63 to 3.71 (one faculty now services 3.71 graduates). Program excellence (COD/COE) is not a significant determinant of productivity in the overall specification. However, its importance is highlighted in a subsequent specification. To understand the behavior of educational productivity, the ratio of graduates to faculty is disaggregated and presented below. It seems that productivity is higher in those HEIs where quality metrics are implemented. As far as public HEIs are concerned, their productivity is higher because of their mandate to grant students access to higher education.

Table 36: Productivity ratios for different HEI groups

HEI group	Productivity ratio	HEI group	Productivity ratio
Overall	3.63		
Public	5.14	With accredited programs	4.80
Private	3.04	Without accredited programs	3.18
With board programs	3.75	With COD/COE programs	4.83
Without board programs	3.18	Without COD/COE programs	3.55

Private HEIs

The data includes 1,302 private HEIs. Like the overall specification, the significant drivers of private education productivity are PRC and accreditation. In addition, the number of excellent programs (COD/COE) is the third driver for educational productivity. Specifically, a 1% increase in the board passing percentage is likely to reduce private educational productivity by –2.78, from 3.04 graduates per faculty to 0.26 graduates per faculty. This may be done by implementing a strict student selection or increasing the number of faculty inputs. Conformance with the quality standards of professional boards has budgetary implications for private schools. It is financially sustainable if accompanied by other measures such as expanding the number of degree courses to include non-board programs to compensate for the student selectivity.

The depressing effect on private educational productivity is likewise observed for the number of excellent programs (COD/COE). For instance, increasing the number of COD/COE by one unit is likely to shrink private educational productivity by –0.36, from 3.04 graduates per faculty to 2.68 graduates per faculty. It seems that the offering of excellent programs is related to student selectivity as well as to increasing the number of faculty. In addition, COD/COE programs require some amount of capital investments like program-specific facilities and laboratories.

Accreditation is an important driver of private education productivity. Increasing the number of accredited programs by one unit is likely to increase productivity by 0.20, from 3.04 graduates per faculty to 3.24 graduates per faculty. It seems that when quality processes are in place, such as the improvement in passing percentage and excellent programs, accreditations would facilitate the private education productivity.

Public HEIs

The 493 public HEIs provide contrary findings. The only productivity driver for public HEIs is PRC, and unlike the private HEIs, it is positive. Thus, increasing the passing percentage by 1% is likely to improve public education's productivity by 3.00, from 5.14 graduates per faculty to 8.14 graduates per faculty. What could account for this public-sector advantage? One of the key performance indicators (KPIs) of public HEIs is the "average percentage passing in licensure exams by the SUC graduates over national average" (National Expenditure Program 2016 for State Universities and Colleges, p. 675). SUC funding, thus, depends on its ability to achieve the targeted performance.

What explains the insignificance of PRC and COD/COE as SUC productivity drivers? Private HEIs have long sought accreditations from external accrediting agencies. SUC accreditation is fairly recent, with the upsurge of SUC accredited programs occurring within the past five years. With the exception of renowned SUCs, the normal route for the designation of HEIs as COD/COE is at least a Level 2 accreditation status. Hence, at this point in time, SUCs are still playing catch-up with private HEIs in the field of accreditations and COD/COE designations.

Table 37: Model and data for specifications 2 and 3: multi-period

Model	Data
Dependent: Output	
Total graduates	Total number of graduates from 2010 to 2014
Total enrollments	Total number of enrollments from 2010 to 2014
Independent: Input	
Faculty	Average number of faculty from 2009 to 2014
% Master's	Percent of faculty with Master's Degree from 2009 to 2014

(continued on next page)

(continued from previous page)

% PhD	Percent of faculty with PhD from 2009 to 2014
Model	**Data**
Independent: Quality process	
PRC passing percentage	Passing percentage for licensure programs: 2009–15 Passing percentage = Ratio between passers and takers
Autonomy	CHED-designation granted to private HEIs where 1 = Regulated; 2 = Deregulated; and 3 = Autonomous

Specification 2: Multi-period Educational Output

The productivity model masks the contribution of inputs (faculty and quality process) to educational output (graduates). This specification addresses two concerns, viz., the time lag inherent in quality process, and the marginal productivity of faculty input. The model specification for private HEIs yielded a better fit than public HEIs (F-value=1,008 and R2=0.8258 for private HEIs; F-value=186 and R2=0.6946 for public HEIs). All input and process indicators proved to be highly significant drivers of the private education output, including the proportion of faculty with PhDs. The quantity (average number of faculty) and teaching quality (master's degree percentage) increased degree completion by 13 and 23 graduates, respectively, ceteris paribus. However, enhancing the research quality (PhD percentage) of the faculty by 1% restricted the educational output by 13 graduates. This indicates that the reduction of teaching load of the PhD faculty would provide them the time to pursue research work.

Table 38: Determinants of multi-period educational output

Independent variables	Overall			Private			Public		
	Parameter estimate	t Value	Pr > |t|	Parameter estimate	t Value	Pr > |t|	Parameter estimate	t Value	Pr > |t|
Intercept	18.53898	0.22	0.8245	182.06228	2.75	0.006	-359.58	-1.33	0.1848
Faculty (average)	20.00214	15.43	<.0001	13.1216	11.91	<.0001	29.66798	8.39	<.0001
% Master's (average)	9.09051	3.18	0.0015	22.67967	9.22	<.0001	7.87822	0.88	0.3767
% PhD (average)	5.06128	1.3	0.1938	-13.33687	-3.15	0.0017	-27.38555	-2.64	0.0086
Accreditation	21.92163	4.85	<.0001	24.80291	4.22	<.0001	8.06622	0.94	0.3494
Average PRC	-546.68707	-2.74	0.0062	-727.29885	-4.77	<.0001	226.56608	0.32	0.7455
COD/COE	-169.53492	-6.49	<.0001	-103.67426	-4.18	<.0001	-68.65654	-1.08	0.2828
	Adjusted R^2 =0.7526			Adjusted R^2 =0.8258			Adjusted R^2 = 0.6946		
	F-value	Pr > F	N	F-value	Pr > F	N	F-value	Pr > F	N
	894.46	<.0001	1763	1007.61	<.0001	1275	185.62	<.0001	488

Note: Dependent variable: total graduates, 2010–14

Engagement in the quality process of accreditation, professional regulation, and CHED

regulation are highly significant drivers for private educational output. A closer look at the data reveals that increasing the number of accredited programs would increase the number of graduates. On the other hand, improving the passing board percentage and increasing the number of excellent programs would limit educational output due to the implementation of student selectivity.

On the other hand, only the input variables such as the average number of faculty and the research quality of faculty (PhD percentage) were identified as significant drivers of multi-period public educational output. This indicates the recent adoption of quality assurance tools by public HEIs. As of 2016, public HEIs accounted for 25% of the COD/COE programs, 36% of board passers, and 60% of accredited programs (Table E).

It should be pointed out that the number of faculty turned out to be the biggest predictor of educational output for both public and private HEIs, capturing the size effect. Large institutions, with large enrollment and graduates, tend to hire more teachers. However, the significance of quality process in predicting cumulative educational output is unique to private HEIs. This indicates that quality process in private HEIs is associated with size. In turn, it suggests that large private HEIs enjoy some form of economies of scale in producing more graduates and economies of scope in offering a variety of programs, using common inputs (faculty and process). Illustration of the association between size and quality metrics is given in Table 39.

Table 39: HEI size and faculty characteristics

HEI group	Average no. of graduates	Average no. of Faculty	HEI group	Average no. of graduates	Average no. of faculty
With quality process			Without quality process		
Professional board exam	281.40	74.30	Professional board exam	44.88	19.49
Accreditation	575.58	140.04	Accreditation	92.22	32.35
COD/COE	1,183.30	309.70	COD/COE	159.47	45.01
Overall	215.93	59.62			
Public	330.57	78.79			
Private	171.42	52.29			

Specification 3: Multi-period Model for Private HEIs

Private HEIs are classified as autonomous, deregulated, and regulated, based on the CHED assessment of their program excellence and institutional quality. Autonomous HEIs enjoy a wider array of incentives, compared with the deregulated HEIs. Table 40 presents the results of the generalized linear model (GLM), with multi-period educational demand as the dependent variable. With the inclusion of the extent of CHED regulations (autonomous=3; deregulated=2; regulated=1), the assumption that the error term is normally distributed is no longer applicable; hence GLM is used. GLM assumes non-normality of the error term.

So far, empirical models relate productivity, which is defined as the ratio of output to

input, to process metrics. Output variation, in turn, is explained by process-enhanced inputs. Significant determinants of educational output are faculty, accredited programs, performance in licensure examination, and excellent programs (COD/COE). Specification 3 notes cumulative enrollment as the dependent variable and introduces the level of autonomy as an additional quality metric, unique to private HEIs. In a broader context, educational output "can be designed and turned out to give satisfaction at a price that the user will pay" [3]. Hence, an alternative specification of the dependent variable is educational demand (multi-period enrollment). This specification relates output to customer satisfaction via the expanded demand for tertiary schooling.

An analysis gives interesting results. When educational demand (multi-period enrollment) is specified as the dependent variable, then the significant drivers of cumulative enrollment are the quantity and quality of teaching faculty, and the number of accredited programs. Faculty research-preparedness, performance in licensure examination, and level of institutional autonomy (regulated, deregulated, and autonomous) work to control the educational demand via student selectivity. The results show that if private regulated and deregulated HEIs were benchmarked against autonomous HEIs, then the trade-off for the enhanced status would be a loss of 3,200 and 6,600 students, respectively.

Table 40: Determinants of educational demand: generalized linear model

Parameter	Analysis of maximum likelihood parameter estimates				
	Estimate	Wald's 95% confidence limits		Wald Chi-Square	CO > ChiSq
Intercept	4295.171	1078.506	7511.837	6.85	0.0089
Faculty (average)	96.903	83.3254	110.4807	195.67	<.0001
% Master's (average)	113.3806	83.1419	143.6193	54.01	<.0001
% PhD (average)	-136.46	-188.083	-84.8384	26.84	<.0001
Accreditation	89.7784	-0.4721	180.0288	3.8	0.0512
Average PRC	-4301.19	-6160.66	-2441.71	20.55	<.0001
COD/COE	58.1785	-252.067	368.4238	0.14	0.7132
Regulated	-3198.32	-6282.73	-113.906	4.13	0.0421
Deregulated	-6579.56	-10651.8	-2507.29	10.03	0.0015
Autonomous	0	0	0	.	.
Scale	6891.411	6629.059	7164.147		

Note: Dependent variable: Total enrollment (2010–14); n=1,275

Specification 4: Multi-period SUC Model

Availability of financial data for SUCs, from the CHED and from the Department of Budget and Management (DBM), allows for the analysis of total factor productivity. DBM conveniently disaggregates the SUC expenditures into personnel services, maintenance, and other operating expenses (MOOE); and capital outlay. The CHED, meanwhile, provides data on national government subsidy to SUCs and SUCs' internally-generated income (IGI). The research, through an iterative process, estimated the unallocated portion of government subsidy and

IGI. The estimates were then used to illustrate the Sullivan, et al. (2012) methodology, using the Philippines data. Table 41 shows the four-step productivity calculation.

Table 41: Sample productivity calculation: state universities and colleges

	2013	2014	2015
Step 1: Allocation			
Outputs			
Graduates	193,832	220,445	231,261
Input quantities			
Labor	49,049	54,685	55,337
MOOE (CPI)	8,499,050,300	10,597,371,456	11,834,726,721
Capital outlay (GDP deflator)	7,978,646,600	9,373,359,100	9,249,058,787
Input expenditures			
Personnel services	38,388,704,100	39,413,984,849	39,677,867,093
MOOE	8,499,050,300	11,031,863,686	12,497,471,417
Capital outlay	7,978,646,600	9,748,293,464	9,988,983,490
Total	54,866,401,000	60,194,142,000	62,164,322,000
Step 2: Quantity changes	2013	2013-14	2014-15
Output change			
Graduates	1.00	1.14	1.05
Input change			
Labor	1.00	1.11	1.01
Real MOOE	1.00	1.25	1.12
Real capital stock	1.00	1.17	0.99
Step 3: Input index			
Weights (average)			
Personnel services		67.7%	66.4%
Normal MOOE		16.9%	18.0%
Real capital outlay		15.4%	15.6%
Weighted geometric mean		1.064	1.084
Step 4: Multi-factor productivity			
Productivity index		1.069	0.967
Productivity change			-10.53%

Notes:
* Total is derived from the DBM National Expenditures Plan for SUCs, and CHED data for the SUC National Government Allocation and Income Generating Funds.
** MOOE: Maintenance and Other Operating Expenses; CPI: Consumer Price Index; GDP: Gross Domestic Product
*** Source of Basic Data: Commission on Higher Education; Expenditure Allocation: Department of Budget and Management
**** Methodology for Productivity Calculation Adopted from Table 4.2, p. 70 (Sullivan et al., 2012)

First is the allocation of quantity and expenditure data to output and inputs to be expressed in real terms. The quantity of graduates and labor, which are real values, are provided by the

CHED and the DBM, respectively. There is a need to convert the nominal values for MOOE and capital outlay in real terms. For MOOE, the 2014 and 2015 values are deflated using the consumer price index (CPI2014 = 1.04; CPI2015 = 1.06). Capital outlay is deflated using the producer price index (PPI2014 = 1.04; PPI2015 = 1.08).

Second is the calculation of change for the two periods of 2013–14 and 2014–15. This is simply tracking the change in the real values of output and inputs for the two periods, and is arrived at by dividing the current value with the previous one. Third is the calculation of the input index, which is the geometric mean of the input change of labor, MOOE, and capital outlay, with the average expenditure shares used as weights. Fourth is the calculation of the productivity index, which is the ratio of the output index to the average input index (2013–14 change = 1.14/1.064 = 1.069; 2014–15 change = 1.05/1.084 = 0.967). Productivity change is the ratio of the productivity indices for the two periods (1.069/0.967 – 1) or –10.53%.

The calculation reveals that while educational output grew from 14% and 5% for 2013–14 and 2014–15, respectively, it grew at a decreasing rate. Input growth, however, accelerated from 6.4% to 8.4% for the first and second periods, respectively. Thus, the real input growth outpaced output growth, leading to the decline in the productivity index from 1.069 in the first period to 0.967 in the second period. In other words, the cost approach to productivity reveals that SUCs have to spend more to produce graduates. This finding is consistent with the econometric model explaining that quality-enhancing processes depress educational output via student selectivity.

THE NEXT FIVE YEARS

This section relies heavily on the CHED-articulated initiatives (CHED, 2016), grouped into the dual-mandate of inclusive capacity-building of graduates and faculty; and knowledge production, dissemination, and utilization. The initiatives, considered as critical in improving the higher education productivity in the next five years, are international accreditation; and accelerated knowledge production, dissemination, and utilization. A digression on the effect of adoption of K–12 is first made, prior to the discussion on future-directed initiatives.

The Enhanced Basic Education Act of 2013, which provisions a two-year increase in basic education, saw its first year of implementation in 2016. Before 2016, the Philippines was the only country in Asia and one of three countries worldwide (along with Angola and Djibouti) with a 10-year program. The international standard for basic education is 12 years. The K–12 reform would result into a low multi-period enrollment, with the first batch of K–12 graduates completing tertiary education in 2022. It is estimated that 25,000 faculty and staff would be displaced. To mitigate the impact of K–12 transition, the CHED has allocated a budget of P28 billion over a period of five years. The program covers 15,000 graduate scholarships, opportunities for research, extensions and industry immersions, and the funding of competitiveness-enhancing institutional development and innovation projects.

Despite the loss in educational revenues, the K–12 reform is expected to improve the quality of the tertiary graduates by ensuring that the raw materials, i.e., the incoming tertiary students, possess the competencies to engage in productive work and the capacity to engage

in independent, creative, and critical thinking, among other things. It is important to view basic education as a supplier of the student materials.

International Accreditation

Variability in the quality of graduates can be managed by improving teacher quality and adherence to quality control processes, stipulated by professional associations, external accrediting agencies, and the CHED. With globalization, another layer of quality control is levied, and that is, the international accreditation.

International accreditation allows international mobility of Filipino higher education students and graduates since the credit units and diploma earned in the Philippines' HEIs are recognized in other countries. There are two variants in international accreditation. One is the National Qualification Framework (NQF) and the other is international accreditation of academic programs. The PQF is a national standard that sets eight levels of outcomes-based educational or training qualifications, defined in terms of the three domains of knowledge, skills, and values (KSVs); applications; and degree of independence. The first two levels pertain to national certification for manual skills with an operational focus, mostly acquired from basic education. Levels 3 to 5 are national certifications and diplomas for knowledge and skills that combine theoretical and technical competencies, mainly obtained from technical-vocational education. Levels 6 to 8 are the degrees granted by HEIs, such as baccalaureate, post-baccalaureate and doctoral degrees. Table J presents the outcomes of the training requirements for HEI programs.

CHED is aligning the PQF with the ASEAN Qualifications Reference Framework (AQRF) set to take effect in 2018. Till date, the Philippines is one of four countries, along with Indonesia, Malaysia and Thailand, that have committed their respective NQFs to the AQRF. With the PQF formulation, the Philippines would be included among the 150 NQFs worldwide. The PQF is a collaborative effort among the CHED, Department of Education, Technical Skills and Development Authority, Professional Regulations Commission, Department of Labor and Employment, and the Department of Trade and Industry. Within the next two years, the PQF would have been developed, purportedly to enhance the competencies of Filipinos for employment, job creation, and agility in the workplace.

The PQF provides for a joint review, by the CHED and PRC, of the framework and content of each professional licensure examination to ensure alignment with AQRF. The Philippines is a signatory to the ASEAN Mutual Recognition Arrangements (MRAs) for the seven fields of accounting services, dental practitioners, medical practitioners, engineering services, nursing services, surveying qualifications, and architecture services. MRAs allow the mutual recognition of the qualifications of professional service suppliers, thus facilitating the free flow of professionals and skilled labor in the region. Likewise, the PQF facilitates the CHED's internationalization initiatives, including programs for international mobility of students, networking of centers of excellence in the region; ASEAN MRAs; and education agreements with Canada, Czech Republic, France, Hungary, Palau, Poland, and Spain.

The Philippines is a signatory to the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCWC), the Washington Accord, and the Seoul Accord. STCWC sets qualification standards for masters, officers, and watch personnel for the international marine fleet. The Washington Accord and the Seoul Accord are MRAs for the accreditation of outcomes-based qualifications for engineering, computing, and information-technology programs. One of the requirements for the renewal of Autonomous Status on 2017 is that "at least two programs are accredited under internationally agreed upon criteria and procedures, which guarantee professional mobility across national boundaries, e.g., accreditation under the terms of Washington Accord" [1].

Pushing the Frontiers of Knowledge

Research emanates in the graduate school. Yet, the CHED points out that the poor quality of graduate programs, insufficient research output, and deficient science and innovation culture "posed limits on technological innovations and the search for solutions to critical problems" [1]. To address these gaps, CHED continues to support Research and Development and Extension (RD&E) projects; invest in Philippines-California Advanced Research Institutes (PCARI); and expand research funding to leading HEIs.

RD&E support includes capacity building programs, thesis and dissertation grants, travel grants for international paper presentation, awards and incentives, regional research promotion activities, support to CHED-accredited journals, and research funding on priority themes. These themes are: food production and security; environment disaster risk reduction and response, climate change, and energy; terrestrial and marine resources systems, economy, biodiversity and conservation; smart analytics and engineering innovations; health systems; and education for science, technology, engineering, agri-fisheries and mathematics (STEAM).

The PCARI is a skill-enhancing and technology-generating initiative that encourages research partnerships between Filipino researchers and experts from top research universities in California, USA, such as University of California at Berkeley and University of California at San Francisco. The PCARI is designed to hone the skills of Filipino researchers in the areas of information infrastructure development (IID) and health innovation and transformational medicine (HITM). The project provides for master's and doctoral scholarships for priority areas, postdoctoral fellowships, design of PCARI-related training modules, and attractive research support for the proponents, such as competitive honorarium, attendance in conferences, and provision of equipment and state-of-the-art laboratories.

Top research-performing HEIs are clustered into PHERNet, HERRC, and the National Agriculture and Fishery Education System (NAFES). PHERNet comprises 10 HEIs mandated to conduct intellectual property-generating research (basic and applied, interdisciplinary); and to provide quality postgraduate education and training environments for HEI researchers.

HERRC consists of 18 HEIs tasked to conduct R&D activities with the following objectives:

- To respond to the needs of their respective regions.
- To undertake research capability activities for region-based HEIs.

- To participate in regional innovation clusters.
- To promote the utilization of research outputs and technology transfer/extension programs in their regions.

NAFES includes 31 National Universities and Colleges of Agriculture and Fisheries (NUCAF) and 81 Provincial Institutes of Agriculture and Fisheries (PIAF). NUCAF engages in productivity-enhancing agricultural research, while PIAF is extension-focused.

Analysis of Productivity Initiatives

Firms usually accelerate their R&D activities during recession. Similarly, the CHED and HEIs are using the K–12 induced enrollment hiatus to improve educational productivity by upgrading the skills of incoming students and improving faculty competencies. Upgrading faculty qualification to meet international and research standards through the PQF development as well as generous grants for graduate scholarship, industry immersion, and research would impact the educational productivity favorably.

The PQF adoption would ensure international mobility of higher education students and graduates, allowing for ease of credit-transfer and mutual recognition of professional qualification, respectively. In turn, these would spur improved HEI enrollments in undergraduate programs. The MRAs would benefit the Filipino OFWs since they would now enjoy competitive rates based on their professional category, thus making the deskilling effect a phenomenon of the past. Inclusion in the worldwide NQF network would hasten HEI internationalization through international student and faculty exchange, international research collaboration, and international accreditation of academic programs. The full PQF effect might be realized beyond five years, although slight productivity improvement might be felt within the next five years.

To analyze the effect of research productivity initiatives on educational productivity, the CHED argument is first implicitly drawn for PCARI and priority funding to leading HEIs. Then, analytical refinements are presented. PCARI-funded IID and HITM projects are designed to equip Filipino researchers with "highly advanced systematic knowledge and skills in highly specialized or complex multidisciplinary fields of learning for complex research" (Level 8, Table J). Through research collaboration with the USA-based expert-mentors, and the provision of adequate funds, the projects could spur innovation at the HEIs. In turn, this could advance the research quality of faculty and HEIs; increase publications in internationally-accredited journals and intellectual property registration; attract foreign graduate students; and enhance the country's global competitiveness and innovation culture.

It would seem that PCARI replicates the 1960s to mid-1980s experience when Filipino graduate students benefited from the USA-university scholarships. For a period, there was an upsurge in the foreign student enrollments in both undergraduate and graduate programs, and the Philippines became a favorite destination of Asian students. Eventually, the Philippines lost this advantage. Thus, there is a need to conduct a root-cause analysis to prevent the occurrence of a similar result from a similar experience.

PHERNet and HERRC are considered to be research hubs in the country and in the region. The assumption is that their designations would allow PHERNets and HERRCs to sustain their research productivity by producing quality research outputs and registering research-developed intellectual properties, while stimulating the research production of other HEIs through a spillover effect. This concept is an application of the growth-pole theory, wherein leading HEIs serve as magnets in regional research development.

On the other hand, regional HEIs have limited technical, disciplinal, and managerial competencies to spur research development in the regions. Limiting research funding to these 18 HEIs would be contrary to CHED's access objective and the Philippines' development goal of inclusive growth. Instead of perpetuating the 16-year old zonal research center model, PHERNet could be substituted for a discipline-based consortium of HEIs with COD/COE programs, with the primary goal of advancement of disciplinal learning. As a case in point, Table K highlights the correlates of research productivity, in order of significance as follows: COE programs, faculty with PhD, faculty with master's, total enrollment, total graduates, COD programs, accredited programs, proportion of faculty with PhD, and licensure passing rate.

The HERRCs could be retained, but with a different composition. Membership could be expanded to include regional offices of CHED, DEPED, TESDA, DOLE, DTI, DOST, industry representatives, and local government units, to ensure that the research projects have a regional flavor. Perhaps, HERRCs could unify the different research consortia within the region, come up with a consolidated budget, and solve region-specific problems using a multi-disciplinary lens.

CONCLUSION

The Philippines' higher education sector consists of over 2,000 entities, including satellite campuses, which collectively enrolled 3.8 million students and produced around 650,000 graduates in 2014. The dominant private HEIs (72%) account for 54% of these graduates, with the remaining 46% are attributable to public HEIs. The quality of an educational output is rated in terms of its acceptability by local and global employers. The phenomenon of the educated unemployed in the Philippines labor market as well as the deskilling of OFWs in the global market are symptoms that the quality of educational output is wanting and uneven.

An econometric model explains educational productivity in terms of quality metrics. Single-period regression shows varying results for productivity drivers, by HEI types. Significant drivers for private HEI productivity are accreditation, licensure passing percentage, and COD/COE programs, with the last two indicating the implementation of student selectivity. Within the context of performance-based budget, licensure passing percentage is the main determinant of public HEI productivity.

Multi-period regression yields a better fit and more robust results, especially for private HEIs. Significant drivers for private HEI outputs are expanded to include faculty, teaching quality, research quality, accreditations, licensure passing rates, and COD/COE programs. The evidence suggests that the quality process in private HEIs is associated with size. Large institutions, with large enrollments and graduates, tend to hire more quality teachers.

Private and public HEI models are presented, depending on sector-data availability. GLM results for private HEIs have a wider array of significant educational demand drivers, namely the faculty, teaching quality, research quality, accreditation, and level of autonomy. The availability of financial data allowed the computation of total productivity for public HEIs, defined as the ratio of output change to input change. SUCs experienced a decline in productivity for a three-year period since the input index grew faster than output index in the third period.

There is a trend toward the elevation of program quality assurance to meet international standards. The CHED is now developing the PQF as a prelude to its entry to the worldwide NQF. This initiative would hasten the internationalization of HEIs and facilitate international mobility of students, workers, and professionals. In contrast, the initiative toward the development of a research and innovation culture among HEIs is low-impact. It does not address research productivity issues such as poor-quality graduate programs, insufficient research output, lack of technical solutions to societal problems, and a deficient science, technology and innovation culture. Its growth-pole approach to stimulate research might retard the development of a national innovation system.

Summing up, while the Philippines has a highly-developed quality assurance mechanism for academic programs, there is a need to come up with quality assurance tools for research productivity. As the major players in the knowledge economy, HEIs are compelled to train knowledge workers who can create, invent and innovate new products and processes. These new products and processes would be the engines of the nation's growth and sustained development.

REFERENCES

[1] Commission on Higher Education. CHED Accomplishment Report 2010–16; 2016.

[2] Biggs J.B. From theory to practice: a cognitive systems approach. Higher Education Research and Development 1993; 12: 73–86.

[3] Deming W.E. Quality, productivity and competitive position. Cambridge, MA: Massachusetts Institute of Technology, Center for Advanced Engineering Study; 1982.

[4] Dill D.D., Beerkens M. Public Policy for Academic Quality: Analyses of Innovative Policy Instruments. Netherlands: Springer; 2010.

[5] El-Khawas E. Accountability and Quality Assurance: New Issues for Academic Inquiry. In: Forest J.J., Altbach P.G., eds. International Handbook of Higher Education, Part One: Global Themes and Contemporary Challenges. Netherlands: Springer; 2007, 23–38 pp.

[6] Enders J. The Academic Profession. In: Forest J.J., Altbach P.G., eds. International Handbook of Higher Education, Part One: Global Themes and Contemporary Challenges. Netherlands: Springer; 2007, 5–22 pp.

[7] Enhanced Basic Education Act of 2013. Republic Act No. 10533; 2013.

[8] Ewy R.W., Gmitro H.A. Process Management in Education: How to Design, Measure, Deploy and Improve Educational Processes. Wisconson: ASQ Quality Press; 2010.
[9] Fayolle A., Redford D.T. Handbook on the Entrepreneurial University. United Kingdom: Edward Elgar Publishing Ltd; 2014.

[10] Gibbs G. Dimensions of Quality. United Kingdom: The Higher Education Academy; 2010.

[11] Governance of Basic Education Act of 2001. Republic Act No. 9155; 2001.

[12] Harvey, L., Green D. Defining quality. Assessment & Evaluation in Higher Education 1993; 18(1): 9–34.

[13] Higher Education Act of 1994. Republic Act No. 7722; 1994.

[14] Jarvis D.S.L. Regulating higher education: Quality assurance and neo-liberal managerialism in higher education; A critical introduction. Policy and Society 2014; 33: 155–166.

[15] Juran J.M., Godrey A.B. Juran's Quality Handbook, Fifth Edition. New York: McGraw-Hill; 1999.

[16] Manansala T. Philippines Qualification Framework: Implications for Higher Education. Keynote Address delivered during the 24th PACUCOA General Assembly, 6 December 2013.

[17] Technical and Skills Development Act of 1994. Republic Act No. 7796; 1994.

[18] Worthington F., Hodgson J. Academic labor and the politics of quality in higher education: a critical evaluation of the conditions of possibility of resistance. Critical Quarterly: issue 1–2 2005, 47: 96–110.

APPENDICES

Table A: Philippines higher education indicators: AY 2010–11 to AY 20114–15

Indicator	2010–11	2011–12	2012–13	2013–14	2014–15	% Change: 2004–05 to 2014–15
Total number of HEIs	**2,247**	**2,299**	**2,313**	**2,374**	**2,388**	**5.90**
Public	643	656	661	675	680	5.44
Private	1,604	1,643	1,652	1,699	1,708	6.09
Proportion of private HEIs	*71.4*	*71.5*	*71.4*	*71.6*	*71.5*	*0.1*
Total enrollments in all disciplines	**2,951,195**	**3,044,218**	**3,317,265**	**3,563,396**	**3,811,726**	**22.58**
Public	1,199,717	1,278,480	1,423,766	1,538,835	1,684,088	28.76
Private	1,751,478	1,765,738	1,893,499	2,024,561	2,127,638	17.68

(continued on next page)

(continued from previous page)

Proportion of private HEIs	*59.3*	*58.0*	*57.1*	*56.8*	*55.8*	-3.5
Indicator	**2010–11**	**2011–12**	**2012–13**	**2013–14**	**2014–15**	**% Change: 2004–05 to 2014–15**
Enrollment per HEI: All HEIs	**1,313**	**1,324**	**1,434**	**1,501**	**1,596**	**17.72**
Public	1,866	1,949	2,154	2,280	2,477	24.66
Private	1,092	1,075	1,146	1,192	1,246	12.34
Ratio of public to private	*1.7*	*1.8*	*1.9*	*1.9*	*2.0*	*0.3*
Total graduates in all disciplines	**496,949**	**522,570**	**564,769**	**585,288**	**648,752**	**23.40**
Public	206,755	223,102	253,248	276,240	299,677	31.01
Private	290,194	299,468	311,521	309,048	349,075	16.87
Proportion of private HEIs	*58.4*	*57.3*	*55.2*	*52.8*	*53.8*	*-4.6*
Crude graduation rate: All HEIs (in %)	**16.8**	**17.2**	**17.0**	**16.4**	**17.0**	**0.2**
Public (in %)	17.2	17.5	17.8	18.0	17.8	0.6
Private (in %)	16.6	17.0	16.5	15.3	16.4	-0.2
Public-private gap (in %)	*0.7*	*0.5*	*1.3*	*2.7*	*1.4*	*0.7*
Faculty qualification	**49.96**	**54.10**	**50.20**	**52.59**	**53.35**	**3.4**
Proportion with MA/MS	38.87	41.44	38.75	40.87	40.81	1.9
Proportion with PhD	11.09	12.66	11.45	11.72	12.54	1.5
Performance (% passing) in licensure	**33.91**	**35.92**	**42.61**	**39.21**	**39.76**	**5.9**
Accreditation						
No. of HEIs with accredited programs	447	484	515	566	606	**26.24**
% of HEIs with accredited programs	19.89	21.54	22.40	24.47	25.38	*5.5*
No. of accredited programs by level	**2,454**	**2,785**	**3,351**	**3,992**	**4,856**	**49.46**
Level 1	704	842	1,173	1,345	1,641	57.10
Level 2	1,038	1,174	1,343	1,644	1,835	43.43
Level 3	702	734	725	851	1,199	41.45
Level 4	10	35	110	152	181	94.48
Autonomous/ deregulated private HEIs	63	63	64	64	64	**1.56**
% of HEIs with autonomous/deregulated status	2.80	2.74	2.77	2.70	2.68	*-0.1*

Table B: The Philippines macroeconomic fundamentals, 2010–14

Variable	2010	2011	2012	2013	2014
Projected population	93,135,100	94,823,800	96,510,900	98,196,500	99,880,300
Age group 15–19 (A)	9,736,800	9,823,500	9,906,900	9,987,000	10,063,600

(continued on next page)

(continued from previous page)

Variable	2010	2011	2012	2013	2014
% of age group 15–19	10.45	10.36	10.27	10.17	10.08
Age group 20–24 (B)	18,435,900	8,671,800	8,910,500	9,152,000	9,396,400
% of age group 20–24	9.06	9.15	9.23	9.32	9.41
Total enrollment in all disciplines (C)	2,951,195	3,044,218	3,317,265	3,563,396	3,811,726
% of enrollment to age group 15–19 (C/A)	30.31	30.99	33.48	35.68	37.88
Total graduates in all disciplines (D)	496,949	522,570	564,769	585,288	648,752
% of graduates to age group 20–24 (D/B)	5.89	6.03	6.34	6.40	6.90
Household consumption in PHP million	6,442,033	7,132,581	7,837,881	8,463,826	9,156,446
Education, in PHP million	256,817	282,816	302,772	331,844	364,078
% of education to household consumption	3.99	3.97	3.86	3.92	3.98
Total labor force in thousands	38,893	40,006	40,426	41,022	41,379
Employed, in thousands	36,035	37,192	37,600	38,118	38,651
Employment rate	92.65	92.97	93.01	92.92	93.41
Unemployed, in thousands	2,859	2,814	2,826	2,905	2,728
Undergraduate and college	1,178	1,181	1,164	1,222	1,232
% of educated unemployed	41.20	41.97	41.19	42.07	45.16
Gross domestic product (GDP), in million pesos	9,003,480	9,708,332	10,561,089	11,542,286	12,642,736
Compensation from rest of the world, in million pesos	2,058,272	2,129,027	2,429,426	2,758,252	2,964,567
% of rest of the world compensation to GDP	22.86	21.93	23.00	23.90	23.45
Gross domestic product per capita, in pesos	97,227	102,389	109,429	117,543	126,579
Per capita rest of the world compensation, in pesos	22,100	22,452	25,173	28,089	29,681
Household consumption expenditure per capita, in pesos	69,567	75,224	81,212	86,193	91,674
Deployed overseas Filipino workers	1,470,826	1,687,831	1,802,031	1,836,345	1,832,668
Percent of employed workers	4.08	4.54	4.79	4.82	
Estimated ROW compensation per deployed worker, in pesos	1,399,399	1,261,398	1,348,160	1,502,034	1,617,624
ROW compensation, in million pesos at constant prices	1,280,090	1,272,996	1,407,129	1,560,895	1,630,603

(continued on next page)

(continued from previous page)

Variable	2010	2011	2012	2013	2014
Estimated ROW compensation per deployed worker, in constant pesos	870,320	754,220	780,857	850,001	889,743
Labor productivity, in constant pesos	158,182	158,194	167,596	178,023	187,988
Agriculture	55,352	55,421	57,748	60,087	80,892
Industry	344,877	342,484	352,214	375,102	538,058
Service	170,197	172,029	181,002	188,936	268,177
Labor productivity, GVA/ total hours worked, constant pesos	73	74	79	78	59
Equivalent of eight hours worked	582	594	630	626	474
Education of emigrants*	86,075	83,410	83,640	78,228	80,689
At least college education (49.1%)	41,973	40,496	41,059	38,584	40,440
At least basic education (36.0%)	30,890	30,172	30,523	28,418	28,292
Vocational/non-formal education (7.0%)	5,972	5,907	5,726	5,318	5,873
No schooling (7.9%)	7,240	6,835	6,332	5,908	6,084

ROW, rest of the world; GVA, gross value added

* Commission on Overseas Filipinos

Source: 2015 Philippines Statistical Yearbook

Table C: Declaration of policy vis-à-vis powers and functions of the CHED

Section 2. Declaration of policy	Section 8. Powers and functions of the CHED
The state shall protect, foster and promote the right of all citizens to affordable quality education at all levels.	Formulate and recommend development plans, policies, priorities, and programs on higher education and research.
	Monitor and evaluate the performance of programs and institutions of higher learning for appropriate incentives as well as the imposition of sanctions such as, but not limited to, diminution or withdrawal of subsidy, recommendation on the downgrading or withdrawal of accreditation, program termination or school closure.
	Identify, support and develop potential centers of excellence in program areas needed for the development of world-class scholarship, nation building and national development.

(continued on next page)

(continued from previous page)

Section 2. Declaration of policy	Section 8. Powers and functions of the CHED
It shall take appropriate steps to ensure that education shall be accessible to all.	Rationalize programs and institutions of higher learning and set standards, policies and guidelines for the creation of new ones as well as the conversion or elevation of schools to institutions of higher learning, subject to budgetary limitations and the number of institutions of higher learning in the province or region where creation, conversion or elevation is sought to be made.
	Develop criteria for allocating additional resources such as research and program development grants, scholarships and other programs, provided that these shall not detract from the fiscal autonomy already enjoyed by colleges and universities.
The state shall likewise ensure and protect academic freedom.	Section 13. Guarantee of Academic Freedom. Nothing in this Act shall be construed as limiting the academic freedom of universities and colleges.
The state shall promote its exercise (academic freedom) and observance for continuing intellectual growth.	Perform such other functions as may be necessary for its effective operations and for the continued enhancement, growth or development of higher education.
The state shall promote the advancement of learning and research.	Formulate and recommend development plans, policies, priorities and programs on research.
	Recommend to the executive and legislative branches, priorities and grants on higher education and research.
	Develop criteria for allocating additional resources such as research and program development grants, scholarships and other programs, provided that these shall not detract from the fiscal autonomy already enjoyed by colleges and universities.
	Direct or redirect purposive research by institutions of higher learning to meet the needs of agro-industrialization and development.
The state shall promote the development of responsible and effective leadership.	Devise and implement resource development schemes.
	Administer the Higher Education Development Fund, which will promote the purposes of higher education.
	Review the charters of institutions of higher learning and state universities and colleges including the chairmanship and membership of their governing bodies and recommend appropriate measures as basis for necessary action.
	Promulgate such rules and regulations and exercise such other powers and functions as may be necessary to carry out effectively the purpose and objectives of this Act.

(continued on next page)

(continued from previous page)

Section 2. Declaration of policy	Section 8. Powers and functions of the CHED
The state shall promote the education of high-level and middle-level professionals.	Set minimum standards for programs and institutions of higher learning recommended by panels of experts in the field and subject to public hearing, and enforce the same.
The state shall promote the enrichment of our historical and cultural heritage.	
State-supported institutions of higher learning shall gear their programs to national, regional or local development plans.	Recommend to the Department of Budget and Management the budgets of public institutions of higher learning as well as their general guidelines for the use of their income.
All institutions of higher learning shall exemplify through their physical and natural surroundings the dignity and beauty of, as well as their pride, in the intellectual and scholarly life.	

Source: Republic Act 7722, Act for creating the Commission on Higher Education and appropriating funds for that and other purposes

Table D: Content analysis of CHED issuances, by CHED functions, 1994–15

Function	1994–04	2005–15	Total	Share
Quality programs and accreditations	*120*	*127*	*247*	*27.57%*
Identify, support and develop potential centers of excellence in program areas needed for the development of world-class scholarship, nation building and national development.	24	86	110	
Rationalize programs and institutions of higher learning and set standards, policies and guidelines for the creation of new ones as well as the conversion or elevation of schools to institutions of higher learning, subject to budgetary limitations and the number of institutions of higher learning in the province or region where creation, conversion or elevation is sought to be made.	35	21	56	
Set minimum standards for programs and institutions of higher learning recommended by panels of experts in the field and subject to public hearing, and enforce the same.	42	5	47	
Monitor and evaluate the performance of programs and institutions of higher learning for appropriate incentives as well as the imposition of sanctions such as, but not limited to, diminution or withdrawal of subsidy, recommendation on the downgrading or withdrawal of accreditation, program termination or school closure.	19	15	34	
Advancement of research	*88*	*105*	*193*	*21.54%*
Formulate and recommend development plans, policies, priorities, and programs on higher education and research.	31	46	77	
Develop criteria for allocating additional resources such as research and program development grants, scholarships, and other similar programs; provided that these shall not detract from the fiscal autonomy already enjoyed by colleges and universities.	30	24	54	
Recommend to the executive and legislative branches, priorities and grants on higher education and research.	16	20	36	
Direct or redirect purposive research by institutions of higher learning to meet the needs of agro-industrialization and development.	11	15	26	

(continued on next page)

(continued from previous page)

Function	1994–2004	2005–15	Total	Share
Responsible and effective leadership	*33*	*19*	*52*	*5.80%*
Devise and implement resource development schemes.	11	13	24	
Review the charters of institutions of higher learning and state universities and colleges including the chairmanship and membership of their governing bodies and recommend appropriate measures as basis for necessary action.	15	6	21	
Recommend to the Department of Budget and Management the budgets of public institutions of higher learning as well as general guidelines for the use of their incomes.	7	0	7	
CHED operational efficiency	*179*	*225*	*404*	*45.09%*
Perform such other functions as may be necessary for its effective operations and for the continued enhancement, growth or development of higher education.	142	207	349	
Administer the Higher Education Development Fund, as described. in Section 10 hereunder, which will promote the purposes of higher education.	13	9	22	
Promulgate such rules and regulations and exercise such other powers and functions as may be necessary to carry out effectively the purpose and objectives of this Act.	24	9	33	
Total	**420**	**476**	**896**	**100.00%**

Source: Various CHED memorandum orders

Table E: Levels of quality assurance

Region/ type	CHED		Technical panel, CHED		Professional licensure			Accredited programs	
	Autonomous/ deregulated	regulated	No COE/ COD	With COE/ COD	Takers	Passers	Passing rate	Number	Percent
NCR	*26*	*226*	*256*	*26*	*516,738*	*245,866*	*47.58*	*618*	*14.05*
Private	26	226	229	23	405,886	184,728	45.51	457	10.39
Public			27	3	110,852	61,138	55.15	161	3.66
North Luzon	*18*	*284*	*378*	*33*	*606,047*	*232,075*	*38.29*	*1101*	*25.03*
Private	18	284	288	14	372,360	139,398	37.44	379	8.62
Public			90	19	233,687	92,677	39.66	722	16.41
South Luzon	*8*	*310*	*433*	*21*	*490,934*	*177,327*	*36.12*	*909*	*20.66*
Private	8	310	308	10	273,451	91,393	33.42	314	7.14
Public			125	11	217,483	85,934	39.51	595	13.53

(continued on next page)

(continued from previous page)

Region/ type	CHED		Technical panel, CHED		Professional licensure			Accredited programs	
	Autonomous/ deregulated	regulated	No COE/ COD	With COE/ COD	Takers	Passers	Passing rate	Number	Percent
Private	13	214	227	215	340,653	135,910	39.90	288	6.55
Public			121	13	226,624	87,848	38.76	731	16.62
Mindanao	*10*	*327*	*423*	*29*	*666,943*	*205,823*	*30.86*	*752*	*17.09*
Private	10	327	323	14	427,065	127,331	29.82	303	6.89
Public			100	15	239,878	78,492	32.72	449	10.21
Philippines	**75**	**1,361**	**1,838**	**337**	**2,847,939**	**1,084,849**	**38.09**	**4399**	**100.00**
Private	75	1,361	1,375	276	1,819,415	678,760	37.31	1741	39.58
Public			463	61	1,028,524	406,089	39.48	2658	60.42
% Total	***5.22***	***94.78***	***84.51***	***15.49***	***100.00***	***100.00***			
% Private	100.00	100.00	74.81	81.90	63.89	62.57			
% Public			25.19	18.10	36.11	37.43			

Source: Knowledge Management Division, Office of Planning, Research and Knowledge Management, CHED

Table F: Accredited programs, by level, agency, region, and HEI types

Region/ type	Accreditation level						Agency				
	Candidate	1	2	3	4	Total	AACCUP	ACSU-AAI	PAASCU	PACUCOA	Total
NCR	*38*	*161*	*192*	*206*	*59*	*756*	*190*	*70*	*172*	*324*	756
Private	100	123	130	146	58	557		70	164	323	557
Public	38	38	62	60	1	199	190		8	1	199
North Luzon	*198*	*349*	*432*	*284*	*36*	*1299*	*844*	*61*	*142*	*252*	1299
Private	76	89	188	79	23	455	0	61	142	252	455
Public	122	260	244	205	13	844	844				844
South Luzon	*281*	*350*	*405*	*127*	*27*	*1190*	*783*	*40*	*104*	*263*	
Private	93	104	134	49	27	407		40	104	263	407
Public	188	246	271	78		783	783				783
Visayas	*225*	*406*	*408*	*163*	*42*	*1244*	*901*	*54*	*163*	*126*	*1244*
Private	54	82	123	50	33	342	0	54	162	126	342
Public	171	324	285	113	9	902	901	0	1	0	902
Mindanao	*258*	*234*	*347*	*158*	*13*	*1010*	*633*	*47*	*202*	*128*	*1010*
Private	74	62	145	83	13	377	0	47	202	128	377
Public	184	172	202	75	0	633	633	0	0	0	633
Philippines	**1,100**	**1,500**	**1,784**	**938**	**177**	**5,499**	**3,351**	**272**	**783**	**1,093**	**5499**
Private	397	460	720	407	154	2138	0	272	774	1092	2138
Public	703	1040	1064	531	23	3361	3351	0	9	1	3361
% Total	*20.00*	*27.28*	*32.44*	*17.06*	*3.22*	*100.00*	*60.94*	*4.95*	*14.24*	*19.88*	*100.00*
% Private	36.09	30.67	40.36	43.39	87.01	38.88		100.00	98.85	99.91	38.88
% Public	63.91	69.33	59.64	56.61	12.99	61.12	100.00		1.15	0.09	61.12

Notes:
AACCUP, Accrediting Agency of Chartered Colleges and Universities in the Philippines
ACSU-AAI, Association of Christian Schools, Colleges and Universities – Accrediting Agency, Inc.
PAASCU, Philippine Accrediting Association of Schools, Colleges and Universities
PACUCOA, The Philippine Association of Colleges and Universities Commission on Accreditation
Source of basic data: Knowledge Management Division, Office of Planning, Research and Knowledge Management, CHED

Table G: CHED accreditation of research journals, 2010–15

Journal category	2010[a]	2011[b]	2012[c]	2013[d]	2014[e]	2015[f]	Total	Share (%)
A-1 (listed in Thomson Reuters and Scopus)	*17*	*1*	*3*	*2*	*2*	*-2*	*23*	*26.14*
Higher education institution	8	1	2	2	2	-2	13	14.77
Research & development institution	6						6	6.82
Professional association/ society	3		1				4	4.55
A-2 (score of 85 - 100)	*6*	*2*	*1*	*2*	*4*	*7*	*22*	*25.00*
Higher education institution	5	2	1	2	4	7	21	23.86
Professional association/ society	1	1	1		1		4	4.55
B (score of 70 - 84)	*11*	*1*	*5*	*1*	*12*	*13*	*43*	*48.86*
Higher education institution	11	1	3	1	12	12	40	45.45
Professional association/ society			2			1	3	3.41
Overall	**34**	**4**	**9**	**5**	**18**	**18**	**88**	**100.00**
Higher education institution	24	4	6	5	18	17	74	84.09
Research & development institution	6	0	0	0	0	0	6	6.82
Professional association/ society	4	1	4	0	1	1	11	12.50

Legend: a, CMO 09 Series of 2010; b, CMO 25 Series of 2011; c, CMO 04 and 36 Series of 2012; d, CMO 26 Series of 2013; e, CMO 10, 15 and 23 Series of 2014; f, CMO 22 and 29 Series of 2015

Table H: Higher educational institutions with CHED-accredited and Scopus-indexed journals

Region/type		HEIs with accredited and Scopus-indexed journals		CHED accredited		Scopus-indexed	
		Number	Percent	Number	Percent	Number	Percent
NCR		*20*	*30.77*	*30*	*42.86*	*8,410*	*66.50*
	Private	14	21.54	13	18.57	3,777	29.86
	Public	6	9.23	17	24.29	4,633	36.63
Northern Luzon		*9*	*13.85*	*5*	*7.14*	*397*	*3.14*
	Private	3	4.62	2	2.86	263	2.08
	Public	6	9.23	3	4.29	134	1.06
	Private	2	3.08	1	1.43	125	0.99
	Public	4	6.15	6	8.57	1,877	14.84
Visayas		*14*	*21.54*	*12*	*17.14*	*1,056*	*8.35*
	Private	4	6.15	4	5.71	609	4.82
	Public	10	15.38	8	11.43	447	3.53

(continued on next page)

(continued from previous page)

Region/type		HEIs with accredited and Scopus-indexed journals		CHED accredited		Scopus-indexed	
		Number	Percent	Number	Percent	Number	Percent
Mindanao		*16*	*24.62*	*16*	*22.86*	*782*	6.18
	Private	5	7.69	6	8.57	99	0.78
	Public	11	16.92	10	14.29	683	5.40
Philippines		**65**	**100.00**	**70**	**100.00**	**12,647**	**100.00**
	Private	28	43.08	26	37.14	4873	38.53
	Public	37	56.92	44	62.86	7774	61.47

Source: Various CHED memorandum orders; Scopus database

Table I: Estimated enrollments of PHEIs, by region and type, 2014

Region/type		Pre-baccalaureate	Baccalaureate	Graduate	Total	% Share
NCR		*40,682*	*723,510*	*60,692*	*824,884*	*21.40*
	Private	20,753	529,103	27,784	577,640	14.98
	Public	19,929	194,407	32,908	247,244	6.41
North Luzon		*50,440*	*681,470*	*37,493*	*769,403*	*19.96*
	Private	13,107	339,506	18,613	371,226	9.63
	Public	37,333	341,964	18,880	398,177	10.33
South Luzon		*56,146*	*637,429*	*25,258*	*718,833*	*18.65*
	Private	13,643	328,134	12,150	353,927	9.18
	Public	42,503	309,295	13,108	364,906	9.47
Visayas		*40,285*	*694,094*	*31,436*	*765,815*	*19.87*
	Private	13,148	346,415	13,429	372,992	9.68
	Public	27,137	347,679	18,007	392,823	10.19
Mindanao		*40,446*	*701,751*	*33,840*	*776,037*	*20.13*
	Private	11,845	428,174	18,435	458,454	11.89
	Public	28,601	273,577	15,405	317,583	8.24
Philippines		**227,999**	**3,438,254**	**188,719**	**3,854,972**	**100.00**
	Private	72,496	1,971,332	90,411	2,134,239	55.36
	Public	155,503	1,466,922	98,308	1,720,733	44.64
Share of total		*5.91*	*89.19*	*4.90*	*100.00*	

Source: Knowledge Management Division, Office of Planning, Research and Knowledge Management, Commission on Higher Education

Table J: Philippine Qualification Framework: Levels 6 to 8

Level	Knowledge, skills and values	Application	Degree of independence
Level 6 Baccalaureate degree	Graduates at this level will have a broad and coherent knowledge and skills in their field of study for professional work and lifelong learning.	Application in professional work in a broad range of discipline and/or for further study.	Independent and/ or in teams of related field.
Level 7 Post-baccalaureate program	Graduates at this level will have advanced knowledge and skills in a specialized or multi-disciplinary field of study for professional practice, self-directed research and/or lifelong learning.	Applied in professional work that requires leadership and management in a specialized or multi-disciplinary professional work and/ or research and/or for further study.	Independent and or in teams of multidisciplinary.
Level 8 Doctoral degree and post-doctoral programs	Graduates at this level have highly advanced systematic knowledge and skills in highly specialized and/or complex multidisciplinary field of learning for complex research and/ or professional practice or for the advancement of learning.	Applied in highly specialized or complex multi-disciplinary field of professional work that requires innovation, and/ or leadership and management and/ or research in a specialized or multi-disciplinary field.	Independent and/ or in teams of multi-disciplinary and more complex setting.

Source: Manzala (2013)

Table K: Correlates of research productivity

Correlates	CHED accredited journal			Scopus-indexed articles		
	Coefficient	Significance	N	Coefficient	Significance	N
Number of COE programs	0.79940	<.0001	2442	0.87171	<.0001	2442
Average number of faculty with PhD	0.72417	<.0001	2093	0.69842	<.0001	2093
Average number of faculty	0.49757	<.0001	2392	0.42541	<.0001	2392
Average number of faculty with Master's	0.47627	<.0001	2356	0.40307	<.0001	2356
Total enrollment, 2010-2014	0.41659	<.0001	2442	0.32656	<.0001	2442
Total graduates, 2010-2014	0.41177	<.0001	2442	0.30651	<.0001	2442
Number of COD programs	0.30181	<.0001	2442	0.22972	<.0001	2442
Level 3 accredited programs	0.22504	<.0001	2442	0.06435	0.0015	2442

(continued on next page)

(continued from previous page)

Correlates	CHED accredited journal			Scopus-indexed articles		
	Coefficient	Significance	N	Coefficient	Significance	N
Level 4 accredited programs	0.16853	<.0001	2442	0.17725	<.0001	2442
Level 2 accredited programs	0.13699	<.0001	2442	0.01812	0.3708	2442
Total licensure passing percentage	0.13682	<.0001	1944	0.12615	<.0001	1944
Level 1 accredited programs	0.10445	<.0001	2442	0.02237	0.2692	2442
Percent of faculty with PhD	0.07515	0.0002	2442	0.06487	0.0013	2442
Candidate status	0.06318	0.0018	2442	0.00056	0.978	2442
Number of CHED journals	1.00000		2442	0.88721	<.0001	2442
Number of Scopus-indexed articles	0.88721	<.0001	2442	1.00000		2442

CHAPTER 9
SRI LANKA

G.M.R.D. Aponsu[1], Ministry of Higher Education and Highways, Sri Lanka

EXECUTIVE SUMMARY

The research analyzes the state of higher education sector to introduce higher education productivity indicators using the hub-and-spoke model. Considering the availability of data and the size of the contribution to higher education, the research is limited to the state-sector higher education institutes (HEIs). In the hub, the analysis was conducted at the institutional level and did not consider the data at the departmental level.

The basic concept behind the productivity model is the outcome-to-input ratio, and therefore all the inputs and outcome values were deeply studied by grouping 14 state HEIs into two groups. Finally, productivity indicators were calculated for education productivity, research productivity, and academic productivity. Three types of productivities were calculated in the forms of ratios as well as percentages. To realize the actual situation of institutes, the final calculations were limited to six selected HEIs due to the non-availability of time-series data for some outcomes.

The analysis showed that there were huge disparities among HEIs in terms of inputs as well as outcomes. All the input and outcome ratios were set to one at the base year 2010. Most of the outcome ratios showed inconsistencies and therefore led to an inconsistency in productivity ratios. Most of the HEIs showed negative percentages of productivity in 2014. Further, the results showed that some institutes showed higher productivity ratios due to a drop in the input ratio over the previous year.

The spoke part of the model analyzed the changes in the higher education policy, strategies, and management order to describe the changes in ratios. Accordingly, the impact of introducing strategic planning and the Sri Lanka Qualification Framework, coupled with student-centric learning and outcome-based education; as well as that of introducing outcome indicators such as graduate employability and university ranking, were discussed. It is recommended to use this productivity system after any necessary modifications, to allocate public funds in a proper manner instead of using the existing ad hoc funding mechanism. It is also recommended that a better management information system be maintained to enable the policy makers to take timely decisions by using proper productivity measurements.

[1]I would like to express my sincre gratitude to the Asian Productivity Organization for selecting me to carry out the Sri Lankan context of the "Research on Measuring Productivity in Higher Education," and to Dr Jose Elvina and his team for assiting in all the coordinating works; to P Ranepura, former Secretary, Ministry of Higher Education; and the National Productivity Secratariat for nominating me for this project. This effort is heavily based on the data we have on the higher education sector in Sri Lanka and was limited by the fact that some essential data is not available generally. In this context, I am extremly grateful to PV Damayanthi, the Statistician of the UGC, and Renuka Sugathadasa, Information Officer of the National Science Foundation for their assistance in the collection of data. I would like to give my sincre thanks to my staff for assisting me at various stages. I would also like to express my sincre gratitude to the Chief Expert of this research, Dr Hamish Coates for his guidance all the time. Last but not the least, I would like to thank my loving wife Deepthi, daughter Dhyani and son Thidas for their patience when I used my leisure time on this research.

INTRODUCTION

This research is designed for analyzing the productivity of HEIs in Sri Lanka using the hub-and-spoke method. The 'hub' is the core of the research for developing a set of indicators for measuring the productivity of each HEI. The calculation of indicators is based on the activities of teaching and doing research as the major functions of HEIs. For the teaching component, producing of graduates through the bachelor's degree programs, and coursework completed were considered, among other things. The research part considered all research activities performed.

The data is analyzed for the period 2010–15. To select the HEIs for this research, two factors were considered. One, the size of the contribution to providing higher education in terms of number of student enrollments; and two, the availability of required data. Accordingly, the study had to be limited to 14 state-sector universities coming under the University Grants Commission (UGC) except for the Open University of Sri Lanka (OUSL). Further, the number of HEIs was reduced to six universities when finalizing the indicators due to non-availability of certain data for the entire period considered for the analysis.

The 'spoke' of the research focused on the changes in policies, strategies, and management of the sector. The introduction of the National Higher Education Strategic Management Plan (NHESMP) and the Sri Lanka Qualification Framework (SLQF), along with outcome-based education (OBE) and student-centerd learning (SCL) were mainly considered. Measuring of graduate employability and using webometrics as an indicator for ranking universities were considered as the major changes in the management system of the sector. The analysis did not consider the data at the level of department as some input as well as output data showed disparities. Each HEI was analyzed considering all of the faculties.

BACKGROUND

The higher education sector in Sri Lanka can be grouped into four basic categories based on the governing system as shown in Figure 74. Block A of this diagram explains the universities and institutes in the state sector that are regulated under the Universities Act, No. period 16 of 1978. This is the engine for providing access to higher education for the seekers in the country. There are 14 conventional universities; the OUSL; seven postgraduate institutes; and 10 other institutes that are currently functioning under the UGC, which was set up by way of the Universities Act. Mainly, these universities and institutes are conducting undergraduate as well as postgraduate degree programs, and carrying out research activities as well.

Block B of the same diagram summarizes the HEIs established under different Acts. The Buddhist and Pali University was established under the Parliament Act No. 74 of 1981, while the Sri Lanka Bikshu University was set up under the Parliament Act. No 26 of 1996. Both these universities focus on the Buddhist studies, and are functioning under the Ministry of Higher Education. The Sri Lanka Institute of Advanced Technological Education (SLIATE), which was established by the Parliament Act No. 29 of 1995, is also functioning under the Ministry of Higher Education. The SLIATE offers only Higher National Diplomas in a few selected subject areas.

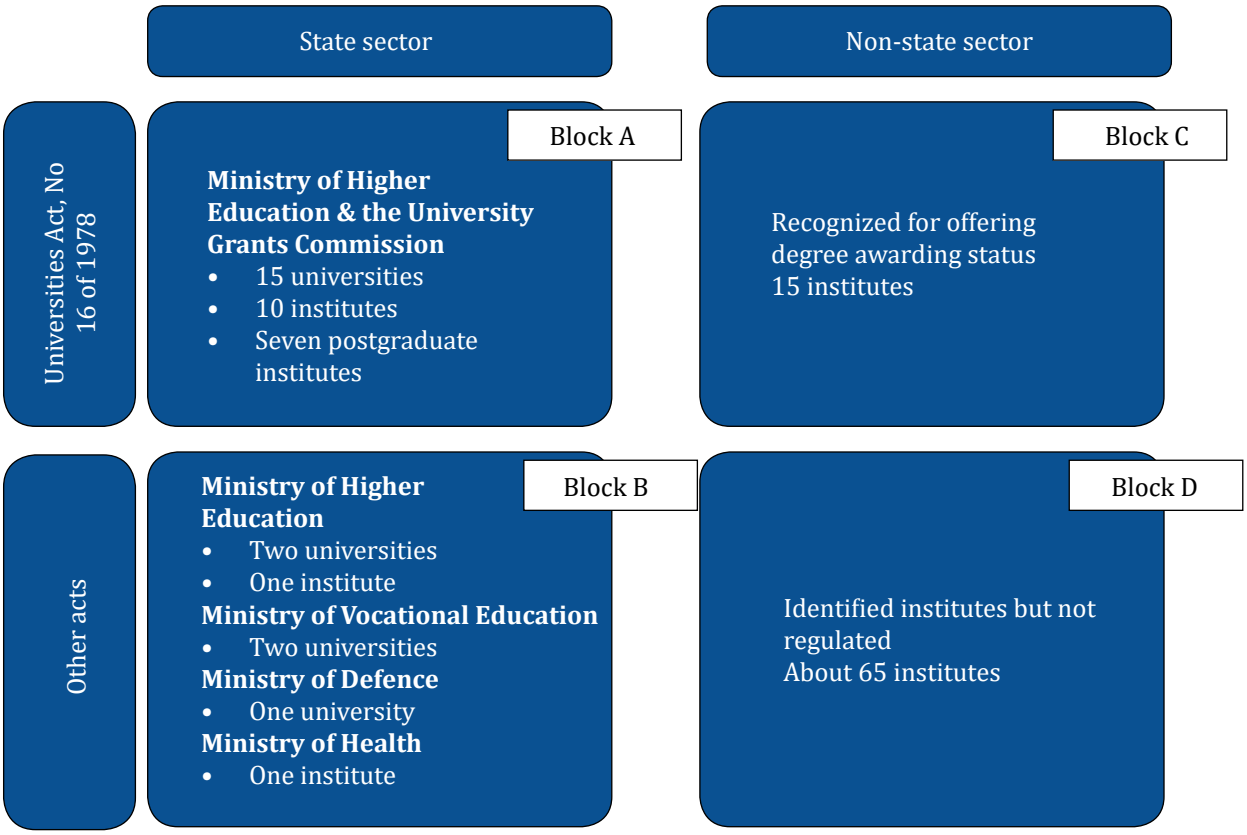


Figure 74: Classification of higher education sector

The University of Vocational Technology (UnivoTec), established by the Parliamentary Act No. 31 of 2008; and Ocean University of Sri Lanka, established by the Ocean University of Sri Lanka Act No. 31 of 2014 are functioning under the Ministry of Vocational Education. There are a few more higher education providers in the state sector. For example, the Defence University is under the Ministry of Defence and Nursing Training School is under the Health Ministry.

The institutes indicated in the Block C belong to the non-state sector and are recognized under the provisions of various universities Acts. There are 15 institutes recognized during the period 1994–2015. The institutes represented by the Block D are in the non-state sector and are yet to be regulated.

Except for the postgraduate degree and diploma programs, bachelor's degrees and higher national diploma programs offered by the state-sector institutes are operating on free-of-charge basis. Only Kothalawala Defense University is conducting paid bachelor's programs while also giving a few students free-of-charge opportunities. The state-sector HEIs summarized in Block A form the major system of the higher education sector in Sri Lanka. A total of 14 universities, except the OUSL, and four institutes in this system follow a central admission system at the UGC to select students for each academic year.

According to the guidelines of the UGC, the selection method is based on the dual criteria of 'district quota system' and 'merit on national rank' and places are filled based on the Z-score of the students obtained at the General Certificate of Examination (Advanced Level) (Student Hand book, 2014). These institutes offer 89 degree programs for students from

four major subject disciplines such as bio science, physical science, arts & humanities, and commerce & management (SHB, 2014). In addition, these institutes allow students to register for external degree programs in the selected disciplines. Further, there are a few research institutes engaging in national research activities, providing assistance to research activities, and doing policy studies under the Ministry of Science and Technology.

On the other hand, the private sector is also increasingly involved in providing higher education facilities. As mentioned above, there are 13 HEIs that are recognized under universities Acts for offering degree and diploma courses. About 60 institutes in the non-state sector, functioning locally as well as affiliated to foreign HEIs, have been identified but not recognized under the Act. For assuring the quality of higher education provided by the state-sector HEIs, an internal quality assurance system is maintained. In the case of non-state sector, the quality is reviewed when the HEIs are recognized for offering the degree-awarding status. However, a national-level mechanism has been proposed for the quality assurance and accreditation of the entire higher education sector in the country.

RECENT ADVANCES

Higher Education Strategic Plan

One of the initiatives to improve the productivity in higher education was the introduction of a higher education strategic plan in the year 2012. This initiative focused on the management system of the state-university sector. Until this initiative, the public investment in higher education in the form of programs and projects was implemented in state universities with the approval of the Department of National Planning, on the basis of requirements identified by each university individually. Universities and institutes prepared their corporate and strategic plans on the basis of their needs and requirements.

Usually, the method used by the UGC to prepare the corporate plan is to summarize the investment activities indicated in action plans of universities. "Corporate strategy outlines the plan of strategies and activities agreed upon by stakeholders to achieve the institution's primary objectives or mission by means of planned improvements and interventions in the organizational structure, systems, and processes" (Corporate Plan 2011–16). However, in practical environments, these cooperate plans were used as formal documents rather than monitoring tools. This was identified as an improper practice used in the state higher education sector. According to Kotler and Murphy [3], this practice was very common. Many institutions have undertaken three major levels of planning. The first level refers to the budgeting and scheduling process; a second level encompasses short-range planning; while the third level represents long-range planning. This type of planning utilizes both quantitative and qualitative assessment of the external environment to determine institutional priorities and strategies.

To change such a culture practiced in the state higher education sector since long, the Ministry of Higher Education introduced the National Higher Education Strategic Management Plan (NHESMP), addressing the government policy direction for the higher education sector. NHESMP is more focused on the external environment than on the third-level planning and on the definition of strategic planning. Kotler and Murphy [3] define strategic planning as

"the process of developing and maintaining a strategic fit between the organization and its changing marketing opportunities." The NHESMP directed all state HEIs to align with the government investment policy. With this initiative, all institutes reviewed their vision and mission statements; defined key performance indicators for their objectives; and initiated to prepare their separate strategic plans aligned with the NHESMP.

As an assistance to these institutes, many workshops were conducted and consultancies were given. Training programs were also conducted. All the institutes were able to identify the lacking and missing areas of investment; the prioritized and urgent needs of investment; and inefficient areas of the administrative processes. Most importantly, these exercises allowed them to share the individual experience and knowledge mutually. Further, preparation of strategic plans assisted the officers engaging in the monitoring and auditing process to make the higher education system more efficient and productive. If there are some gaps showed in using the strategic plans in individual institutes, averagely, every institute is getting to understand the importance of strategic plan as a productivity tool.

Curriculum Review

Curriculum review was another important initiative for improving the higher education output. This initiative directed institutes to review the curricular for necessary changes, while also emphasizing upon the need for changing the existing teaching culture.

This directive led to an essential debate in the sector criticizing the existing system. First, the existing teacher-centric learning culture was questioned, and some actions were taken to introduce the student-centric learning methods. Second, the need for identifying the outcome of each degree program was emphasized. This led to introducing an outcome-based education system and preparing the guidelines for implementing the initiative. Further, necessary changes to the Sri Lanka Qualification Framework were also introduced. The SCL system was used as a strategy to change the system to produce more knowledgeable graduates with a higher quality.

SCL, often referred to as project-based learning (PBL), is a 21st century concept of implementing a new curriculum using technology and leveraging the student's own abilities to achieve higher standards than the traditional learning styles [9]. Stephanie (2010) states it best, "PBL is not a supplementary activity to support learning. It is the basis of the curriculum." In order to realize this initiative, public investment was made available for universities to purchase new learning materials, furniture, and other necessary equipment to prepare the learning environment in HEIs for SCL. As a compliment of SCL, outcome based education (OBE) was also introduced to the state higher education sector. Spady [10] mentioned, "OBE means clearly focusing and organizing everything in an educational system around what is essential for all students to be able to do successfully at the end of their learning experiences."

Showing the relation of OBE to the reviewing of curricular, further, Spady [10] reveals, "This means starting with a clear picture of what is important for students to be able to do, then organizing curriculum, instruction, and assessment to make sure this learning ultimately happens." Even though the OBE is not a new concept and "goes back at least 500 years to the

craft guilds of the Middle Ages" [4], the state HEI system was instructed to use the concept blended with the SCL. A manual for 'implementing OBE by using SCL' was introduced in 2014. This manual guided the system for the four core activities, namely curriculum design, teaching and learning process, assessment evaluation method, and continuous quality improvement.

Curriculum review focused on another area when introducing OBE and SCL. This was the area of curriculum relevancy. The relevancy of curricular is being discussed at various levels of the higher education sector as well as higher policy level. The General Treasury, as the decision maker of allocating budgetary provisions for public expenditure, emphasized recently that the need for maintaining an outcome-based investment program for higher education shows the interest in the productivity of the system (Circular, 2014).

A World Bank study on the higher education sector in Sri Lanka states that "when graduates emerge from the university system with life skills that make them employable and sought after by employers of all kinds, then the system that produced them has achieved a quality benchmark. Some university systems produce graduates that languish for many years on the job market because the curriculum they have followed has not given them adequate value in the eyes of employers. Thus, a curriculum that is relevant to the needs of its society is a mark of a quality system, as well as a worthwhile investment." (World Bank, 2009).

A conceptual framework for the quality of higher education explained by the World Bank study (World Bank, 2009) emphasized upon the relevant curricular, skilled and experienced staff, learning and teaching methods, ICT, equipment and library resources, quality assurance and enhancement process, facilities and infrastructure, and assessment methods. (Figure 75).

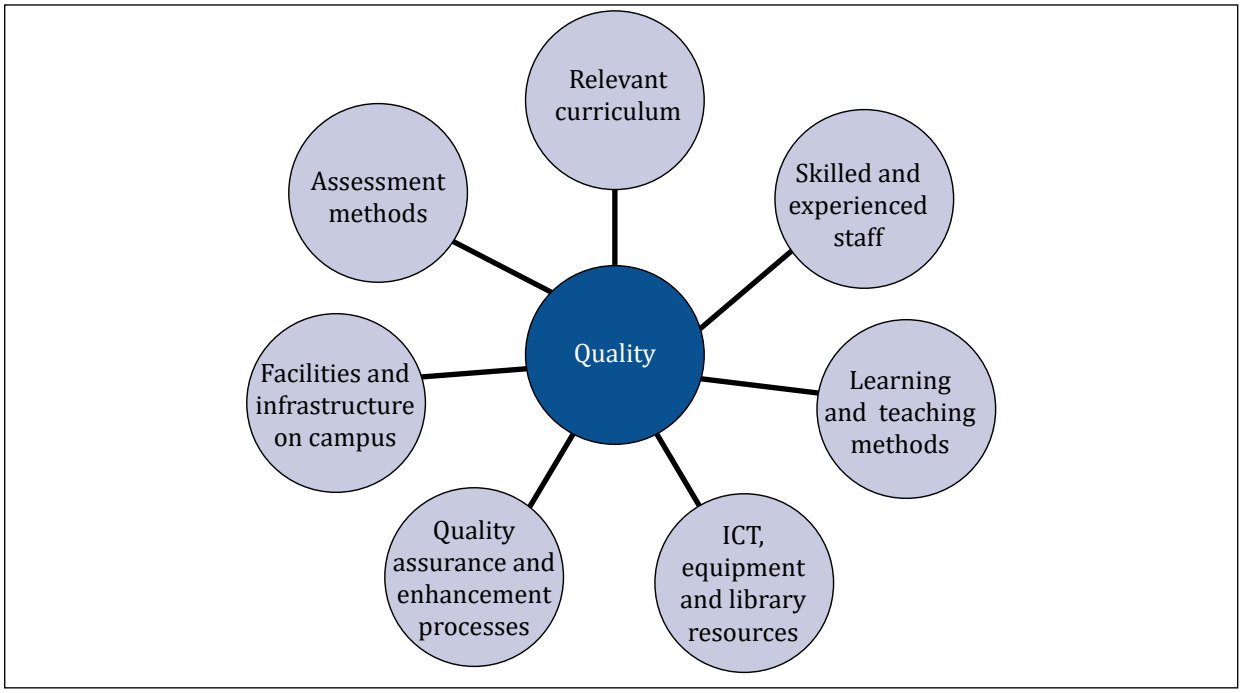


Figure 75: A conceptual framework for quality
Source: Tower of Learning, World Bank, 2009

The response of HEIs for preparation of strategic plan was very negative initially but showed improvement gradually.

The financial progress of the capital investment is considered to be an instrument for getting an idea of the benefits of implementing strategic plans in each HEI. Figure 76 shows the actual expenditure against the capital allocation for the period of 2008 to 2014.

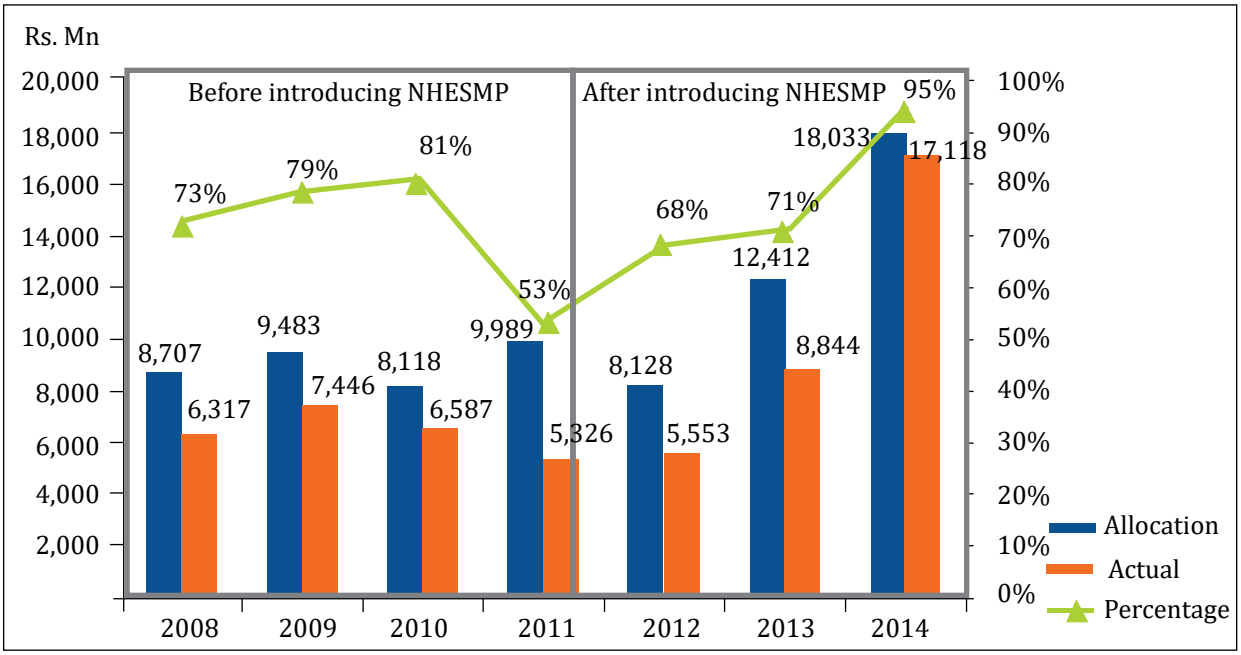


Figure 76: Capital expenditure in state higher education sector: allocation versus actual

Figure 76 shows the utilization pattern of capital expenditure before and after the implementation of NHESMP against the allocated amount. It may be noted that the percentage has increased while the allocation increased rapidly from Rs 8,128 million earlier, to Rs 18,033 million after NHESMP. Before implementing NHESMP, the allocation did not increase rapidly even if it showed increase in the percentage. In this period a sharp fall in percentage was also reported. This comparison shows positive trend in productivity due to NHESMP.

As an outcome of the process, the graduate employability was considered. It was assumed that the absence of the OBE system and the SCL culture would be some major reasons for low levels of employability for some degree programs. Until 2012, except one or two institutes, most of institutes in the state sector did not show an interest in measuring the employability of their outputs.

In this context, the ministry proposed a unique method to measure the graduate employability which was agreed upon by all and implemented. Figure 77 shows the employability measures of graduates in each HEI for the period 2012–14.

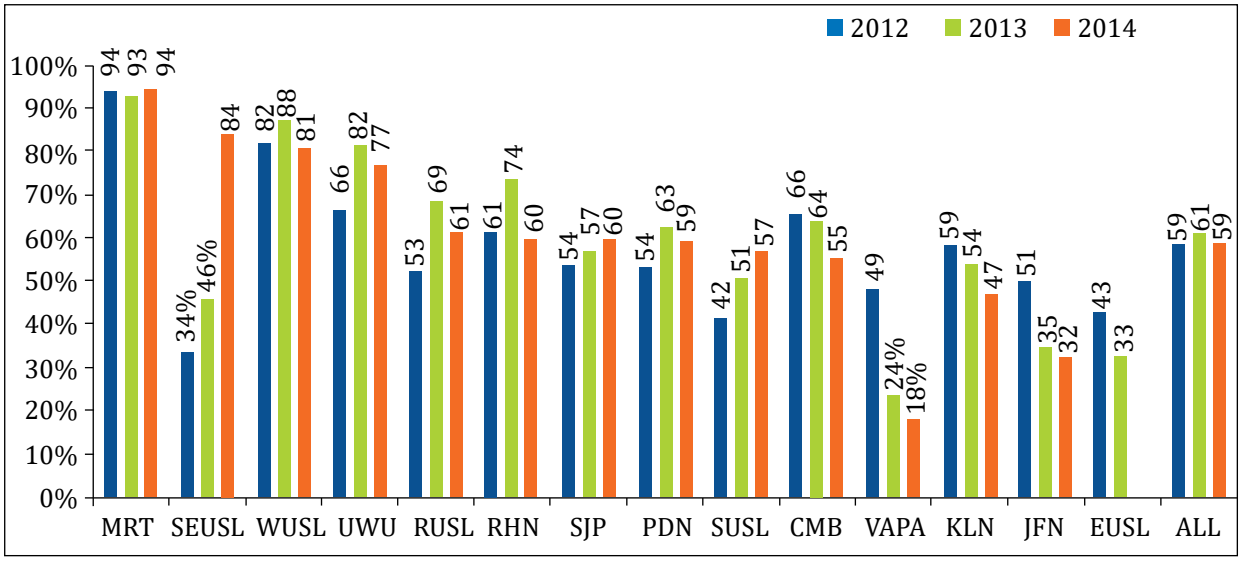


Figure 77: Graduate employability of state universities
Source: HETC project, Ministry of Higher Education

The graduate employability survey conducted by the Higher Education for Twenty-first Century (HETC) project under the Ministry of Higher Education covered 14 state universities, except the OUSL. Data was collected from graduates at the time of convocation, and as such the employability was measured within three to six months of the completion of their studies. This survey revealed that the graduate employability rate of each university provided better comparison among universities.

According to the results, University of Moratuwa (MRT) maintained the highest value while University of Visual and Performing Arts (VAPA) recorded the lowest value in 2014. Some universities such as Eastern University of Sri Lanka (EUSL), University of Jaffna (JFN), University of Kelaniya (KLN), and Sabaragamuwa University of Sri Lanka (SUSL) showed performance below average in all the years. South Eastern University of Sri Lanka (SEUSL) showed rapid increase in its employability rate. The important message given by this result is the opportunity for each university to learn from others in choosing their institutional strategies.

However, it may be noted that different universities enjoy different capacities. The total number of students; composition of students, such as arts, commerce, and science; the number of degree programs offered; and the infrastructure and human capital as inputs are not distributed homogenously among the universities.

As an instrument for a comparison of the state universities as well as a proxy indicator to measure the overall outcome of the sector, Webometrics of World University ranking was used. Explaining the Webometrics ranking, Aguillo, et al [1] say that "at the academic level, universities have a very important role as a means to communicate scientific and cultural achievements. Web publication by scholars are not only the tools for scholarly communication but are also a means to reach larger audiences, and in general, are a reflection of the performance of the institutions. There have been several efforts to develop web indicators that can ultimately lead to build a university's rankings". A comparison for

top-ranked seven universities in Sri Lanka is shown in Figure 78. The linear trend in world ranking of most universities showed downward relation, i.e. achieved a higher rank. These results assisted HEIs to set their inputs, and budgetary allocations for research activities, and drew the attention of the UGC.

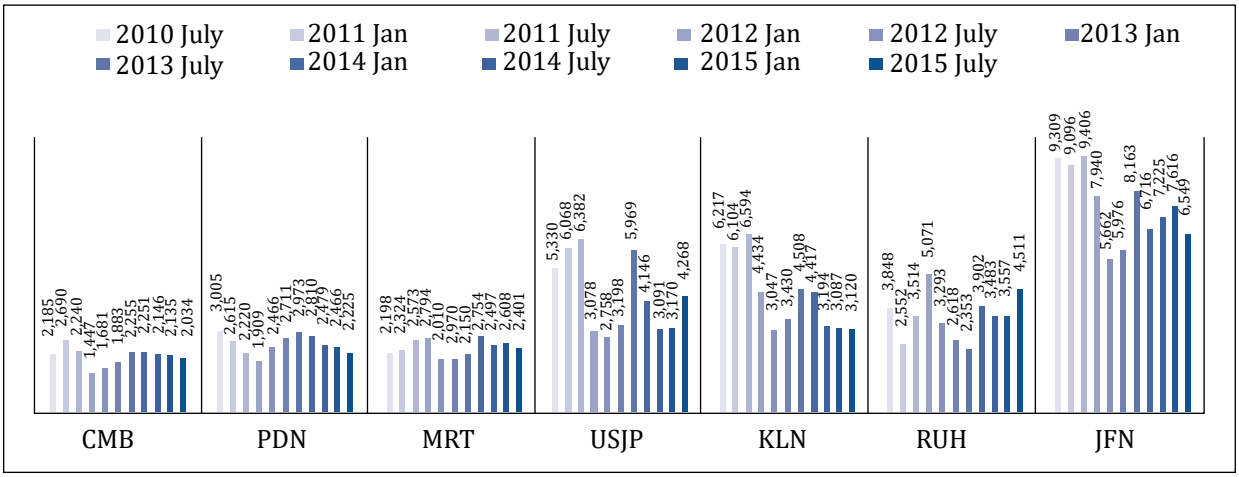


Figure 78: Webometrics ranking of universities: July 2010 to July 2015
Source: www.webometrics.info.org

RESEARCH METHODS

We have adopted a 'hub and spoke model' for this research. The hub is a quantitative indicator of productivity, which is mathematically stated as:

P=O/I; where P=productivity, O=output and I=inputs.

Also, the productivity model is focused on education and research as the outcome of the system. Finally, the academic productivity is taken as the average of research productivity and the education productivity.

Table 42: The hub: key outcome indicators

	Indicator	Measure
Education	• Coursework completions • Graduate employment rate • Credit hours completed • Percentage of learning outcomes	• Number of graduates. Only SLQF 6 and 7 • Percentage of graduates finding a job within three to six months of the graduation • Credit hours delivered to produce the above graduates • Percentage of students' success at the final examination at the first attempt.
Research	• Number of publications • Number of citations • Number of patents obtained • Number of research completions • Research funds received	• Journal publications and conference proceedings including abstracts • Citations in SCOPUS • Patents filed • Journal publications and conference proceedings excluding abstracts • Amount allocated for research activities in USD

The indicators of education outcomes and research outcomes; and the way they were measured are described in Table 1. As the input of the sector, labor, capital, and intermediaries are considered and measured by monitory value. Intermediaries considered here are energy, materials, services, etc.

Finally, the productivity is calculated for each year for research, education and academics, based on the following formulas and definitions:

$$Productivity_t^j = \left[\frac{P_t^j}{P_{t-1}^j} - 1\right] \times 100\,\%$$

where, P_t^j is the productivity ratio for the period "t" and for j = R (research) and E (education)

Productivity is calculated for j = R, E and A (research, education & academic)

$$P_t^A = Average(P_t^R, P_t^E)$$

where

P_t^A = *Academic productivity ratio,*

P_t^R = *Research productivity ratio, and*

P_t^E = Education productivity ratio.

Where P_t^R and P_t^E are defined as

$$P_t^E = \frac{O_t^j}{I_t^W \times I_t^F} \quad \text{and} \quad P_t^R = \frac{O_t^j}{I_t^W \times (1 - I_t^F)}$$

Where, O_t^j is Outcome for the year "t" for *j*= *R* and *E*

I_t^W is weighted input ratio,

I_t^F is input fraction for Education

and assumed that I_t^F = 0.5

I_t^W is calculated as

$$I_t^W = Exp\left(\sum_i w_t^i \times \ln\frac{I_t^i}{I_{t-1}^i}\right),$$ Where *i* = L for labor, K for capital and S for intermediaries

w_t^i are Input weights for *i* = K, L and S for the year "t"

I_t^i are Inputs in USD for *i* = K, L and S for the year "t"

w_t^i are calculated as

$w_t^i = Average\left(\frac{I_{t-1}^i}{I_{t-i}^T}, \frac{I_t^i}{I_t^T}\right)$, Where I_t^T is Total input in USD for the year "t"

The outcome O_t^j for *j*= E and R are calculated as the averages of outcome ratios for both education and research as follows.

$O_t^E = Average\left(O_t^{cw}, O_t^{gr}, O_t^{cr}, O_t^{lr}\right)$, Where $O_t^{cw}, O_t^{gr}, O_t^{cr}, O_t^{lr}$ are calculated using the relevant outcome measures.

$$O_t^{cw} = \frac{cw_t}{cw_{t-1}} \qquad O_t^{gr} = \frac{gr_t}{gr_{t-1}} \qquad O_t^{cr} = \frac{cr_t}{cr_{t-1}} \qquad O_t^{lr} = \frac{lr_t}{lr_{t-1}}$$

Where "*cw*" is course worked completed, measured in numbers
"*gr*" is graduate employability in percent value
"*cr*" is credit hours delivered measured in numbers
"*lr*" is learning outcomes measured in percent value

Similarly:

$O_t^R = Average\left(O_t^{pb}, O_t^{pt}, O_t^{ct}, O_t^{rc}, O_t^{rf}\right)$, Where relevant outcome ratios are measured as follows.

$O_t^{pb} = \frac{pb_t}{pb_{t-1}}$ $O_t^{pt} = \frac{pt_t}{pt_{t-1}}$ $O_t^{ct} = \frac{ct_t}{ct_{t-1}}$, $O_t^{rc} = \frac{rc_t}{rc_{t-1}}$ and $O_t^{rf} = \frac{rf_t}{rf_{t-1}}$

"pb" is publications
"pt" is patents obtained
"ct" is number of citations as per the SCOPUS
"rc" is number of research completed
"rf" is research funds received

These equations can be summarized into following four formulas for calculating both productivity ratios and productivity percentages.
Productivity ratios:

$$P_t^E = \frac{Average\left(\frac{cw_t}{cw_{t-1}}, \frac{gr_t}{gr_{t-1}}, \frac{cr_t}{cr_{t-1}}, \frac{lr_t}{lr_{t-1}}\right)}{Exp\left(\Sigma_i \left(Average\left(\frac{I_{t-1}^i}{I_{t-i}^T}, \frac{I_t^i}{I_t^T}\right)\right) \times \ln\frac{I_t^i}{I_{t-1}^i}\right) \times 0.5}$$ Formula (1)

$$P_t^R = \frac{Average\left(\frac{pb_t}{pb_{t-1}}, \frac{pt_t}{pt_{t-1}}, \frac{ct_t}{ct_{t-1}}, \frac{rc_t}{rc_{t-1}}, \frac{rf_t}{rf_{t-1}}\right)}{Exp\left(\Sigma_i \left(Average\left(\frac{I_{t-1}^i}{I_{t-i}^T}, \frac{I_t^i}{I_t^T}\right)\right) \times \ln\frac{I_t^i}{I_{t-1}^i}\right) \times 0.5}$$ Formula (2)

$P_t^A = Average\ (P_t^R, P_t^E)$ Formula (3) and

Productivity percentages:

$$Productivity_t^j = \left[\frac{P_t^j}{P_{t-1}^j} - 1\right] \times 100\ \%$$ Formula (4) for j= R, E and A

The year 2010 is considered as the base year and therefore all outcome indicators for the year 2010 are set as $O_{2010}^R = O_{2010}^E = 1$ ..

Establishing a Productivity Indicator

Inputs of the Model

Capital Expenditure
Capital expenditure as one of the inputs in this productivity model is further studied and categorized into five major groups. They are:

- Rehabilitation and improvement of capital assets.
- Acquisition of fixed assets.

- Construction and infrastructure development.
- Human capital development.
- Strengthening research activities.

Figure 6 shows that the highest portion of the annual capital expenditure of state higher education is allocated for constructions and infrastructure development. The average percentage for the period 2012–15 is 49.2. Average allocations for acquisition of fixed assets, and rehabilitation and improvement of capital assets, are 20.6% and 11.2%, respectively, while 12.7% is allocated for the development of human capital. However, only about 6.3% is allocated for strengthening the research activities.

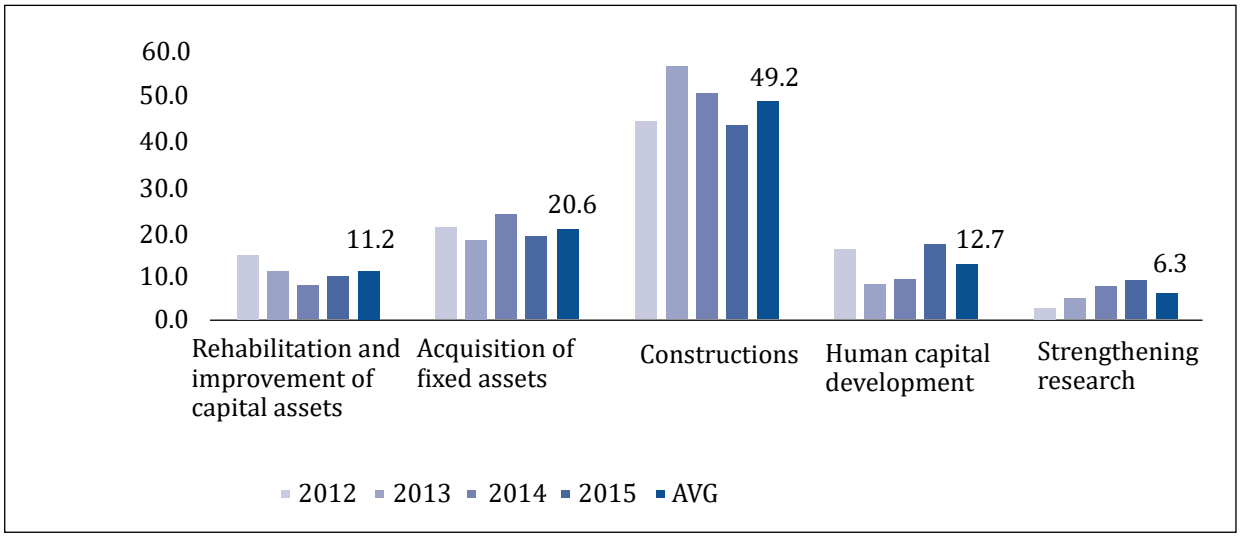


Figure 79: Composition of capital allocation in percentage for the period 2012 to 2015
Source: University Grants Commission and Ministry of Higher Education

The analysis is continued toward institutional expenditure. The study followed the guidelines of the UGC for capital expenditure allocation and found that there are two tiers of HEIs. In the first tier, there are seven universities: University of Peradeniya (PDN), University of Colombo (CMB), University of Moratuwa (MRT), University of Kelaniya (KLN), University of Sri Jayewardenapura (SJP), University of Ruhuna (RUH), and University of Jaffna (JFN). These have been treated as well-established universities. In the second tier, there are seven other universities: Rajarata University of Sri Lanka (RUSL), Wayamba University of Sri Lanka (WUSL), Eastern University of Sri Lanka (EUSL), South Eastern University of Sri Lanka (SEUSL), University of Visual & Performing Arts (VAPA), Uva Wellassa University (UWU), and Sabaragamuwa University of Sri Lanka (SUSL). These are categorized as recently established universities.

The UGC, with concurrence of the Ministry of Higher Education as well as the Ministry of Finance and with careful consideration of the annual requirements of HEIs, does the capital allocation to each HEI. The capital expenditure in construction and infrastructure is basically for increasing the access of the university, improving the quality of learning environment in HEIs, and improving the welfare facilities of the university community.

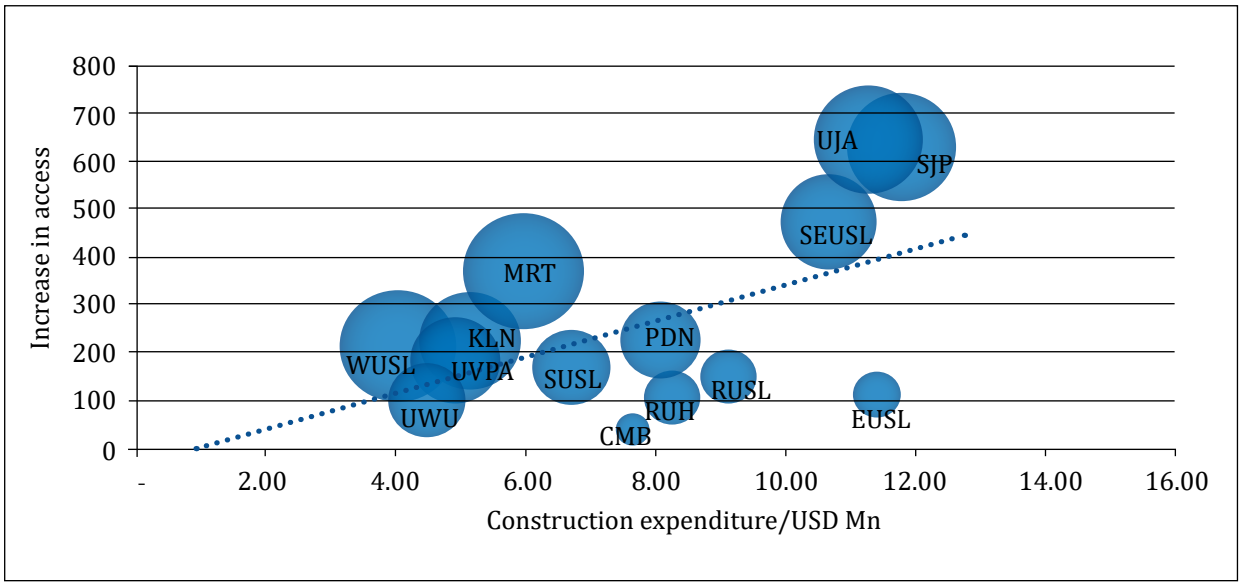


Figure 80: Change in access versus total capital in construction and infrastructure development during the period 2010 to 2015

Source: UGC and MoHE

The total capital allocation for construction and infrastructure development in 14 state universities during the period 2012–15 was USD109.4 million. Of this amount, SJP, UJA, MRT, and KLN, representing the first tier, utilized USD11.7 million, USD11.2 million, USD5.9 million, and USD5.14 million, respectively. This resulted in increases in student intakes by 632, 642, 369, and 220, respectively, during the period. These universities showed higher ratios of increase in the access-to-construction expenditure (A/C) than other universities. The sizes of the bubbles in Figure 80 represent the magnitude of the A/C ratio. SEUSL, UVPA and WUSL, representing the second tier, also showed higher A/C ratios. The first-tier PDN, and the second-tier SUSL and UWU showed A/C ratios just below the average. Other four universities very far below the average. However, the results give some indications that the universities that showed lesser value had more concern about quality improvement than increasing the access.

Expenditure on Research

The capital expenditure on strengthening research activities was maintained at an average of 6.3% in the period 2010–15. The analysis shows that comparatively higher capital has been allocated to universities in the second tier than those in the first tier in terms of per academic research expenditure. These results are summarized in Figure 81. The first-tier universities had more permanent academic staff ranging from 299 to 711 for the period 2010–15, compared to the second-tier universities where the number ranged from 87 to 184.

Per academic expenditure on research is calculated as:

$$\frac{\textit{Average annual expendiure on research in 2012–15}}{\textit{Number of permanent academic staff}}$$

The group averages for first-tier and second-tier universities were calculated separately, and resulted in AVG_{FT} = USD856, and AVG_{ST}= USD1,168, respectively. The second-tier RUSL showed the highest per academic research allocation of USD1,575 per year while the first-tier RUH recorded the lowest of USD543 per year.

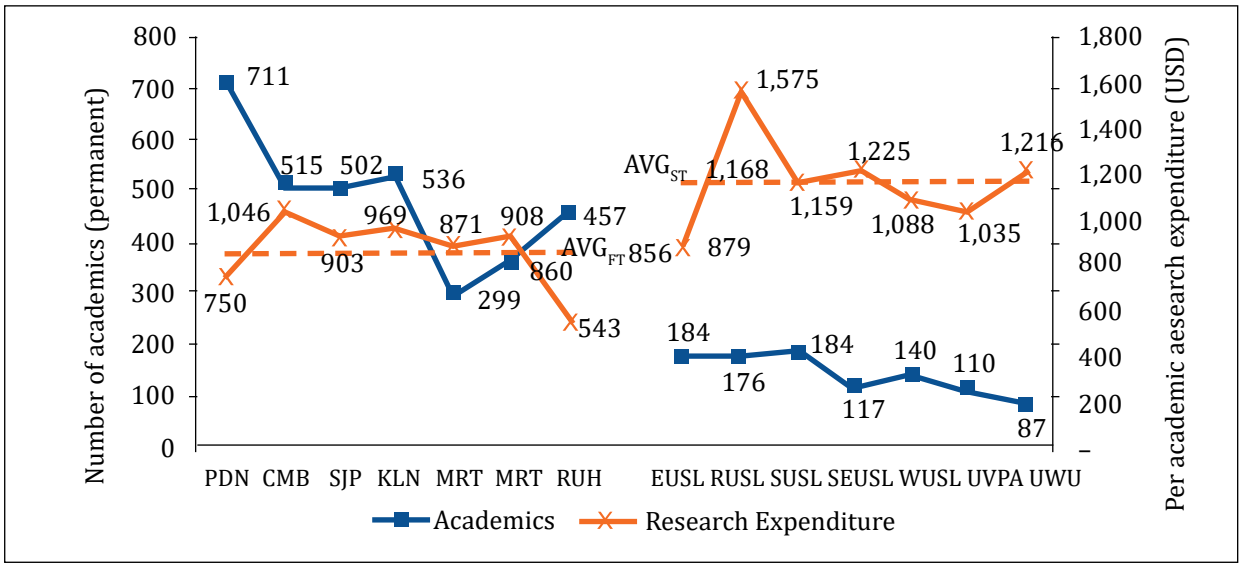


Figure 81: Per academic research expenditure
Source: UGC, MoHE

Labor

Another input considered in this research is labor which includes both academic and non-academic staff. Without doubt, one can argue that the teaching staff with higher academic quality and experience have higher potential to produce quality graduates as well as quality research outcomes for their universities. Therefore, following the classification used by the UGC to group the academic staff, the existing number of academic staff is analyzed.

The number of academics is calculated by taking the average for the period from 2010 to 2014, including temporary staff. The academic groups classified here are professors, associate professors, senior lecturers, and lecturers, including probationary lecturers. The temporary staff includes the staff recruited on a temporary basis due to some technical limitations of appointing them on a permanent basis. The academic supporting staff is not considered as the academic staff even though they are in permanent positions. The results showed that PDN had the highest number of academic staff at 847, of which 115 or about 15% were professors. KLN, CMB, and SJP recorded 581, 561, and 510 numbers of total staff, respectively. Of these, the professors were 105, 84, and 65, respectively. Comparatively, the first-tier universities had higher number of professors than the second-tier universities. The summary of this result is given in Figure 82.

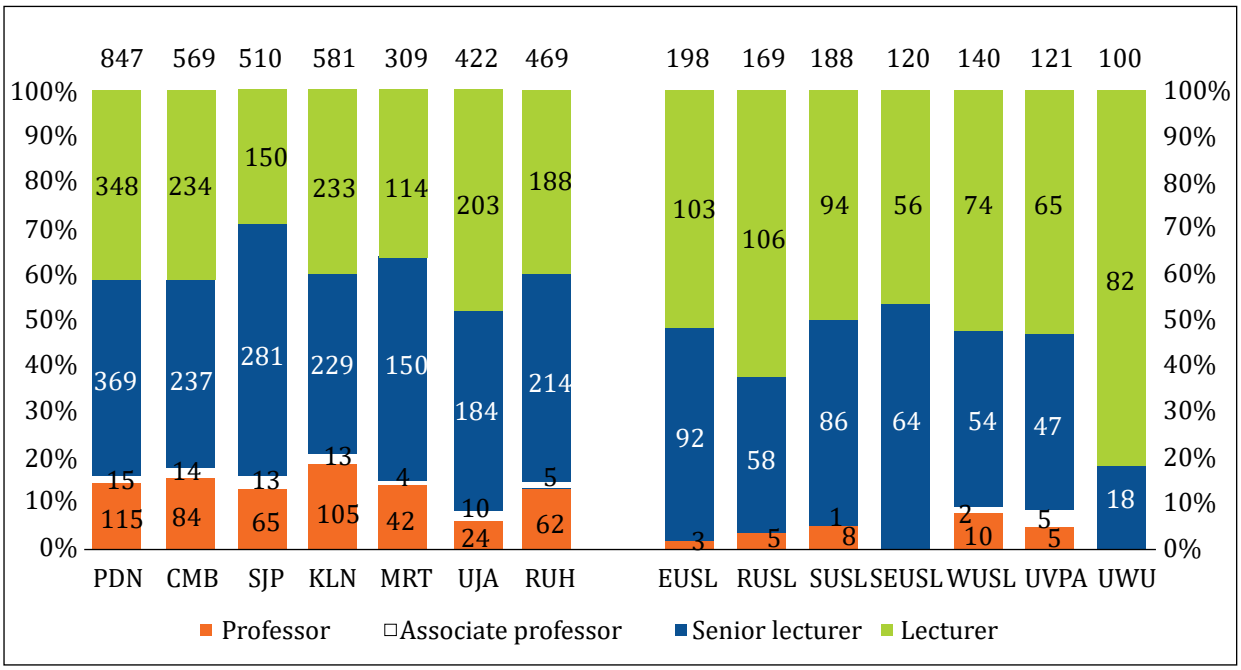


Figure 82: Academic staff averages for the period 2010 to 2014
Source: UGC

The number of academic staff affects the quality of higher education and especially the student-staff ratio (SSR), which "is treated as proxy for teaching quality" [5]. PDN showed the best SSR ratio of 1:12 while handling a larger number of staff as well as student enrollments. The student enrollments were calculated by taking the average for the period from 2010 to 2014. SJP had the lowest SSR value of 1:20.6, in the first-tier universities group while handling the largest number of students. Among the second-tier universities, the best SSR was reported by UVPA, at 1:17.2; while the lowest SSR was that of RUSL, at 1:26. RUSL had the highest number of student enrollments in the second-tier universities group. The results are summarized in Table 43.

It was observed that non-academic staff (NAS) accounted for the highest portion of the labor in the universities considered. They may be categorized into five groups, namely executive; clerical and allied; technical; skilled and semiskilled; and academic support, as classified by the UGC. PDN had the highest number of total NAS recording at 1,787. In the first-tier group, MRT recorded the least number of NAS, at 574; while in the second-tier group, RUSL recorded the highest NAS of 330, and UWU recorded the lowest NAS of 39. UWU showed a different pattern from other universities in the composition of NAS. It had seven officials in the executive grade, which accounted for about 18% of the total; while other universities had executive officers within a range of 2% to 5%. It was also noted that all the universities in the first-tier group maintained lesser percentages of executives than those in the second-tier group. NAS in the non-executive categories showed similar patterns in all universities except UWU. These details are summarized in Figure 83.

Table 43: Student-staff ratios of the universities

University category	University	Number of academic staff †	Student enrollment ‡	SSR
FT	PDN	847	10,161	12.0
	CMB	569	8,750	15.4
	SJP	510	10,482	20.6
	KLN	581	8,588	14.8
	MRT	309	5,501	17.8
	UJA	422	6,231	14.8
	RUH	469	6,533	13.9
ST	EUSL	198	3,614	18.3
	RUSL	169	4,395	26.0
	SUSL	188	3,377	17.9
	SEUSL	120	2,704	22.6
	WUSL	140	2,599	18.5
	UVPA	121	2,084	17.2
	UWU	100	1,767	17.7

Source: UGC

Notes:

† Average number of staff during 2010–14, including both permanent and temporary academics.

‡ The average student enrollment during the period 2010–15.

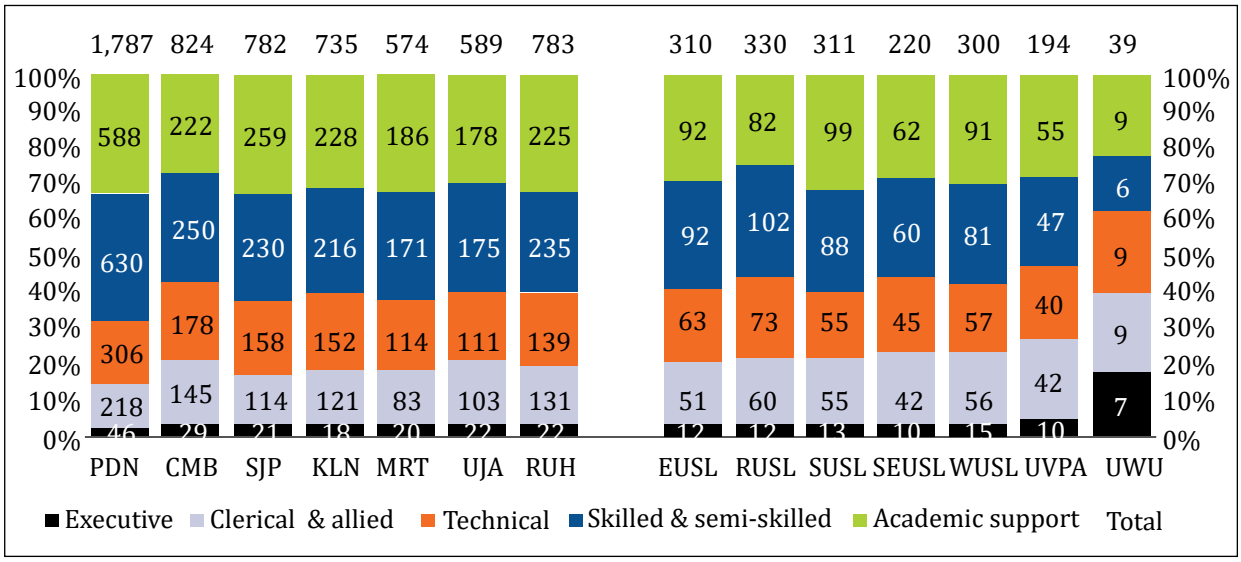


Figure 83: Non-academic staff averages for the period 2010–14

Source: UGC

Labor as an input in this research is measured in monitory terms, based on the personal emoluments (PEs). All HEIs considered are public institutes and use a common formula for calculating the PEs. Therefore, the variations in labor costs heavily depend on the number of staff members in each category. PE includes the salaries and wages, university provident fund, pension, employer trust fund, cost of living allowance, language proficiency, gratuity,

overtime and holiday payments for NAS, and academic allowances and research allowance for academic staff (AS). The composition of the PE is given in Figure 84.

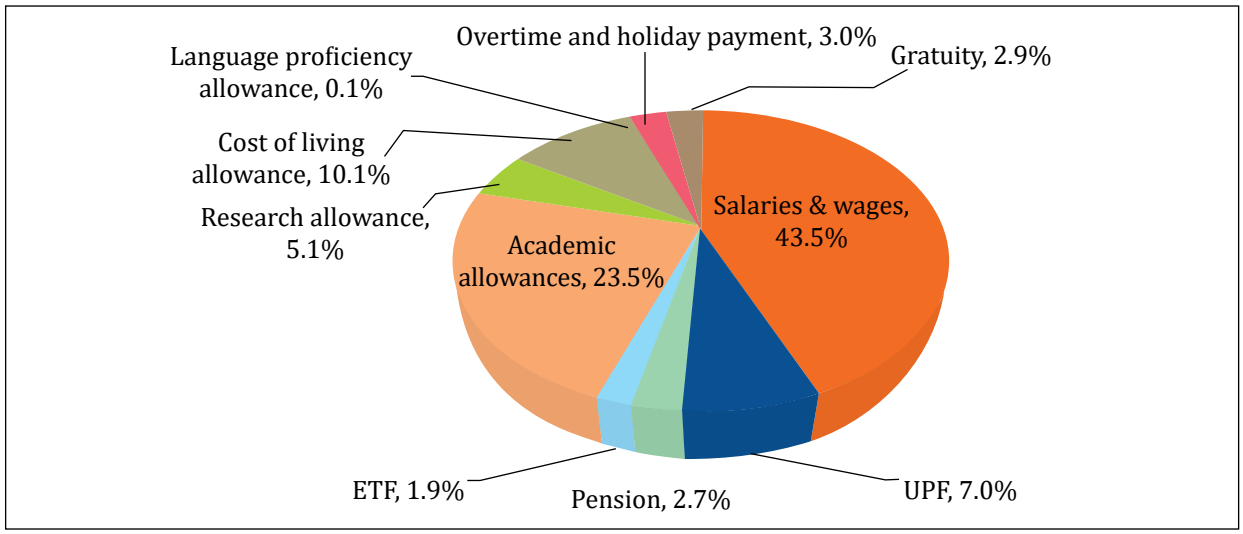


Figure 84: Composition of labor cost
Source: UGC

The analysis shows that the labor input in the first-tier universities group was comparatively higher than that in the second-tier group. The annual averaged PE for the period 2012–14 is given in Figure 85. PDN recorded the highest value of PE for both AS and NAS with values of Rs 1,316 million and Rs 1,022 million, respectively. The lowest PE for AS in the first-tier group was recorded at Rs 821 million by RUH, which also recorded the second-highest PE for NAS in the same group, at Rs 468 million. Universities in the second-tier group showed comparatively lesser values for PE. The highest PE for AS in this group was reported by RUSL, at Rs 297 million; while the lowest PE was reported by UWU, at Rs 105 million. In the second-tier group, RUSL and UWU reported the highest and lowest PEs for NAS, at Rs 192 million and Rs 23 million, respectively.

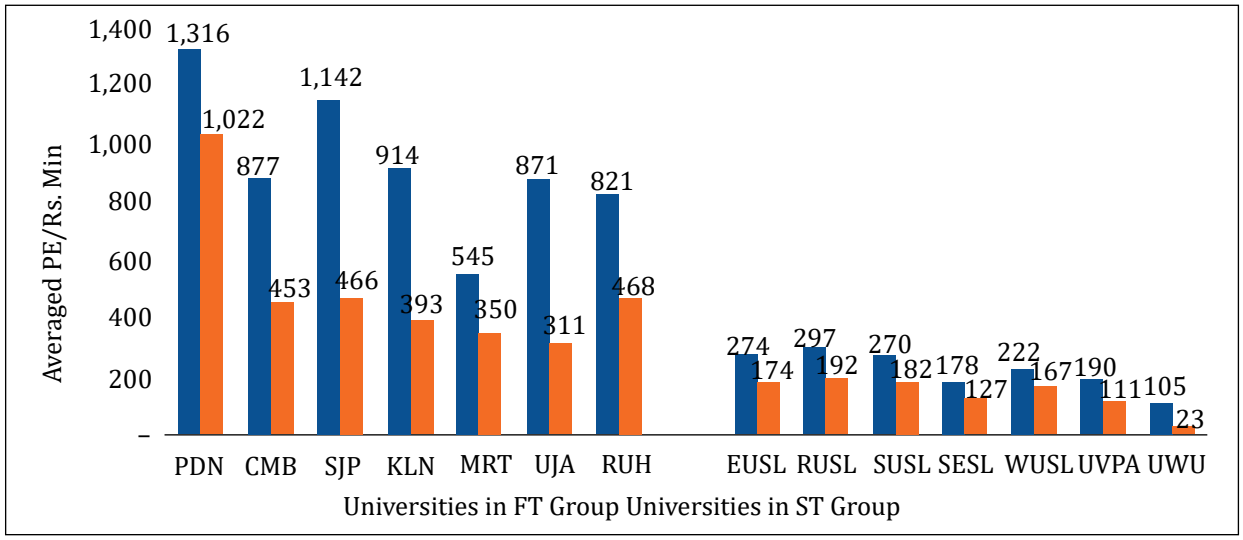


Figure 85: Averaged PE for the period 2010 to 2014
Source: UGC

Intermediaries

Intermediaries constitute another input considered in the calculation of higher education productivity. These include expenditures on energy items, materials, and various services used. The analysis of the sector through the selected 14 universities summarizes the following composition of intermediaries (Figure 86).

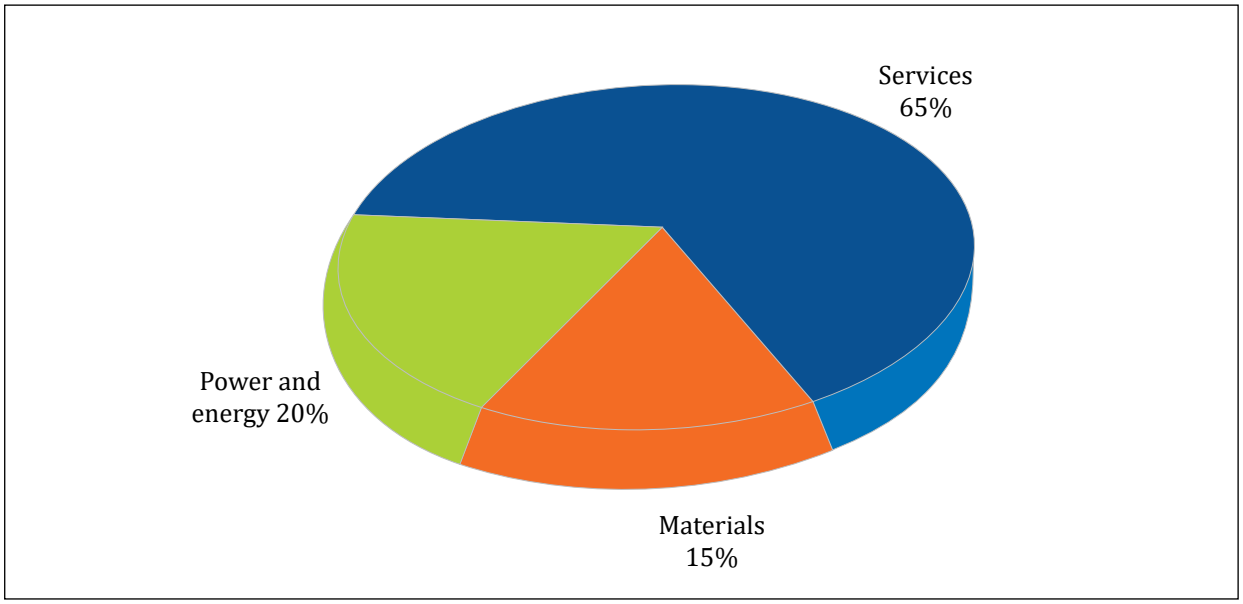


Figure 86: Major composition of intermediaries

Services

Expenditure on services is the major component, with 65% share. This component covers a range of services including security (16%), maintenance (11%), cleaning (10%), students activity-related (9%), and telecommunication (8%) as major items (Figure 87).

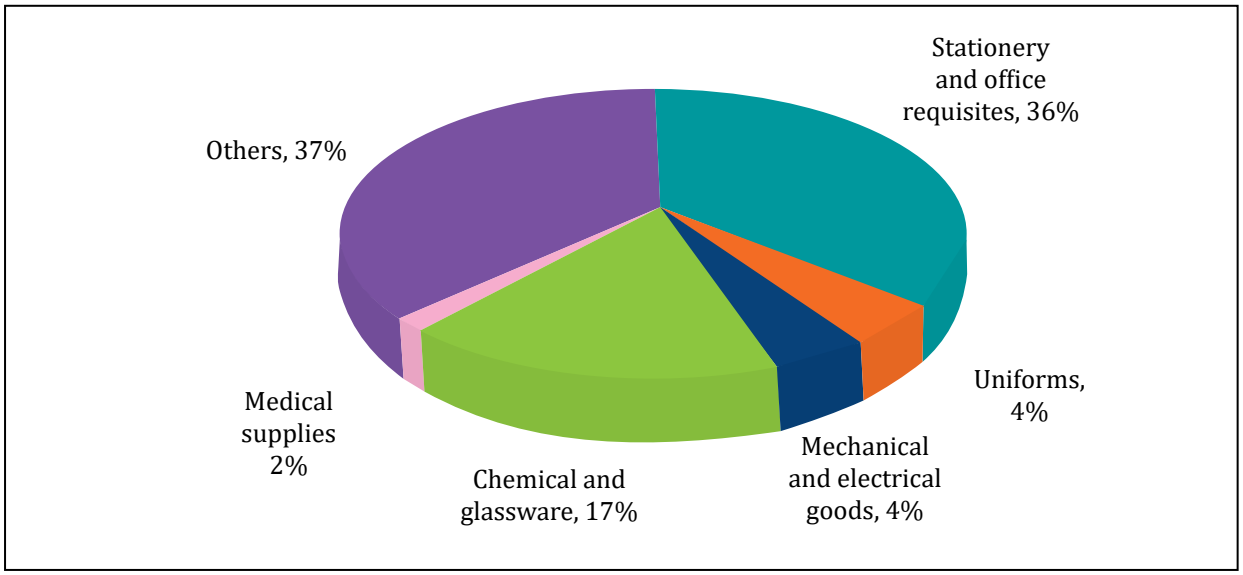


Figure 87: Sub components of services

The percentage composition of intermediaries in each HEI is summarized in Figure 88. It shows that expenditure on services in the HEIs in second-tier group is higher than that in the first-tier group. In the first-tier group, it ranges from 49% at MRT to 75% at SJP, while in the second-tier group, it ranges from 66% at EUSL to 84% at UWU. The major reason for this disparity is the comparatively higher security service expenditure in the latter group. Further analysis of this service expenditure shows that the per person security cost is higher in the second-tier group (Figure 89).

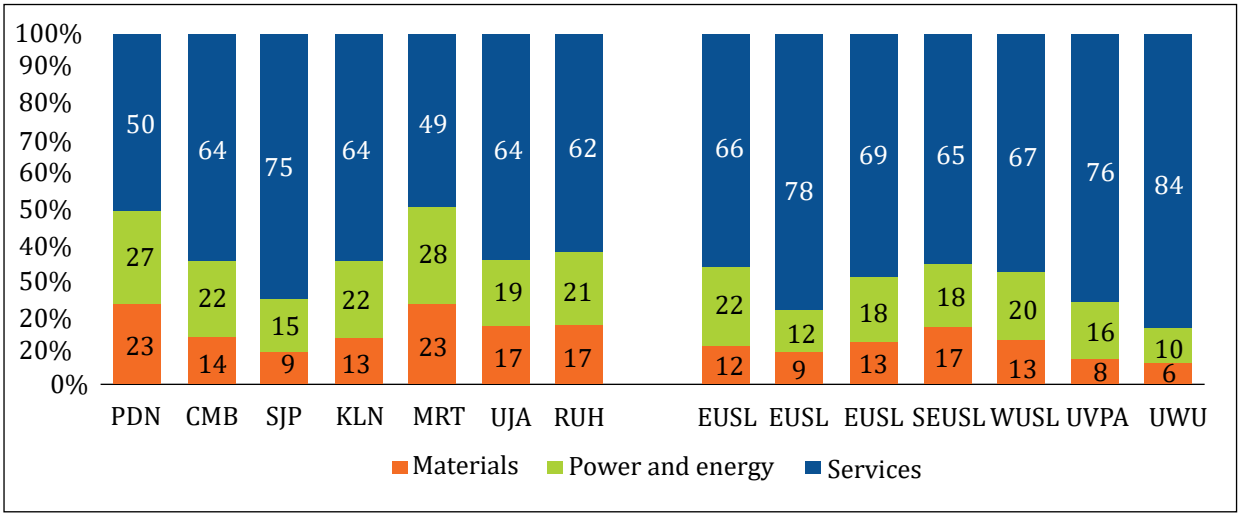


Figure 88: Percentage composition of intermediaries

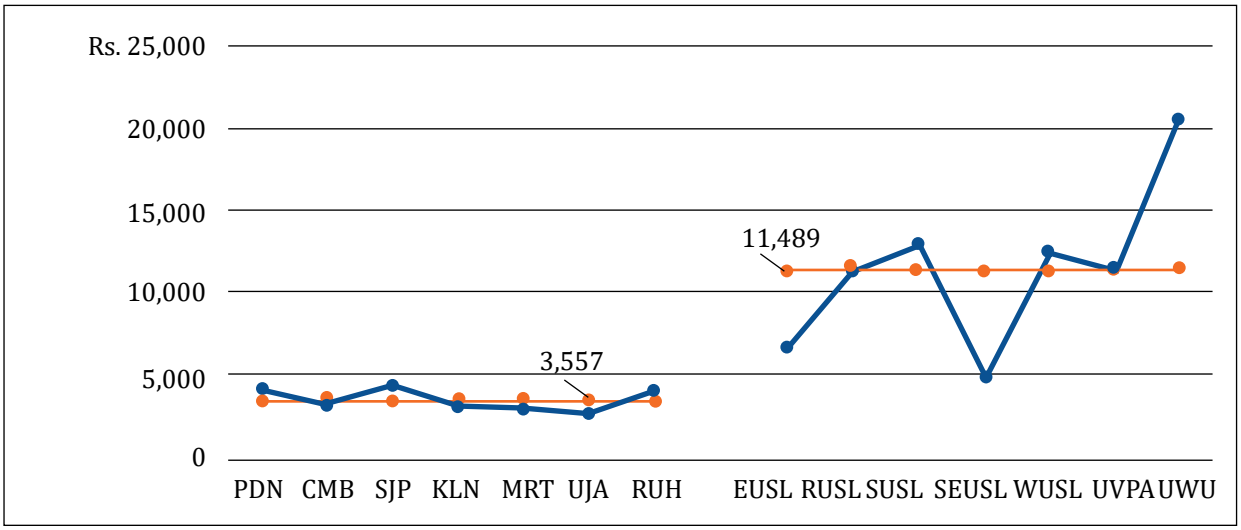


Figure 89: Per student security cost average for the period 2010 to 2014

Outcomes of Higher Education

Outcome was categorized into two groups in this research. They are education outcome, and research outcome. Education outcome is further classified as coursework completions, graduate employments, credit hours, and learning outcomes. The research outcome is further classified as publications, citations, patents, research completions, and research funds.

Coursework Completions

Coursework completion is measured by the number of coursework students graduating per calendar year. According to the Sri Lanka Qualification Framework (SQLF), coursework students are categorized into SLQF 5, SLQF 6, SLQF 8, and SLQF 9; referring to bachelor's, bachelor's honors, postgraduate diplomas, and master's, respectively (SLQF, 2014). These degree programs are mapped with ISCED 6 of 2011 and were considered in the analysis. (ISCED, 2011). In addition, SLQF 10 which refers to the master's degree, with coursework and research components, and is mapped to the ISCED 7, was also considered.

Table 44: Average number of coursework students for the period 2013 to 2015

HEI group	HEI	Average number of coursework students	Bachelor's ratio	Postgraduate diploma ratio	Master's ratio
FT	PDN	2,289	100	11	9
	CMB	3,022	100	50	38
	SJP	2,219	100	4	7
	KLN	2,697	100	2	50
	MRT	1,048	100	6	21
	UJA	1,062	100	1	15
	RUH	1,566	100	2	6
ST	EUSL	447	100	1	1
	RUSL	670	100	1	4
	SUSL	578	100	0	2
	SEUSL	383	100	1	1
	WUSL	412	100	2	9
	UVPA	502	100	0	1

Source: UGC

The summary for each university on the average number of coursework students for the period of 2013–15 is given in Table 44. CMB reported the highest value of 3,022 while MRT reported the lowest value of 1,048 in the first-tier group. In the second-tier group, RUSL reported the highest number, at 670 while SEUSL recorded 383. The composition of coursework students in the form of ratios of bachelor's degrees, postgraduate diplomas, and master's degree for each university is also summarized in the same table.

These ratios show how the education outputs vary from each other. CMB shows a more different picture from other universities reporting the said ratio at 100:50:38. KLN produces more master's degree holders than other universities, recording the ratio at 100:2:50. Comparatively, HEIs in first-tier group show higher trends in producing master's degree holders and postgraduate diploma holders than those in the second-tier group. It may be assumed that some reasons such as the geographical location as well as the goodwill amounted to the significant difference for a university, other than the input resources

considered. Since the free-of-charge basis is limited to SLQF 5 and 6 level programs, the HEIs have revenues from other degree programs such as SLQF 7 and above. This revenue is not included in the expenditure under the inputs considered in the 'hub and spoke model.' This reason caused to limit the outcome coursework delivered to SLQF 5 and 6 when calculating of productivity ratios and percentages.

Credit Hours Delivered

Credit hours delivered by each university across all bachelor's degree programs (SLQF 5 and 6) for the period 2010–15 were reported as an outcome for the calculation of education productivity. The credit hours delivered under the postgraduate diploma and master's degree programs were not considered. The credit-hours system was introduced to the higher education system when introducing the SLQF in 2012 and therefore the credit hours recorded before 2012 are converted values according to the definition. The average value of this outcome for six universities is shown in Figure 90. PDN delivered 11,250 credit hours for eight faculties, thus recording the highest value. KLN and RUH in first-tier group delivered 6,605 credit hours for five faculties, and 4,942 credit hours for seven faculties, respectively. In the second-tier group, ESSL delivered 2,973 credit hours for seven faculties; SUSL delivered 3,327 credit hours for five faculties, and WUSL delivered 1,539 credit hours for four faculties.

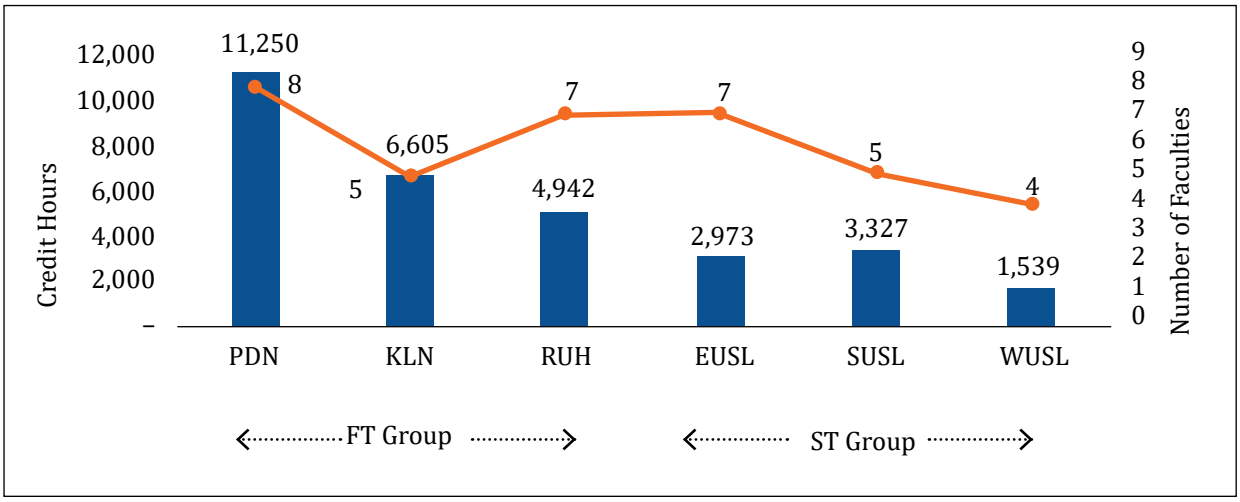


Figure 90: Credit hours delivered

Learning Outcome

According to Nusche [7], "Learning outcomes refer to the personal changes or benefits that follow as a result of learning. Such changes or benefits can be measured in terms of abilities or achievements." There are several methods to measure these achievements. Inkelas, citing Maki [2], explains basic methods used worldwide. These are classified into three categories, namely direct methods, indirect methods, and performance-based methods.

According to this explanation, the direct methods use the performance of students at standardized tests such as CAAP, CLA, MAPP, GRE, and PRAXIS; while the indirect methods

focus on students' perception of their learning and learning environments. Representation of students in the learning process by responding to assignment and projects are considered in the performance-based methods. The use of such methods to measure the learning outcomes of students in the state universities of Sri Lanka is not significant.

Nusche [7] cited (Spady, 1988; Allan, 1996; Andrich, 2002; Adam, 2004) to explain that "the term learning outcomes has its origins in outcomes-based education, a model of educational structuring that involves the clear and explicit identification, statement and assessment of student learning." Outcome-based education systems organize curricula around explicit and detailed student outcome statements. Further, he cited Adam (2004) and stated that "such statements describe what the learner is expected to know, understand, and be able to demonstrate at the end of a period of learning."

The curricular of state universities were revised introducing the concept of outcome-based education and therefore it is assumed that the success of students at the final examination at the first attempt could be a measure of the learning outcome. Following this definition, measurements were taken for learning outcomes of state universities. According to the data in 2014, PDN, KLN, RUH and UVPA showed 100% of the learning outcome. First three universities represented the first-tier group and their numbers of students participated was higher than UVPA, which represented the second-tier group. The lowest recorded learning outcome was 80% by SEUSL. The details are given in Table 45.

Table 45: Learning outcome of students in 2014

University	No. of students appeared	No. of students passed	Learning outcome
PDN	1,423	1,423	100
CMB	2,408	2,242	93
SJP	3,220	2,716	84
KLN	1,979	1,979	100
MRT	1,097	1,010	92
UJA	1,192	1,166	98
RUH	1,511	1,511	100
OUSL			
EUSL	556	545	98
RUSL	573	494	86
SUSL	976	840	86
SEUSL	901	721	80
WUSL	449	421	94
UVPA	436	436	100
UWU	413	376	91

Source: UGC

Citations

Citations were measured using the Scopus database. The summary for each university is shown in Figure 91. PDN and CMB were at the forefront, recording on an average 236 and 242 number of citations, respectively, for the period of 2010–15. USJP, KLN, MRT, and RUH showed some similarities in their performances, with averages of 53, 82, 102, and 80 citations, respectively. MRT led this group of four universities. JFN's performance, as a member of the first-tier group, was relatively less impressive. On the other hand, all HEIs in the second-tier group recorded lesser number of citations, given their relatively modest resources, i.e. lesser number of academics. However, the per academic research expenditure (PARE) shown in the same figure implies a different argument. HEIs in the two groups, first-tier and second-tier, were treated in different manner when allocating funds, with the first-tier group having a lesser PARE than the other one. PARE was calculated using the data for the average research expenditure for the period 2012–15 and the average number of permanent academics in each university for the same period.

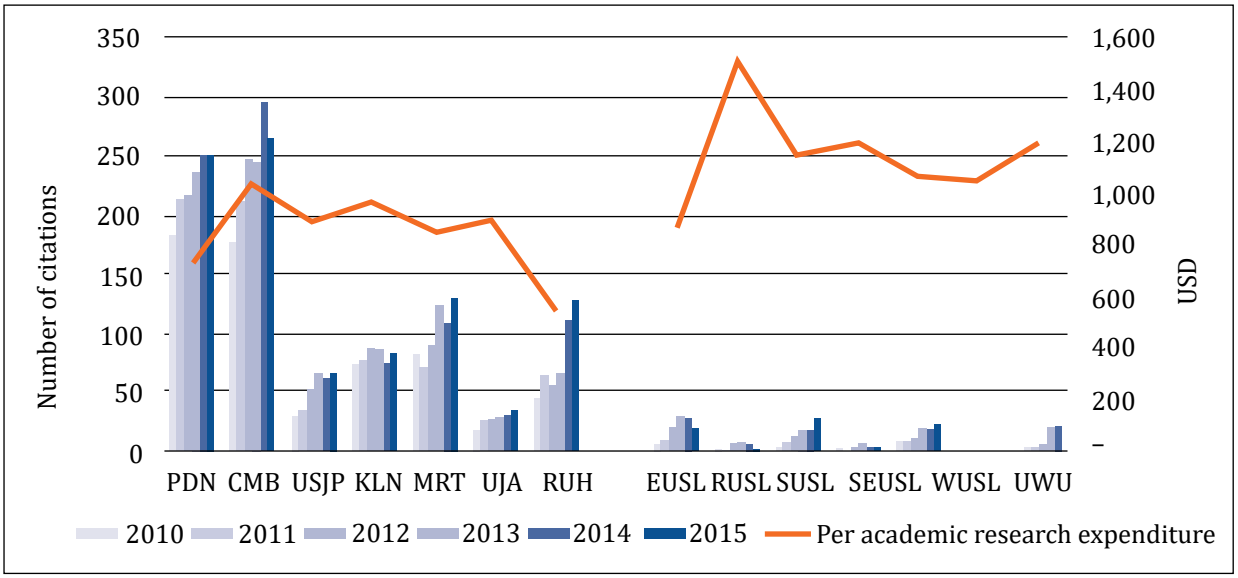


Figure 91: Citations in Scopus for the period 2010–15 and research expenditure
Source: Scopus, NSF

Table 46: Number of patents filed in 2014

University	National	International	Total
PDN	19	-	19
CMB	1	-	1
SJP	6	-	6
KLN	3	-	3
MRT	8	-	8
UJA	-	-	-
RUH	-	-	-

(continued on next page)

(continued from previous page)

University	National	International	Total
EUSL	-	-	-
RUSL	-	-	-
SUSL	1	-	1
SEUSL	-	-	-
WUSL	1	-	1
UVPA	-	-	-
UWU	1	1	2

Source: UGC

Patents

Patents considered in this research are the number of innovations filed nationally as well as internationally to obtain the patent right. According to the details, in 2014, PDN recorded the highest number of 19 patents at the national level. MRT and USJP, which represented the first-tier group, recorded eight and six patents, respectively. UWU, within the second-tier group, recorded the highest number of two patents, one nationally and one internationally. The details are given in Table 46.

Table 47: Research completions and publications 2014

HEI group	University	Indexed journals	Non-indexed referred journals	Non-referred journals	Conference proceedings	Total for research completion	Abstracts	Total for publications
First-tier	PDN	153	181	58	136	528	868	1,396
	CMB	67	74	33	71	245	379	624
	SJP	51	89	32	46	218	321	539
	KLN	112	73	12	94	291	378	669
	MRT	86	68	0	407	561	0	561
	UJA	129	56	24	131	340	251	591
	RUH	31	14	3	57	105	77	182
Second-tier	EUSL	27	54	16	76	173	68	241
	RUSL	51	68	9	50	178	194	372
	SUSL	31	33	5	39	108	110	218
	SEUSL	0	0	0	116	116	22	138
	WUSL	24	78	0	84	186	185	371
	UVPA	0	0	7	12	19	12	31
	UWU	22	12	2	19	55	62	117

Source: UGC

Research Completions and Publications

The count of research publications is used to measure the research completions. Only full publications were considered to be categorized into four groups, namely indexed journals, non-indexed referred journals, non-referred journals, and conference proceedings.

Abstracts were counted, not for the research completions but for the publications. The data in 2014 was considered for the institutional analysis and the summary is shown in Table 5. The analysis shows that MRT was at the forefront, reporting 561 research completions containing the highest number of conference proceedings. PDN also showed a comparatively high number of 528 completions. RUH recorded the least number of research completions, 105, in the first-tier group. UJA, KLN, CMB, and SJP had counts of 341, 291, 245, and 218, respectively. WUSL recorded the highest number, 186, in the second-tier group. RUSL and EUSL also recorded comparatively high number of research completions with counts of 178 and 173, respectively. SEUSL reported a count of 116, which includes only conference proceedings.

Including 868 abstracts, PDN recorded the highest number of 1,396 publications in the system. In the first-tier group, RUH recorded the lowest numbers of 182 publications, including 77 abstracts. In the second-tier group, RUSL recorded the highest number of abstracts and publications, with counts of 194 and 372, respectively. WUSL came a close second, with a count of 185 abstracts and 371 publications.

PRODUCTIVITY OF INSTITUTES

Education Productivity

When considering the year 2014 as the base year and 2015 as the latest year for the available data, Formula (1) was limited to the calculation of $P_t^E\%$ for t = 2011, 2012, 2013, 2014 and 2015; and $Productivity_t^E\%$ for t = 2012, 2013, 2014 and 2015. To show the real situation of the selected HEIs, the productivity calculations were limited to the year 2014 since the period of 2010–12 contained some approximated data and 2015 had some missing data. Again, the calculations for CMB, SJP, MRT, UJA, RUSL, UWU, UVPA, and SEUSL were held due to use of approximate data for the completed credit hours for the entire period. Accordingly, the summary of calculated productivity ratios for 2013 and 2014 and percentages for the year 2014 are given in Figure 92. All outcome ratios considered in the calculation for the years 2011 and 2012 were set to equal at the base year value where approximate data was used. For the base year 2010, the values of all outcome ratios were set to one.

According to the results obtained for the years 2013 and 2014, PDN and KLN in the first-tier group showed declines in productivity ratios from 2.14 to 1.68, and 1.98 to 1.41; with negative productivity percentages of –21% and –29%, respectively. RUH showed a rise in productivity ratio from 1.55 to 1.92, with a positive productivity percentage of 4%. While showing different results, EUSL, SUSL, and WUSL recorded increases in productivity ratios with positive productivity percentages.

There were a few major reasons for the negative percentages. Initially, the trade union actions were taken in the year 2012. That led to the non-conduct of final examinations in some degree programs in 2012. Therefore, the outcome indicator for coursework completed, "cw_{2012}" fell down from the expected value. It was settled in 2013 and therefore "cw_{2013}" went higher than expected. Comparatively, "cw_{2014}" came down again from the expected value. These fluctuations lead P_{2014}^E to record a lower value than in the year 2013 and hence

a negative percentage. However, RUH outweighed this negative impact by the positive trend recorded in graduate employability, "gr."

KLN recorded higher weighted input indicators in 2014 than in 2013 ($I^W_{2013} < I^W_{2014}$). This implied, $Productivity^E_{2013}\% > Productivity^E_{2014}\%$ for KLN, and resulted in a higher negative percentage in productivity. Inversely, other HEIs recorded $I^W_{2013} > I^W_{2014}$, which resulted in positive productivity percentages for RUH, EUSL, SUSL, and WUSL. This positive feature was not enough for PDN to outweigh the decline in "cw." The productivity comparison is shown in Figure 92.

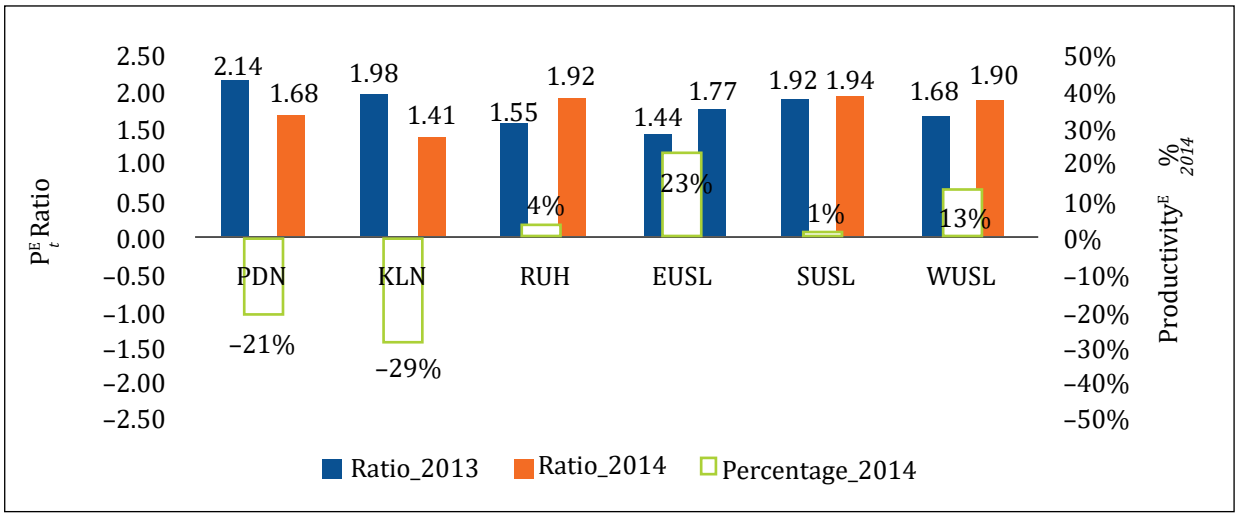


Figure 92: Education productivity ratios and percentages, 2014

Research Productivity

In 2013, except PDN, other universities from the selected six universities, recorded P^R_t recorded ratios within a range (3.03, 2.18). PDN showed a comparatively higher value of 5.61. In 2014, all of them recorded the values within the range (2.58, 2.24). The higher amount of research fund received by PDN, in comparison with what it received in the previous years and also in comparison with what other HEIs received, caused PDN to report the higher value in 2013. Declines in research funds received by PDN in 2014, in comparison with 2013, caused it to record a lesser value for the outcome indicator for research funds, rf_{2014}. This led PDN to record a negative productivity percentage of –53.95% in 2014.

RUH, SUSL, and WUSL also showed a decline from 2013 while KLN and EUSL showed improvements. The details are given in Figure 93. The continuing increases in rf_t and the increase in patents filed (pf_{2014}) as well as the increase in citations (ct_{2014}) led KLN to report a positive percentage in productivity in 2014. However, the positive percentage recorded by EUSL was due to the decline in inputs in 2014 against 2013, with all outcome indicators showing declines. The decline in all outcome indicators, except ct_{2014}, led RUH to show a negative productivity percentage in 2014. Also, both SUSL and WUSL showed declines in all the outcome indicators in 2014, excepting rf_{2014}.

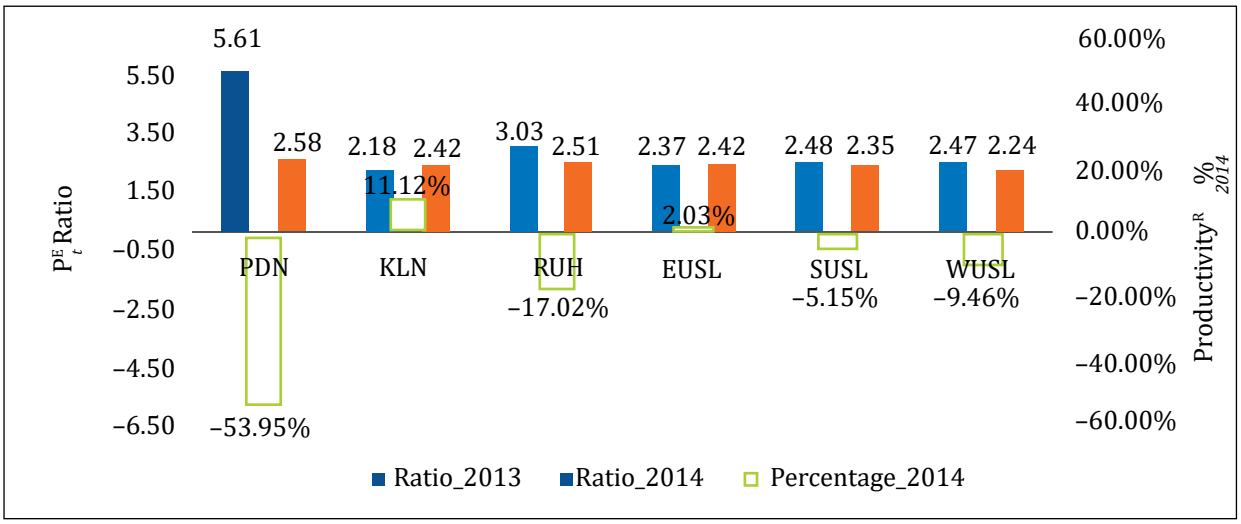


Figure 93: Research productivity ratios and percentages

Academic Productivity

According to the Formula (3), the academic productivity, P_t^A, is taken to be the average of P_t^E and P_t^R. The average value showed positive changes in percentage of productivity only for EUSL while all other HEIs recorded negative percentages. However, EUSL recorded the lowest P_{2014}^A at 1.77. Other HEIs recorded productivity ratios within a very short range (1.91, 2.15), but they have gone through different achievements as described above. The details are given in Figure 94.

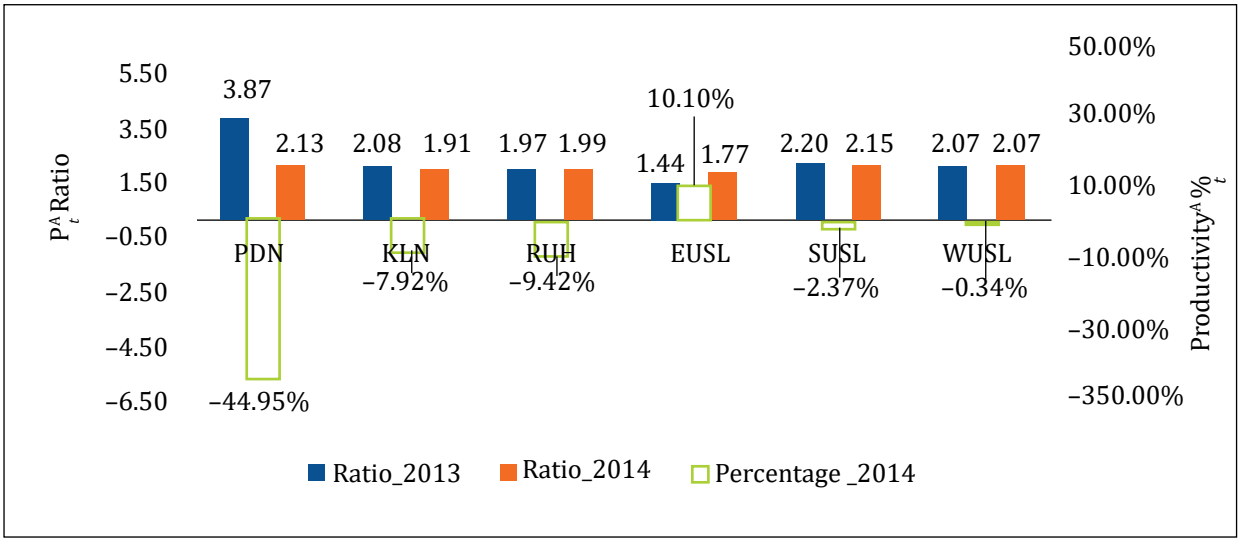


Figure 94: Academic productivity ratios and percentages, 2014

THE NEXT FIVE YEARS

Productivity Measures

Almost all the input measures for measuring productivity, such as labor, capital, and intermediaries are considered in the existing monitoring process of the HEIs. However, some

of the outcome measures used here as productivity measures were not given much attention. When considering the measurements taken for education outcome, coursework completion is considered under a different label such as 'graduate output.' Graduate employability also has been measured. However, the indicators such as 'credit hours delivered' and 'learning outcome' had not been considered as outcome measures of HEIs.

Credit hours delivered itself is a better indicator to give another view of the prevailing differences among HEIs. Along with the labor cost, it also gives a partial productivity of education as a good indicator for a comparison of HEIs. Considering the data for the period 2010–15, the average values of credit hours delivered and labor costs were calculated. Figure 95 shows that SUSL and EUSL had higher credit hours delivered per labor cost of USD1,000, with partial productivity ratios of 1.01 and 0.88, respectively. PDN, RUH, KLN, and WUSL maintained their ratios within a range (0.52, 0.70) despite the credit hours delivered spreading in a higher range (11,250; 1,539). Considering the importance of "cr" in measuring the education productivity, it can be proposed to collect these data in a regular manner. It is also recommended to collect the data at the department level, in order to extend the productivity calculations to departments.

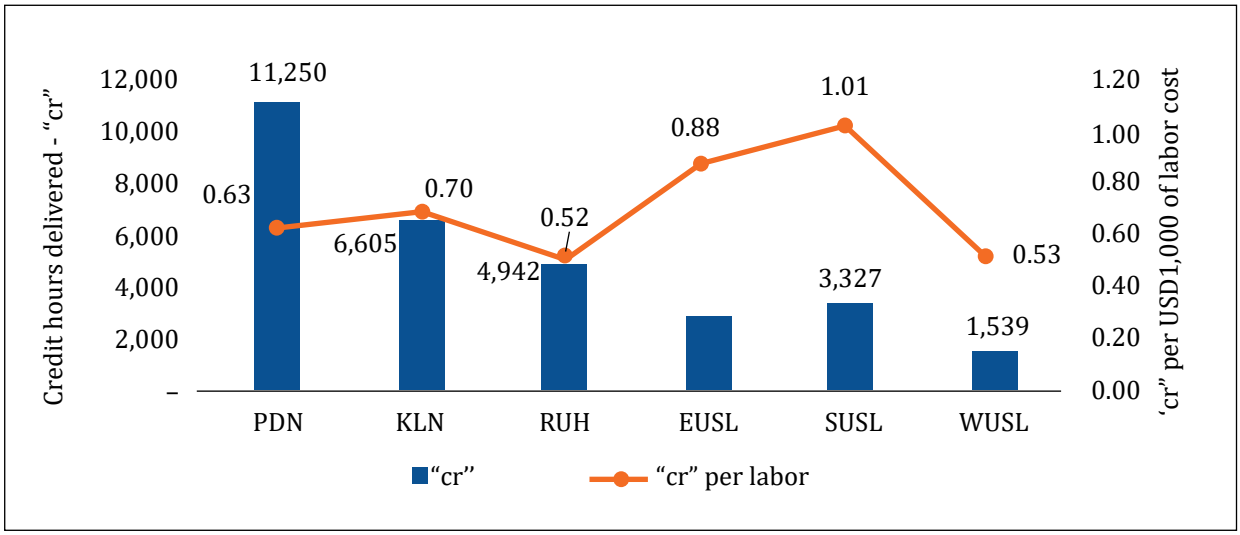


Figure 95: Credit hours delivered and the labor cost

In the absence of using standard methods to measure the learning outcome ('lr'), a proxy indicator was used in this analysis. The ratio of number of students passed to that of the number of students who sat for the final examination at the first attempt is defined as the proxy indicator for 'lr.' The absence of time series data on this was one of the reasons to limit the productivity calculation for the periods of 2013 and 2014. The data for 2014 is shown in Figure 96. Accordingly, PDN, KLN, and RUH in first-tier group reported 100% while maintaining comparatively large number of student participation in the examination. Only VAPA in the second-tier group showed 100% while maintaining lesser number of students. Ratios for other HEIs are also given in the same figure.

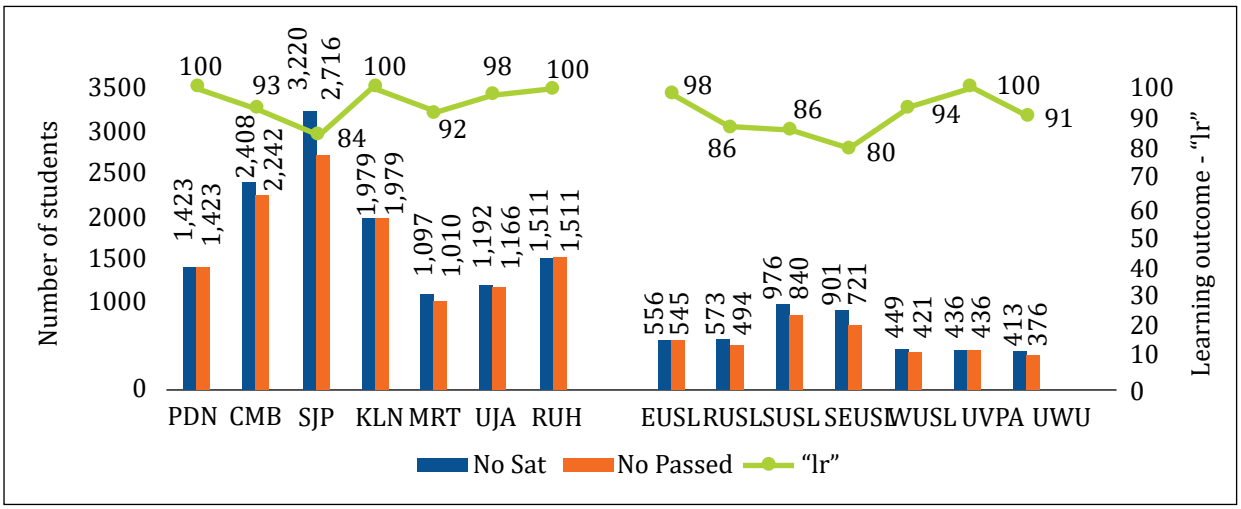


Figure 96: Learning outcome, 2014

Strategic Planning

The academic productivity measured in this analysis consists of two productivity components, namely education productivity (P^E); and research productivity. Both the components have their respective sets of outcome indicators. Formula (1) and (2) give that as $P^E = f(cw, gr, cr, lr)$, and $P^R = f(pb, pt, ct, rc, rf)$. When considering P^E, the outcome indicators such as *cw, cr* and *lr* are directly related with the activities of HEIs. But *gr,* the graduate employability indicator, depends on the requirement of other sectors such as other public-sector institutes as well as industries. In a similar way, P^R also has outcome indicators that are influenced by external impacts. The outcome indicators such as *pt* (patent filed) and *rc* (research completions) have direct links with the need for economic development.

In this context, it is important to consider the improvement of strategic planning for addressing the needs of other sectors, to raise the productivity of HEIs. The policy makers have already considered these matters, and therefore graduate employability has been identified as a function of the quality of HEIs as well as their relevance to the economy. The quality factor also focused not only on the quality of students but also on the quality of academics and the learning environment. The outcome indicator cw (coursework completions) is also no longer considered an internal factor. The policy makers have focused on diversification of higher education for addressing the need of economic development, and therefore higher education seekers have more opportunities that may lead to an increase in 'cw.'

The suggested strategic plan for the higher education sector covers four policy areas such as increasing the access to higher education; improving the quality and relevance of higher education; enhancing the stewardship of higher education; and knowledge transfer to the economy with research outcomes and innovations. Among the strategies for increasing access, the optimization of existing capacity of the system is considered. This has a direct link with the outcome indicator 'cw,' and therefore leads to a better performance of P^E. Again 'cw' shows some declines due to the failure of conducting examinations timely. The policy area of stewardship focused on this matter. Focusing on the P^R, the strategic plan suggests improving the mechanisms for commercialization of the innovations at HEIs, and

enhancement of the academics' knowledge about intellectual properties. Due to the lack of time-series data on credit hours delivered under the postgraduate diplomas and master's degree programs, the outcome indicator 'cr' did not reflect the real situation for the HEIs that produced large number of postgraduate students. The introduction of management information system under the new strategic plan may be able to address the prevailing issues in the data collection process.

Private-sector Involvement in Higher Education

The government is reviewing the policy of higher education to see how the private-sector participation could be increased. Such a participation is important in two ways to improve the productivity of higher education. Initially, it would contribute toward improving the productivity of the entire higher education sector of the country. Specifically, it would help in addressing the inadequate-access issue in higher education. The government expects private institutes to be involved in this matter by providing infrastructure and human capital while the public funds are investing in those institutes by the way of providing students with soft loans and scholarships. These kind of public private partnerships (PPPs) are new to the Sri Lankan economy and therefore models are being developed.

Foreign direct investment (FDI) would also encourage establishing of branch campuses and new private HEIs for increasing access to higher education. Further, the productivity improvement of individual HEIs, especially in the areas of research and innovations, has been considered. In the existing system, the investment in research activities at state HEIs is heavily dependent on public funds. The academics are also mostly engaging with fundamental research rather than applied and industry-driven research. In this context, the government is looking for private-sector people to involve with HEIs for their research development activities. In this way, the government expects to develop another PPP model for developing research and innovations at individual HEIs. This may lead to improvements in the research productivity of HEIs.

CONCLUSION

There is no consistency in maintaining the productivity ratios and therefore it shows fluctuations in the time series. These fluctuations are shown in the productivity percentages with positive and negative values. The main reason is the inconsistency in most of the outcome indicators. Only the outcome indicator ct_t showed a good consistency for almost all the HEIs. When considering the education productivity, the outcome indicator cw_t showed fluctuations for most of the universities.

The main reason observed is the inefficient and untimely conduct of final examinations. Therefore, it is recommended to include the time taken to complete the degree program as an outcome measure when introducing a modification to this productivity model. When considering research productivity, there were no good reasons observed for increasing research funds, which are mainly through the allocation of public funds. This factor also contributed to the inconsistency of productivity. Therefore, it is necessary to introduce a productivity-based system for allocating research funds. On the other hand, if research

productivity is selected as a key measurement, in practice very limited attention is given to the research output of academics. It is observed that there is no proper mechanism in the system to appreciate the research performance, or to encourage potential researchers, from recruitment to promotion and tenure. Among the majority of academics in the system, there is a general lack of interest to do research.

It is also observed that some corrections need to be done in the information system. The actual data for indicators rc_t and rp_t was reported only for the years 2013 and 2014. There was no good mechanism in the system for reporting the data. With the given data, most of HEIs showed declines in 2014 over 2013, without any good reason. Therefore, the validity of data is questionable. Also, declines in the weighted average input indicator, I_t^W, were observed. The main reason for such a decline was the decline in capital allocation.

Further, it is recommended to focus on the performance-based allocation of public funds in order to maintain proper productivity indicators for a better comparison among HEIs as well as the departments within the HEIs.

REFERENCES

[1] Aguillo I.F., Ortega J. L., Fernández M. Webometric ranking of world universities: Introduction, methodology, and future developments. Higher education in Europe 2008; 33(2-3): 233–244.

[2] Inkelas K.K., Ways of measuring student learning outcomes. https://app.shoreline.edu/sba-archive/doc/cas/writinglearningoutcomespart2.pdf. Accessed in 2016.

[3] Kotler P., Murphy P.E. Strategic planning for higher education. The journal of higher education 1981; 470–489.

[4] Malan S.P.T. The 'new paradigm' of outcomes-based education in perspective. Journal of Family Ecology and Consumer Sciences/Tydskrif vir Gesinsekologie en Verbruikerswetenskappe 2000; 28(1).

[5] Marginson S., Van der Wende M. 2007. To rank or to be ranked: The impact of global rankings in higher education. Journal of studies in international education 2007; 11(3-4): 306–329.

[6] Ministry of Higher Education. National Higher Education Strategic Management Plan. No. 18 Ward Place, Colombo 07, Sri Lanka; 2012.

[7] Nusche, D. Assessment of Learning Outcomes in Higher Education: a comparative review of selected practices. OECD Education Working Papers, no. 15. 2008.

[8] OECD Publishing. http://dx.doi.org/10.1787/244257272573. Accessed in 2016.

[9] Overby K. Student-centered learning. ESSAI 2011; 9(1): 32.

[10] Spady W.G. Outcome-Based Education: Critical Issues and Answers. American Association of School Administrators, Arlington; 1994.

[11] The World Bank. The Towers of Learning Performance,Peril And Promise Of Higher Education In Sri Lanka. Human Development Unit, South Asia Region; 1996.

[12] UNESCO. International Standard Classification of Education, ISCED 2011. UNESCO Institute for Statistics, Montreal; 2012.

[13] University Grants Commission. Corporate Plan 2011. No. 20, Colombo; 2011.

[14] University Grants Commission. Sri Lanka Qualification Framework. No. 20, Colombo; 2014.

CHAPTER 10
THAILAND

Siriporn Petchkong[1], Thailand Productivity Institute, Thailand

EXECUTIVE SUMMARY

Higher education is critical to the future of Thailand. Thailand has a long history of higher education, and there has been a substantial growth in the sector in the recent years. Key reforms in the last decade or so included the reform of the admissions system, transforming institutions into autonomous institutions, and strengthening of institutional management. A quantitative modeling of productivity using data from 11 universities between 2012 and 2014 shows that productivity has been strong, though it has grown at a declining rate. Medium-term reforms are planned to increase quality, improve system structure, and enhance efficiency. A range of new funding and regulatory activities are planned to support a managed improvement of the system and the institutions.

INTRODUCTION

Education is vital to the economy. It expands intellectual horizons and empowers the people to have better quality of life. Moreover, education is also regarded as the mainstream of economic growth and social development. Therefore, Thailand attempts to develop its education. Particularly, the higher education is regarded to be of foremost importance for national development as it enhances the country's capacity for competing on a global level.

Improvements in the Thai higher education would lead to production and development of graduates of quality. Furthermore, the measure of productivity in higher education is very important. It is an increasingly important issue for policymakers and economists. Conventionally, productivity measurement is more prominently applied in manufacturing rather than in the education sector. The characteristics and complexities of the higher education require a better understanding of higher education productivity, which is different from manufacturing.

Productivity measurement in higher education is fraught with conceptual and data difficulties. As Massy, Sullivan, and Mackie [4–6] have pointed out, "The biggest problem in addressing higher education's productivity is the absence of an agreed-upon comprehensive measure of output quality and the quality of education is extraordinarily difficult to assess by the providers themselves, by their 'customers,' or by external quality-assurance agencies." However, they applied a model for calculating a higher education productivity index that follows the standard BLS/OECD methodology. This study would also follow that methodology and apply it to the Thai higher education.

[1]This research was partially supported by the APO. I would like to express my deepest appreciation to all those who provided me the support to complete this report. A special gratitude to Prof. Hamish Coates for sharing the methodology of research and for his contribution in stimulating suggestions and encouragement, which helped me in the project, especially in writing this report. I would also like to acknowledge with much appreciation The Office of the Higher Education Commission, Nuchnapha Ruenobcheoy, and Matus Buntuengsuk who provided the insights and expertise that greatly assisted the research.

OVERVIEW OF HIGHER EDUCATION IN THAILAND

Thailand has had a long history of higher education development. It can be traced back to the modernization period almost one hundred years ago when the country needed to adapt and the public education was inadequate to prepare high-caliber government officials to serve the country. The primary purposes of higher education then were to cultivate intellectuality in our young and capable people with modern knowledge so that they could serve in government services for the modernization of the nation. Thailand's first university, Chulalongkorn University, was established in 1916.

The total number of higher education institutions (HEIs) in Thailand at the moment is 156. These are classified into the following four categories:

- 62 public universities, which are composed of 15 public universities, that were formerly called government universities and are fully supported by the government; 38 Rajabhat universities (developed from teacher colleges); and nine Rajamangala University of Technology, formerly a polytechnic institute system that was renamed to the Rajamangala Institute of Technology system before being granted the university status.
- 19 autonomous universities.
- 55 private universities and colleges.
- 20 community colleges.

(Data as of July 2015, www.mua.go.th)

Moreover, in 2015, Thailand's universities have graduated more than 300,000 students, of which around 260,000 students have graduated at the bachelor's level. The number of students who graduated at the master's level was around 38,000 (Figure 97).

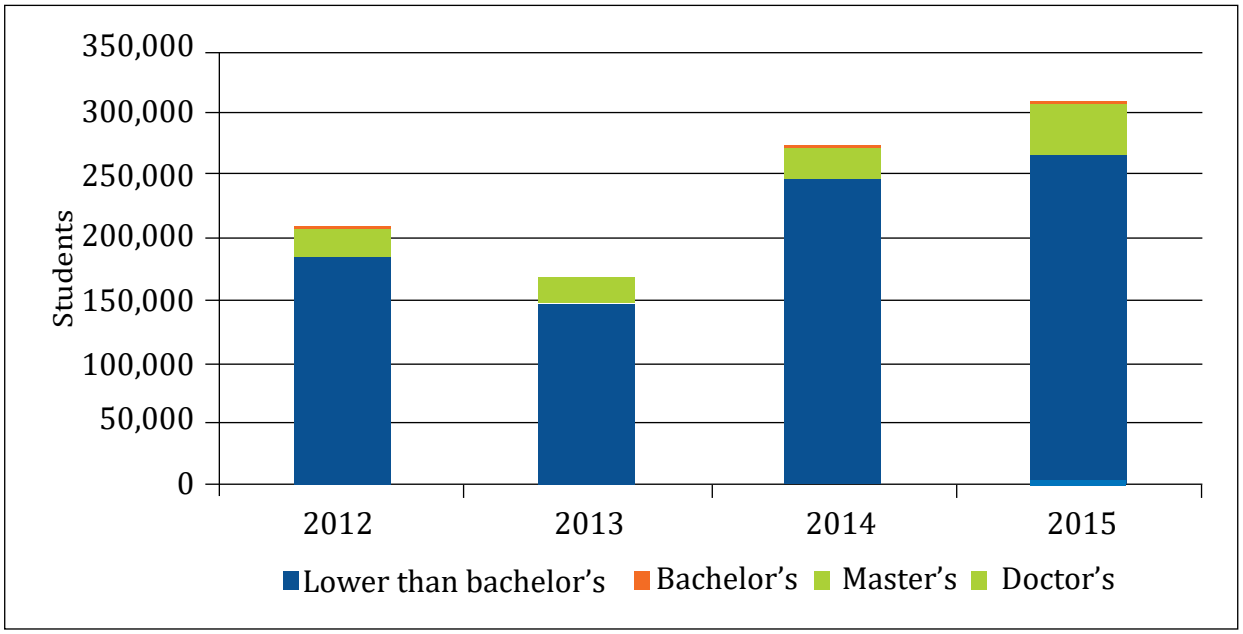


Figure 97: Student completions by level of study, 2012–14

Source: Office of the Higher Education Commission; www.info.mua.go.th

The competitiveness ranking of education in Thailand has tended to decrease in the past, but went up in 2015, when it was ranked 48th among 61 countries (see Figure 98). This was the best rank achieved in the last five years. The strengths that made the ranking competitiveness to go up included the percentage of public expenditure on education, percentage of women with degree, and the literacy rate. The competitiveness of higher education would rise, depending on the focus on all the sub-indicators.

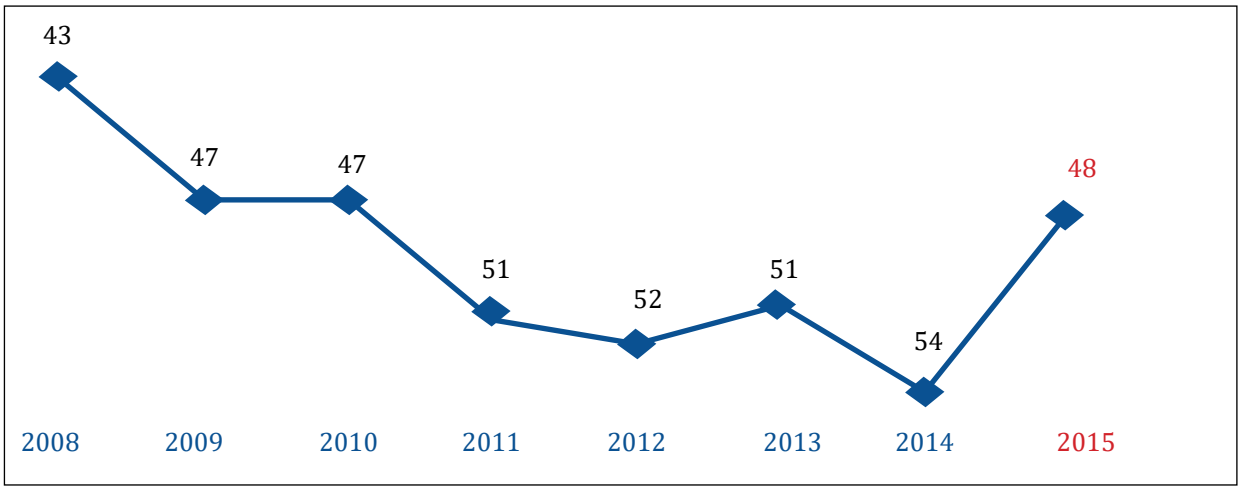


Figure 98: The competitiveness ranking of education in Thailand
Source: Journal of Education for statistics and indicators: 2015 Office of the Education Council; www.m-society.go.th/article_attach/14630/18262.pdf

In 2015, of its gross domestic product (GDP) of 13,201,000 million baht, Thailand's budget expenditure on education was 4.0%; while as a percentage of the national budget, the education budget was 20.7%. The education budget as percentage of the national budget was highest in 2007, at 22.7%; while as a percentage of the GDP, it was highest in 2009 at 4.6% (Figure 99).

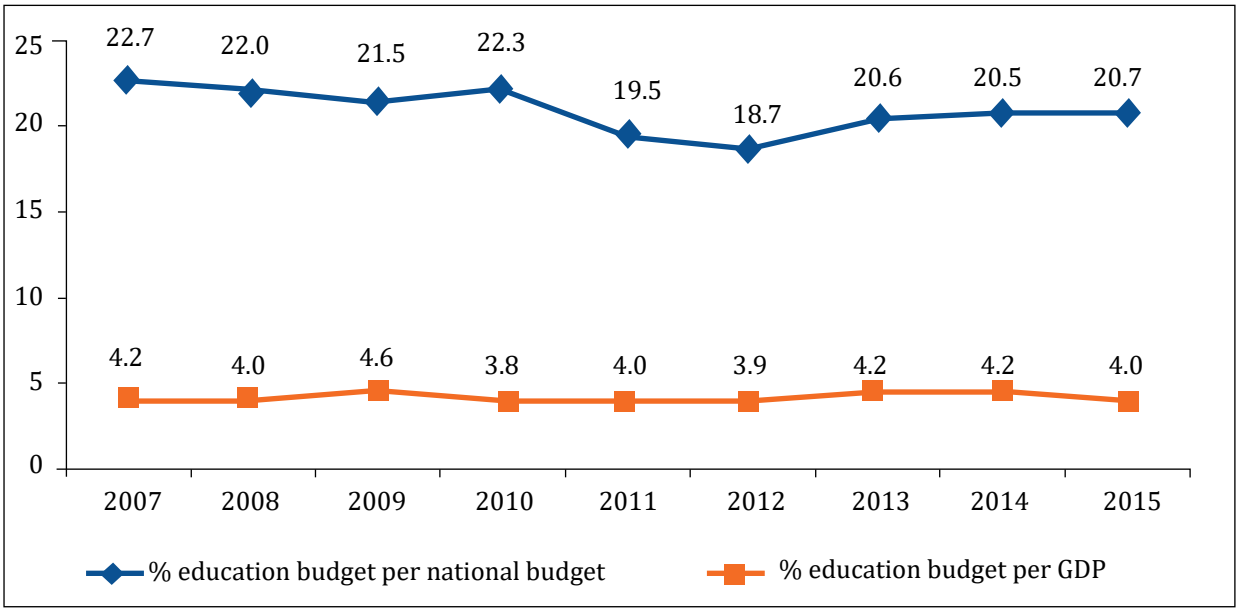


Figure 99: Education budget as a percentage of national budget and the GDP
Source: Statistical Studies of Thailand in Academic Year 2013–14, Office of the Education Council

The statistics from previous education budget found that the national budget, the GDP, and the education budget increased every year when compared with the Asian countries. Thailand allocated more budget for education than any other country. The budget of the Ministry of Education, increased from 355,241 million baht in 2007 to 532,416 million baht in 2015. However, Thailand's global ranking is still unsatisfactory and lags behind many other countries in terms of the opportunity, quality and efficiency of educational management.

The top five heads of educational expenditure are, teachers' wages and salaries (69%); management and executive compensation, and utilities (12%); loans for education (5.5%); expenditure on investment and research (6%); and development of learning activities in the classroom (5%) (www.glf.or.th). In terms of expenditure on education per capita, which may be seen as reflective of investment in the development of population quality, Thailand scores very high. Thailand has allocated a budget of education per capita that is only USD249 less than Luxembourg (USD6,272).

This implies that the efficiency of education management decreased, as showed by the rankings in the IMD report, as the universities of Thailand have failed to respond to the competitiveness requirement at the global level.

POLICIES THAT AFFECTED HIGHER EDUCATION PRODUCTIVITY

In the past, Thailand had gone through educational reforms several times. The latest one was in the form of the National Education Act of 1999, which has affected the Thai higher education system. Some major changes have taken place as follows:

Reform of the Admission System

Earlier, Thailand had operated the university admission system through a central entrance examination system, which encountered a problem that most students were not interested in classes that were not required for examination, because their goal of learning was to study in the university.

In 2006, the Thai government officially implemented the new admission system in place of the earlier one. According to the Association of University Presidents of Thailand, it was based on four indicators of achievement: 20% for the Cumulative Grade Point Average (GPAX); 30% for the Ordinary National Education Test (O-NET); 10–50% for the General Aptitude Test (GAT); and 0–40% for the Professional Aptitude Test (PAT). There is no entrance examination required for admissions to the Ramkhamhaeng University, and the Sukhothai Thammathirat Open University. The new admission system was aimed at eradicating rote learning and placing more importance on critical thinking, creativity, and authentic academic ability.

However, over a period of time, the quality of education has not been satisfactory to the society. The students' achievements in the core subjects of basic education such as english, mathematics and science show that the average score is lower than 50% (Figure 100).

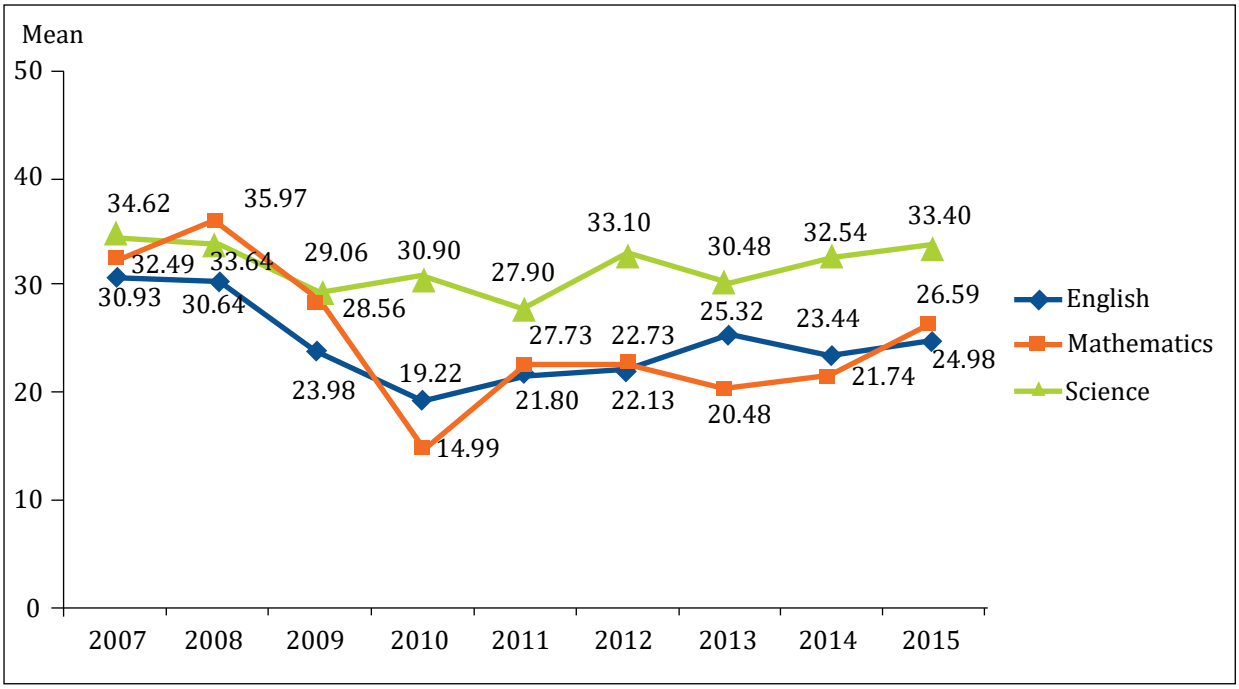


Figure 100: The average O-NET score during 2007–15

Source: National Institute of Educational Testing Service

The capabilities of Thai students, compared to foreign students, as assessed by Program for International Student Assessment (PISA) under the Organization for Economic Co-operation and Development (OECD) were found to be lower. Thai students had scores lower than the OECD average whether it was for reading, mathematics or science (see Figure 101).

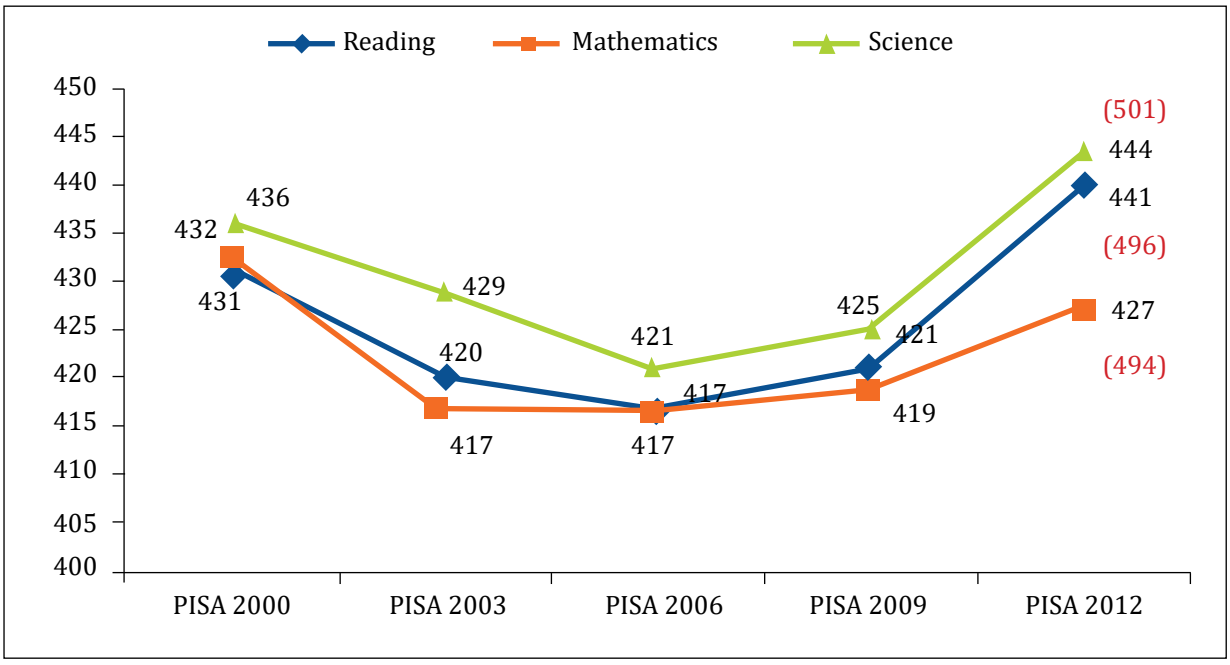


Figure 101: Thailand PISA score

Source: PISA Thailand [13]

Note: The number in parentheses is OECD average

Therefore, the students enrolled in higher education were of a low quality. In addition, the system's evaluation of learning achievements poses a problem, because the grading systems are not consistent across various institutes.

Higher Education Administration and Management

The Thai Government had encouraged public HEIs to transform their status to autonomous universities in order to increase the efficiency and capacity. Moreover, it would help establish a desirable administrative and managerial system in educational institutions, enabling them to carry out their tasks with flexibility, academic freedom, quality, efficiency, and effectiveness. At the same time, it would require them to function with responsibility and accountability under the supervision of their respective councils, in the interest of national development.

Autonomous universities have their own administrative structures and budgeting systems for self-governance and full autonomy. This allows for administrative and management matters of the university to be handled by the university itself, instead of being controlled by government regulations. In addition, the autonomous universities receive public funds through block grants and have the autonomy to establish their own administrative structures or formulate rules on personnel and staffing. These universities also have the authority to manage and use state property.

In the first period, the government policy did not establish any more conventional bureaucratic public universities. Consequently, new public universities were established after 1990, and three universities were established with the autonomous status. After that, 10 universities made submissions to transform from public universities to autonomous universities, and have undergone the restructuring process in terms of administrative structure, legal requirements, and finances toward a more market-driven management. At the time of writing this, Thailand had 19 universities that had moved out of the government's bureaucratic structure.

Figure 102 shows the number of students in autonomous universities. Although, these universities moved out of the government system of administration, the number of their students continued to grow.

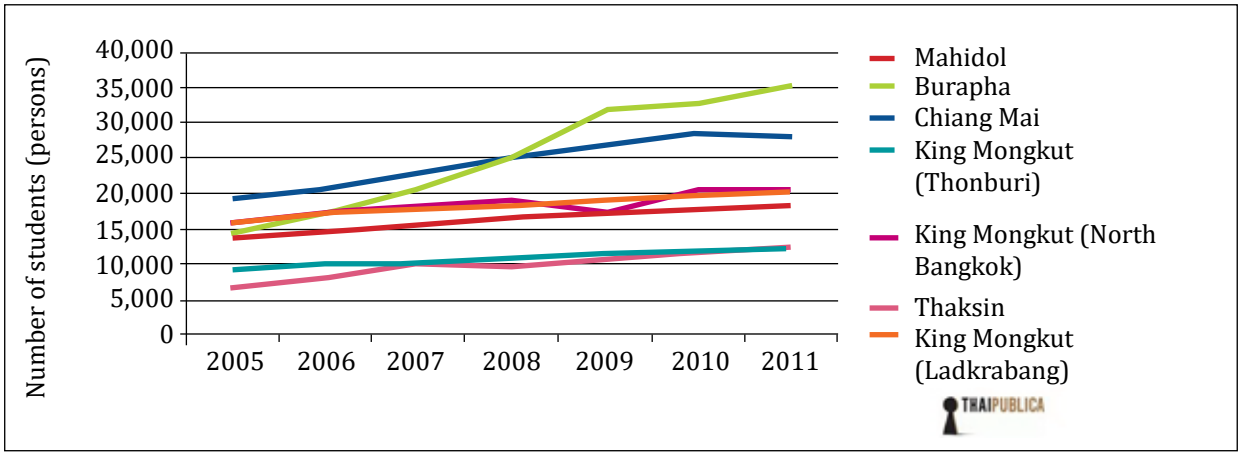


Figure 102: The number of undergraduate students in autonomous universities

Source: http://thaipublica.org/2012/10/autonomous-university1

PRODUCTIVITY OF HIGHER EDUCATION

Methods

The data used for the study was for the four-year period from 2011 to 2014. Output data collected by Commission on Higher Education Quality Assessment Online System (CHE QA Online) is used in the preparation of the self-assessment report. The universities report the indicators to the Office for National Education Standards and Quality Assessment (ONESQA) for evaluating the quality of universities. The limitation of the data is that some universities could not collect all the data, and some of the indicators were missing. Input data was used from the budget that was allocated by the Bureau of Budget.

The sample of data for measuring the productivity of Thai higher education sector pertained to the public universities, excluding the Rajabhat Universities that previously formed the teacher's college system before being elevated to the university status; and the Rajamangala University of Technology, which was formerly a polytechnic institute.

These public universities were allocated annual budgets for their operations from the government for personnel, financing, and general administration. The total number of such public universities was 15. However, this study was limited to 11 universities that had the time-series data required for calculations.

Productivity Concept

Productivity is the ratio of outputs versus inputs. However, profitability is also a relationship between outputs and inputs. Both are measures of the relationship between outputs from a specified process during a period of time and the resources consumed by that process during the same interval of time.

The relation between values on the output side and values on the input side is profitability. The relationship between the physical quantity of outputs produced and the physical quantity of inputs consumed in the production process is productivity. The strength of any productivity measurement system lies in its ability to identify meaningful and sustained changes in the relationship between resources consumed and outputs produced over time. Productivity measurement is an addition to management's array of tools. It provides an indicator for the resources consumed. Quantities of output and input may then be managed independently of their prices or costs. The productivity measurement of higher education may be viewed in the below context:

The measures of "productivity" have been proposed for higher education: e.g., enrollments, credit hours, or degrees, as well as graduation rates and time to graduation, credit hours per faculty member, cost per credit hour, and even "profitability" per faculty member. Whatever their individual merits, none does a proper job of measuring output per unit of input, as required by the economic definition of productivity. Moreover, none of them effectively addresses educational quality, institutional heterogeneity, or joint production (the production of multiple kinds of outputs by multiple kinds of inputs) [4–6].

The output variables included were:

- Education outcomes defined as graduates employed; by calculating the number of bachelor's degree students to get a job after graduation, divided by the number of graduates surveyed about their work, and the graduates who are employed within one year.
- Research outcomes defined as publications, research completions, and research funds.

The input variables included were:

- Expenditures on labor, i.e., salaries and wages, along with fringe benefits of both academic and non-academic employees.
- Expenditures on capital, i.e., the investment budgets for land, building, and equipment.
- Expenditures on intermediate inputs, i.e., operational expenditures, including purchasing, and outsourcing.

Productivity Index

This study used BLS aggregate inputs for its multifactor productivity measures, using a Törnqvist chain index. Some of the basic properties of this index are:

- It is calculated as a weighted average of growth rates of the components.
- The weights are allowed to vary for each time period.
- The weights are defined as the mean of the relative compensation shares of the components in two adjacent years.

The productivity index, as evaluated for time increment Δt, is:

Productivity index [Δt] = Output index [Δt] ÷ Input index [Δt].
The Törnqvist index defines productivity as the change in outputs obtainable from the input changes observed over Δt. Productivity change, in turn, is calculated from the ratio of successive productivity indices:

Productivity change [Δt1 to Δt2] = Productivity index [Δt2] ÷ Productivity index [Δt1] − 1.

This study measured the productivity of higher education, focusing on public universities that received the budgets allocated by the government. The result of study does not represent the higher education in Thailand but is a sample to measure the productivity in higher education.

Results of the Study

The study found that the Thai higher education productivity in the three-year period from 2012 to 2014 had instable growth and tended to decline. Education productivity decreased to 2.22 in 2014 while research productivity decreased to 2.25, which led to the decline of the resulting academic productivity to 2.24 (Figure 103).

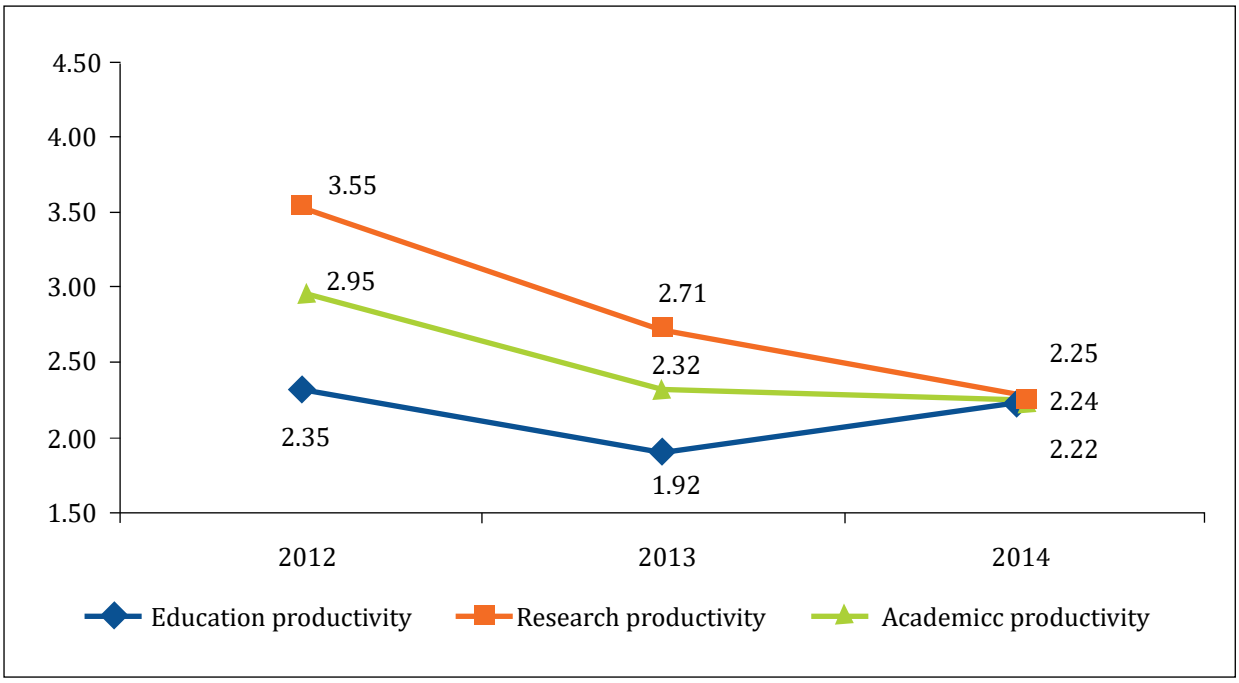


Figure 103: Productivity in higher education

Source: OHEC

Figures from the Higher Education Commission enable separate analysis by university group. This grouping takes account of operating budget and investment budget. The large university has a budget of more than a billion baht; the medium university has a budget of more than 500 million baht but less than a billion baht; and the small university has a budget of less than 500 million baht.

The result found that the large university had the highest efficiency in academic productivity. However, in 2013 the ratio was very low for the group as the universities had received high budgets but gained lower outcomes than in 2012 (Figure 104).

In 2014, the large university had the lowest education productivity (Figure 105). This indicator shows the inefficiency of the education results. However, its research productivity was the highest due to the large university aiming to become a top international university.

The transfer of knowledge between the universities and the business sectors in Thailand is at a low level, which suggests that the perceived quality of education management is still insufficient and does not respond to the labor market. Higher education institutions and those involved in the management of higher education should make it a priority to launch programs for evaluation of the HEIs, which have the responsibility to produce quality graduates.

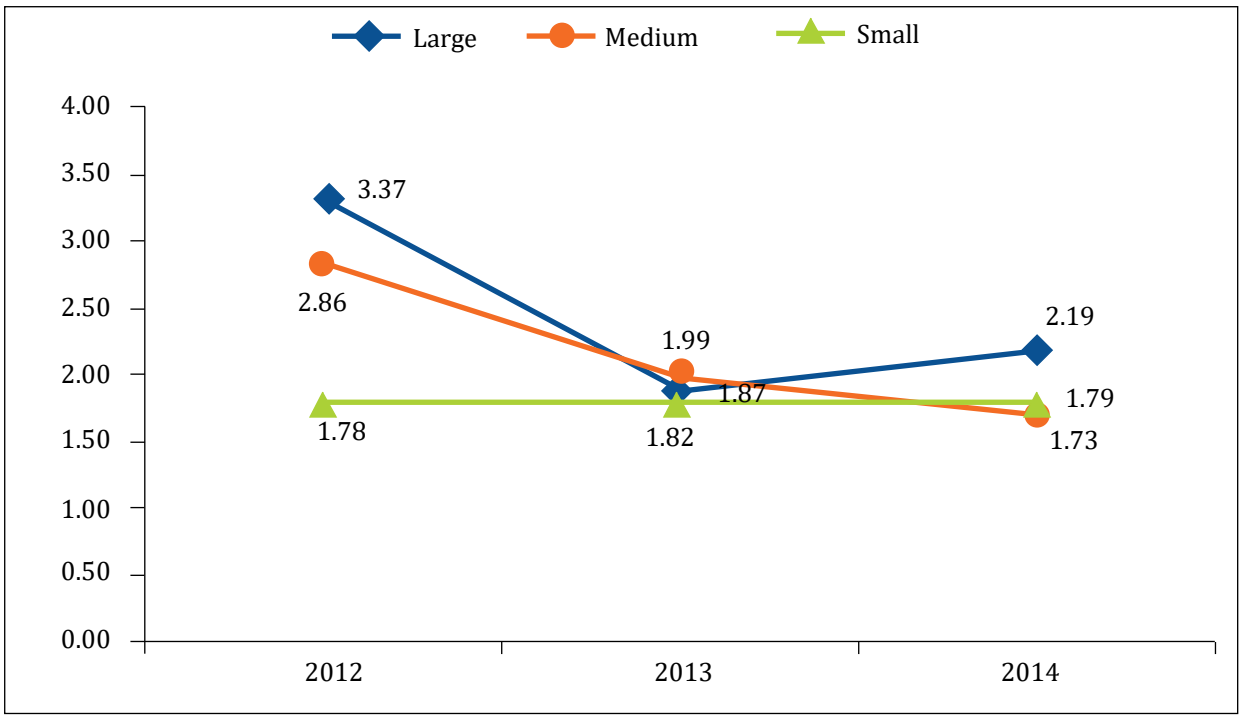


Figure 104: Academic Productivity from 2012 to 2014

Source: used data for calculated from OHEC

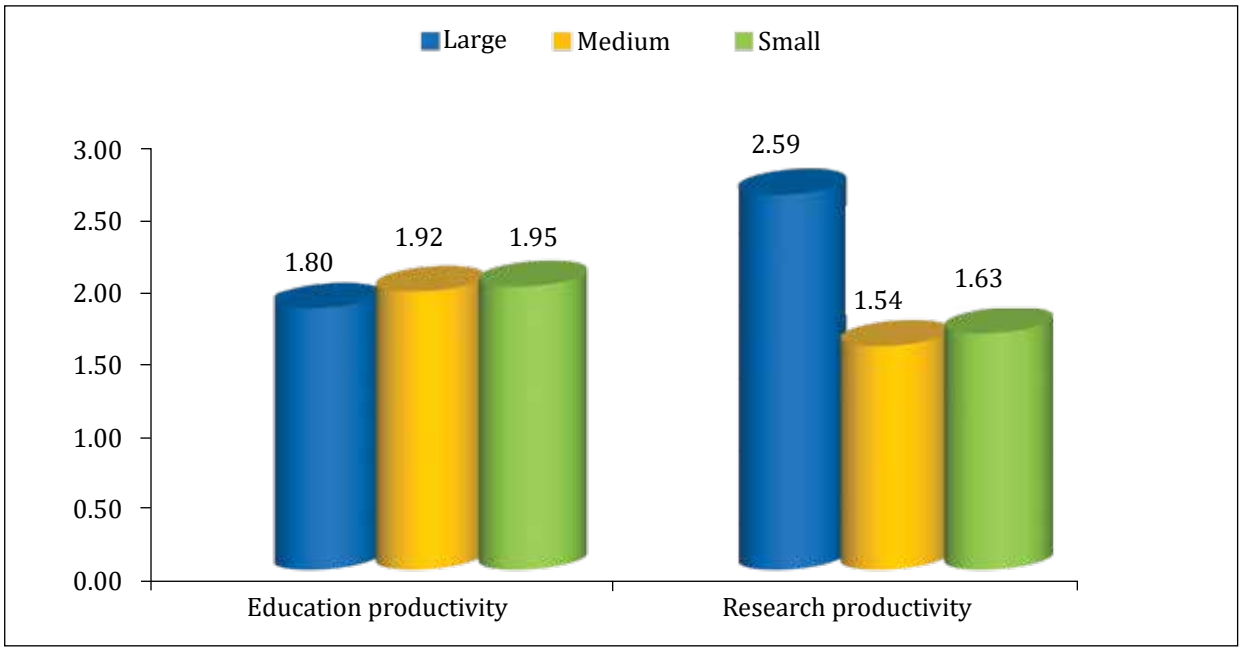


Figure 105: Productivity in higher education by groups of universities, 2014

Source: Used data calculated from OHEC

THE NEXT FIVE YEARS

For the next five years, Thailand has the Framework of the Second 15-year Long Range Plan formulated by the Office of the Higher Education Commission, spanning from 2008 to 2022. The goal of the framework is to have a Thai higher education system of high quality. Such a

system would lead to the production and development of graduates of quality, and capable of life-long work and adjustment. Knowledge and innovation, which are basic and critical to the country's global competitiveness and supportive of sustainable development in every part of Thailand, would be the major outcomes. The quality system would be achieved through mechanisms and measures of good governance, financing instruments, higher education standards, and university networking. The foundation to this is the university's academic freedom, diversity, and unity of the system.

The key theme of the Long Range Plan is to eliminate persistent problems of the Thai higher education financing, in order to set the right directions for higher education development, and to lessen duplication, upgrade quality, and enhance efficiency. One of the key measurements to achieve this purpose, that of categorizing higher education institutions into four groups, needs to be undertaken. It is also recommended, as an approach to address problems of higher education diversity and redundancy, to categorize HEIs that differently define their roles, missions, and service areas.

Each group of universities would be encouraged to excel in accordance with its mission, and would receive the budget from the government in line with its mission. Therefore, HEIs have been categorized into four groups, namely research/graduate university; specialized/comprehensive university; liberal arts university; and community college. The four groups of HEIs would have differentiated missions and goals.

It is seen that the supervision of highly diversified higher education system has an inevitable impact on the policy formulation for quality and standards upgrading; resource support; and monitoring and evaluation of HEIs' performance. The 'one size fits all' policy is impossible to be implemented efficiently. Managerial adjustments and the quest for collaboration for higher education development in the same direction are not likely desirable.

There is a major factor to drive the grouping of universities. Higher education financing reform has adopted the following principle:

- Allocation of performance-based budgets responsive to manpower development policy and country development directions.
- Balanced and connected supply-side and demand-side financing to be put in place through a block grant.
- For supply-side financing, block grant budget will be allocated to students through the Income Contingent Loan, adopting a market-driven approach. However, for some programs that need to be maintained to create knowledge for the society, students will be granted full scholarship regardless of the market need.
- With regard to supply-side financing, block grant budget will be directly allocated to HEIs according to the specific policy framework; for instance, infrastructure development, faculty development, and research and development.
- The budget will come from specific-purpose higher education development funds in forms of grants, loans, partial loans or gifts.
- Financial autonomy is the basis for financial management of HEIs that enjoy autonomy, flexibility, and accountability.

At present, the diversity and differences among Thai HEIs have brought about innovation in higher education management by the grouping of HEIs. By so doing, each individual institution would have its own path to move forward that might be similar to or different from others. Nevertheless, all HEIs would direct their synergies toward the country's development. Higher education financing mechanism, together with the quality audit, would be an effective policy tool to create change in the higher education system, which in turn, would have an impact on the human resource development and creation of knowledge.

CONCLUSION

The development of Thai higher education system was based on policies and directions stipulated as a strategic plan to invigorate the role of Thai higher education in the future and create a desirable society, with emerging changes in the country. The plan focused on the quality of Thai higher education that would lead to the production and development of graduates of quality, capable of life-long work, and adjustment. Moreover, it included the development of knowledge and innovations, which are basic and critical to the country's competitiveness and supportive of sustainable development of all sectors in Thailand.

This study aimed to measure productivity in higher education. The result was presented on the basis of three years of data, and may therefore be unsteady. Thailand should accelerate the implementation of educational reforms and push the universities to deliver high-quality education to make a difference to the Thai society.

REFERENCES

[1] Association of the Council of University Presidents of Thailand. Central University Admissions System.

[2] Bureau of Labor Statistics Multifactor Productivity. Technical Information About the BLS Multifactor Productivity Measures; 2007.

[3] Bureau of the Budget. Budget Expenditure for the Ministry of Education fiscal year 2011–14. www.bb.go.th/bbweb/?page_id=6045. Accessed in 2016.

[4] Massy W.F., Sullivan T.A., Mackie C. Data Needed for Improving Productivity Measurement in Higher Education. Research & Practice in Assessment. vol. 7. 2013.

[5] Massy W.F., Sullivan T.A., Mackie C. Improving Measurement of Productivity in Higher Education, Change: The Magazine of Higher Learning 2013; 45:1, 15–23

[6] Massy W.F., Sullivan T.A., Mackie C. Improving Measurement of Productivity in Higher Education. The National Academies Press. Washington DC; 2013.

[7] National Institute of Educational Testing Service. Ordinary National Educational Test Report (2007–15): Grade 12

[8] Office of the Education Council. Statistical studies of Thailand in Academic year 2013–14. Bangkok; 2015.

[9] Office of the Higher Education Commission. National Qualifications Framework for Higher Education in Thailand. Implementation Handbook. www.mua.go.th/users/tqf-hed/news/. Accessed in 2016.

[10] Office of the Higher Education Commission. Executive Report Framework of the Second 15-Year Long Range Plan on Higher Education of Thailand. www.mua.go.th/users/bpp/developplan/. Accessed in 2016.

[11] Office of the Higher Education Commission. The National Higher Education Plan Issue 11 (2012–16). www.mua.go.th/users/bpp/developplan/download/higher_edu_plan/PlanHEdu11_2555-2559.pdf. Accessed in 2016.

[12] Organization for Economic and Cooperative Development. Measuring productivity, measurement of aggregate and industry-level productivity growth. Paris: Author; 2001.

[13] The Institute for the Promotion of Teaching Science and Technology. PISA Report (2000–12) http://pisathailand.ipst.ac.th/pisa/reports. Accessed in 2016.

[14] Waraiporn Sangnapaboworn. Higher Education Reform in Thailand: Towards Quality Improvement and University Autonomy; 2003.

CHAPTER 11

OVERALL INSIGHTS AND NEXT STEPS

Hamish Coates, Kenneth Moore[1], University of Melbourne, Australia

EXECUTIVE SUMMARY

This chapter takes stock of the research progress and the implications. Three sections synthesize insights from the previous nine chapters. The final section reviews the promise of this nascent field and charts the next steps for development. Six recommendations are made at the outset, to propel and shape future developments in the field:

- **Recommendation 1:** Asian higher education should incorporate research and development into higher education productivity, which will create substantial value, particularly through appropriate quantitative modelling.
- **Recommendation 2:** The APO should take steps to progress its policy leadership of this growing field, by sponsoring communities and works that spur political, technical, and practical changes.
- **Recommendation 3:** Agencies and researchers should transparently document the technical methodologies, especially with respect to the type of production function employed, the exact input-output specifications used, and the ways in which any input or output aggregation calculations were made.
- **Recommendation 4:** Governments and institutions should build infrastructure to measure, analyze, and report the productivity of education, and of research, at the departmental, institutional, and national levels.
- **Recommendation 5:** Regional platforms should be developed to train people and establish networks to boost capability in key areas such as institutional research, productivity evaluation, and benchmarking, by making use of online training resources.
- **Recommendation 6:** Work should be done to trial key productivity initiatives (e.g., activity-based costing, course redesign, and student engagement), which a selection of flagship institutions can embrace to pilot approaches and improve practices.

INTRODUCTION

This foundational research has sought to give momentum to new perspectives on higher education. It has extended in multiple directions, while considering the generation of new discourses and expert communities, developing and testing methodologies and methods, yielding insights into productivity trends and the relevance of such statistics, and unpacking salient political and institutional considerations.

This final chapter takes stock of the research progress and the implications. The next three sections synthesize insights from the previous nine chapters. The final section reviews the

[1]Hamish Coates acknowledges the advice and contributions of many colleagues who have helped shape this chapter, and the support of his family. Kenneth Moore is grateful for the inspiration provided by Eleni Aicia and Benjamin Aiden Moore.

promise of this nascent field and charts the next steps for development. It is important to reiterate the essentially exploratory rather than definitive nature of this research. The country chapters furnish myriad insights into the past and future development of several fast-growing higher education systems. More importantly, they have helped clarify and position the questions and considerations that would frame what would appear to be a substantial and growing new field of work.

MAJOR EMPIRICAL TRENDS

Quantitative analysis of academic productivity has been at the heart of this research. It is helpful to analyze the apparent trends in these figures, as they shed new insights into higher education. While the model and data have been designed with generalizability in mind, it is important to reemphasize the preliminary and partial nature of the analyses and results. This section summarizes major patterns for each country before offering more synthesized insights.

Country-by-country Highlights

This foundation project has by no means sought to produce baseline productivity statistics. The analyses of contexts have also been shaped with the intention of framing the analysis rather than being exhaustive in nature. Given the youthful nature of this field and the bold attempt at cross-national collaboration, the insights in this report must be treated as indicative at best. Nonetheless, it is helpful to review the apparent trends in each country's results.

In the Cambodian chapter, the authors express that higher education productivity is a key indicator of higher education institutional performance. The authors stress how higher education funding is extremely limited in the country. Incorporation of graduate employment as an output indicator also indicates how the authors view the purpose of higher education.

The Fiji chapter includes pertinent background information about past productivity initiatives and highlights the importance of investigating different disciplines separately. Results include a comprehensive analysis of research and education productivity indicators, directly comparing many different combinations of productivity component indices. The analysis also includes change indicators of certain inputs to explain fluctuations in the productivity growth.

The Indian chapter investigates the productivity of 82 centrally-funded technical institutions. The results include helpful disaggregation of productivity data to explain how input changes influence both component and composite productivity indicators. Data shows largely positive year-on-year productivity gains, and concurrent growth in both research and education productivity show evidence that there is healthy prioritization of both research and education functions at the institutions studied.

The Indonesian chapter analyzed productivity analyses at different scales, from a sample of the entire higher education industry to the particular institutions of interest. The analysis performed at the industry level included a large sample size of 73 institutions. The study

included direct comparisons of education productivity versus research productivity, which tended to grow in opposite directions of one another. Indonesia's incorporation of graduate employment as an output indicator is indicative of how the authors view higher education as a key to economic growth and innovation.

The Malaysian study includes an excellent trend analysis of the function inputs and outputs. This gives great context for what factors likely drive the final productivity indicator. The productivity analysis includes input and output index comparisons with the composite productivity index. This is valuable for understanding what part of the P = O/I ratio is most influencing the fluctuations in the final productivity indicator.

The detailed analysis of Pakistan's higher education revealed their results as real outliers among those of the other countries. It shows extreme shifts, due to major funding changes. The Pakistan analysis highlights the importance of discussing technical and contextual factors that play into the larger productivity shifts.

The Philippines study deployed a unique methodology for measuring productivity based on quality indicators. Unique specification of inputs based on faculty members' qualifications also highlights the authors' interest in a unique challenge for the Philippines higher education system. This study's inclusion of tables with raw data allows for close inspection of input and output trends and for follow-up studies of the data using alternative models.

With Sri Lanka, the study included a productivity analysis of 14 different institutions. The chapter included a comprehensive country-level analysis of contextual trends related to higher education productivity in the country. The analysis includes positive and consistent results indicating the productivity growth.

The chapter on Thailand presented an analysis of 11 different institutions. The productivity of the country's higher education system is explained in the context of the pipeline from secondary education to higher education. The authors stressed upon the university admissions reform and incoming students' standardized test scores as notable factors to consider. Results show encouragingly positive productivity growth rates across the institutions studied.

Broader Analytical Insights

Reading these nine country case studies together, these chapters reveal broader insights into the nature and analysis of higher education productivity.

It is apparent that information on education productivity is more accessible than information on research productivity. This is partly due to the low intensity of research in most of the sampled HEIs, and partly due to the sparse and incomplete nature of data regarding research. This alone is an important insight from this research.

Education productivity, as assessed in this study, tends to be growing in many countries and institutions in recent years. While a comprehensive multinational analysis has not been

conducted, this seems partly due to a substantial growth in student and graduate numbers without substantial expansion of the cost envelopes. In other words, existing infrastructure has been used more efficiently to produce graduates, albeit with the quality-related concerns summarized below.

Information on research productivity is more shaky, but perusal of the figures indicates that it tends to hover around one and shows diminishing productivity growth. The absolute volume of research produced is low in the institutions and in many of the countries under study. Increases in recent years have seemed hard to service with existing capabilities. As is already separately evident in more advanced systems and institutions, there is a need for new approaches to producing research; and new technologies and capabilities are required.

There exists notable interest among countries to compare research productivity indicators directly with education productivity indicators. Separate indicators for these distinct academic functions could illustrate the extent to which institutional practices facilitate either mutually reinforcing or competing relationships between education and research. For example, while data from India shows often concurrent gains in research and education productivity, results from other countries show these two functions to be at odds with one another. This illustrates a more zero-sum game between education and research in terms of inputs and outputs. Exploring the institutional and contextual drivers of the results could provide valuable insights for the development of best practices and policies.

There is also an evident variability in the productivity statistics, manifested mostly as stark fluctuation of year-on-year productivity indicator scores. This seems due to problems with data availability in certain years, data reliability, the lack of data smoothing and matching, and of course changes in the phenomena being measured. While there is modest weighting and smoothing of variables in the current analysis, this volatility underscores the sensitivity of the statistics at hand.

Institutional-level productivity data can be inherently noisy based on variable research project schedules and inconsistent student intakes. However, the stochastic nature of higher education productivity data should be distinguished between volatile, experimental, and developmental higher education contexts. Productivity data can be heavily influenced by major funding decisions made at and above the institutional level. Nations and higher education systems that are reevaluating education and research priorities may experience great shifts in productivity, which are not necessarily attributable to internal operational improvements or adoption of better practices. Future work should look into developing protocols to guide appropriate analysis and reporting.

As the presentations in the chapters have conveyed, the multifactor productivity indicators and change statistics can be disaggregated and summed up in a host of ways. The Indian chapter traces results for single institutions; the Thailand chapter shows aggregations by institutional size; and the Cambodian chapter shows even broader results summing together the group of sampled HEIs. As partly evident in the Fiji chapter though fully beyond the scope of this research project, these figures can be reported at levels of analysis within HEIs,

such as faculties or departments, or even individuals or work groups, assuming suitable particularization of data.

The presentation of productivity data was highly variable, illustrating diverse interests. While some countries showed interests in comparing different types of productivity, such as the differences between education and research productivity as discussed above, other countries were more interested in separately quantifying trends in their year-on-year gains or losses in the composite productivity growth. Others still showed interest in explaining productivity fluctuations with respect to input fluctuations. The diversity of the types of results from these cases studies illustrates the power of productivity analyses to uncover various trends of interest amidst complex institutional structures and complex data sets.

SHAPING CONTEXTS

Forces Shaping Progress to Date

The nine country case studies provide insight into factors that have impelled productivity growth in the last decade or so. The analyses are not intended to be exhaustive and the researchers had limited scope to consult or test their ideas with other stakeholders.

The analyses document international matters as playing a role in productivity changes. The impact of general economic growth in the region has had an obvious impact on higher education, and of course higher education has played an important role in facilitating socioeconomic developments. However, several more specific matters have also been relevant. These include international alignment of professional and educational structures, and the accreditation and quality assurance systems. Groups such as ADB, ASEAN, APQN, APEC, and ABET have played important facilitation roles.

System-level factors have also played an important role as higher education grows and repositions in national contexts. Two major factors stand out from the country analyses. The first is bolstering of system-level governance and infrastructure. This has involved establishing new ministries, implementing new legislations and regulations, providing ministries with extra human and financial resources, and setting up of funding and accreditation bodies. In the countries involved in this study, these system-level capabilities have been grown to govern the growth of a large private higher education subsector as much as to fuel the existing public institutions. Indeed, the liberalization of the higher education sector, and the expansion of private and privatized provisions have been notable trends. Various public-private partnerships have emerged, along with new types of institutions. The fundamental driver here has been to provide affordable higher education to the fast-growing domestic markets.

Institution-level developments have shaped productivity, in nuanced interplay with the international and national forces noted above. A notable trend in most of the countries has been the granting of greater autonomy to institutions, i.e., giving them greater control over core facets of governance and management such as finances, staff, property, strategy,

leadership, and resources. Echoing the shifts evident in more advanced tertiary education systems, this devolution of key authorities and responsibilities to institutions has seen governments reorient their interests from input- to output- or outcome-oriented matters. Such changes call for different kinds of leaderships and leaders.

Another trend that the researchers noted was the need to improve many facets of institutional management. In the last decade, improvements have been associated with training of leaders and managers, improving management information systems, reforming institutional structures, and enhancing professional support and academic staffing.

Talented academics are core to higher education, and it comes as no surprise that faculty-related matters have played an important role in productivity improvements. Large-scale growth in demand for higher education services has spurred a need for more teachers, more support professionals, and technologies capable of scaling the blended and hybrid provisions where a face-to-face provision is not viable. Such is the centrality of academic services that country experts noted a shortage of quality academic staff as a major constraint in productivity and growth. Certain countries see workforce as constraining the productivity on research as well as education fronts. Building research capacity requires not only people with research training and doctoral qualifications but also specialized funding and governance capabilities. It appears that the positioning and promulgation of research within universities, particularly the newer private institutions, has played a growing role in the countries in this study.

Student-related matters have played a growing role in the productivity changes. This goes obviously, as already noted, to the growth and diversification of students. People in the selected countries have seen higher education as an increasingly attractive means of investing in their futures. Student-oriented reforms have also been critical, such as expanding student pathways, refining admissions systems, enacting reforms to encourage and support participation from under-represented groups, and changing curriculum to align more closely with the industry and to help students build a broader range of graduate capabilities. It is telling that students have played mostly into the analyses via their roles of consuming the education services. It would be interesting to note any shifts toward seeing students as co-creators in years to come.

Anticipated Future Developments

A general message arising from the analyses is that while the quantity of higher education has been scaled, that has not necessarily been matched by increases in its quality and impact. It is a good time to tilt energy in investigating and developing productivity. This section synthesizes the future-oriented suggestions.

Seven of the nine countries in this volume expressed that governance or institutional autonomy are key areas to improve upon over the next five years. Pakistan's authors see their system as needing stronger governance structures and oversights at institutional levels to reduce wasteful spending. India, on the other hand, is currently in the processes of granting individual institutions with more autonomy and also more responsibility.

The county's authors subsequently wish to move the conversation toward institutional entrepreneurism and innovation. They assert that public institutions have much to learn about the efficiency and effectiveness from their private counterparts. The Malaysian authors feel that a more measured approach to institutional autonomy is necessary. They advocate for an earned autonomy scheme within the country. Advocacy for more top-down governance structures seems to be more in line with input-side productivity improvements and greater accountability for expenditure. Those countries advocating for more autonomy may be concerned with either or both, input and output management.

Seven of the nine countries also stress that improvements to institutional quality assurance and accreditation processes are integral when considering productivity. The key assumption about quality at various levels of productivity is that quality should remain constant. However, internal institutional quality assurance systems across countries are deemed to be not yet fully reliable. Further, the internal quality systems are not fully aligned with external accreditation procedures. Across the board, the authors express that shifting toward examining outputs, rather than inputs, is greatly needed for quality assurance to be more effective. As institutions seek to increase their productivity, they are rightly concerned about the implications for quality. For example, Cambodia acknowledges that the competencies and reliability of assessors for accreditation must be improved, but the Philippines is looking outward, expressing that quality assurance systems must reflect international standards.

The adoption of new technologies has been the single-most influential driver of productivity gains across all industries and all economic sectors. Access to education technologies and technological expertise has never been so abundant. However, outdated technological infrastructures impede productivity gains for many of the countries in this volume. For example, both Fiji and Malaysia see more online classes and blended learning for course delivery to be crucial for generating quality learning outcomes at scale. Sri Lanka, on the other hand, wishes to prioritize knowledge management improvement and maintenance of information systems for general gains in institutional efficiency and effectiveness.

Explicit recommendations for committing to regular productivity assessments and reporting was also common among the countries. While the measurement of higher education productivity is still in its infancy, the countries in this volume regularly tout its importance for managing and monitoring national higher education system development. India's authors strongly assert that the current difficulty in quantifying productivity indicators cannot be an excuse for impeding progress toward better productivity reporting. Cambodia's authors see productivity assessment as highly pragmatic for better determining the real worth of educational outcomes. The Cambodian system is pushing toward more outcome-based performance indicators, and the authors see productivity assessment as a way to illustrate the requisite costs and efforts associated with quality.

Partnerships, mergers, and joint ventures, among other types of cooperation between organizations and industries, have long been inspired for mutual value and productivity gains by the collaborators. The countries in this volume envision similar opportunities for the productivity of their HEIs. Fiji's authors list industry collaboration among the most

influential endeavors for productivity improvement. They explore options of leasing capital to industry for enhancements to both their input and output components of production. Supplemental income could help the input side, and increased access to experiential and practical learning opportunities for students could benefit student outcomes. Indonesia, on the other hand, explores the potential for increased innovation that could sprout from cooperating with the industry. The country's authors see university-industry partnerships in research to be prime mechanisms for improving both quality and quantity of the research output and to increase the impact of knowledge dissemination.

As research remains one of the core missions of higher education, strictly internal initiatives to bolster research are also seen as crucial for enhancing university productivity. The Philippines' authors respect international benchmarking and see Scopus indicators to be relevant and indicative of research output. They seek to raise their performance against these standards of comparison. One key effort mentioned by the authors is to strengthen the country's peer review system. Cambodia's authors emphasize the importance of improving systems for tracking and reporting research outputs. They cite the country's paucity of research data as symptomatic of a higher education system that does not prioritize research as much as it should. They hope that better monitoring and tracking of research outputs will provide better internal standards of comparison for raising research quality and expectations.

VALUE-CREATING AND FEASIBLE PRODUCTIVITY ASSESSMENT

The feasibility of this kind of research must be considered from many perspectives. Only initial and hopefully formative insights are offered in this section, focusing mainly on the technical validity and practical value of this work. To make these concrete, a handful of recommendations are made for the APO and its member countries. Broader forms of feasibility associated with consequential considerations must be earmarked for a later and broader treatment.

The study of higher education productivity is of value, practically. The research conducted for this study affirmed that the information generated through productivity modeling has the potential to be very helpful for national policymakers and institutional leaders alike. Even when data and reports don't exist, the ideas frame conversations which are seen to be helpful in understanding and advancing national and sector-specific agendas. While there has been marked expansion in many of the systems analyzed in this study, there now seems value in directing greater energy and investment into the quality and impact of higher education and research. This must involve consultation with higher education stakeholders.

Recommendation 1: Asian countries should conduct research and development into higher education productivity.

The collection of studies in this volume seemed feasible politically. Higher education is an industry of growing importance in Asia, and Asia is of growing importance to higher education. Governments and other political actors in Asia have demonstrated interest in engaging with the productivity agenda. Given the extent of international engagement in the current study, signs of increasing feasibility for continued research on higher education

productivity are encouraging. Researchers in ten countries have participated directly, and during only the first year, the work has gained sufficient momentum to convene a major international conference. Examining the discussion that flows from broader reporting of the results will provide further important insights into the policy value of such work. The APO has scope to play a major role in steering future intergovernmental developments.

Recommendation 2: The APO should progress its leadership of this growing field by sponsoring work that spurs political, technical, and practical development.

Technical feasibility can be affirmed via acceptance of the model and indicators among contributing experts. All participating experts affirmed the parameterization of productivity model used in this research and its underpinning assumptions and limitations. There remains substantial room for further development, ranging from actuarial work required in procuring and validating data, to econometric work in refining and embellishing the model; and from broader analytical work regarding reporting and interpretation, to even broader governance work regarding quality control and monitoring implications.

The current study has generalized and replicated a previously tested model. Substantial further work is required to define and validate the model and associated assumptions and implications. In order to extract maximum value from the study, and in order to understand external validity or generalizability, productivity studies must be transparent. With increasing numbers of transparent higher education productivity studies, patterns should begin to emerge concerning what types of analyses are best suited for different countries and systems contexts, as well as different scales of analyses. There will also be a value in working toward more standard and representative methodologies to account for a time lag, to improve the value of productivity indicators for better decision-making.

Recommendation 3: Researchers should further develop and document methodologies, especially the production functions and indicators.

Technically, the greatest barrier remained the availability and specificity of data required to underpin the indicators, particularly the research data. In terms of availability, it appears that only in a few instances was sector-wide data available in existing databases. It was more common for a subset of data to be available for a part of the sector, typically the public institutions. As well, many experts had to gather data from institutions or a variety of agencies. In a small number of cases, for practical or political reasons, it was not possible to collect any data at all, or to extract data held in proprietary systems. The specificity of data was also a major barrier. The teaching and research functions of HEIs, while mutually reinforcing in an ideological sense, are often quite separate in an operational sense. Institutional funds used for research-related expenditure or for education-related expenditure are not always labelled separately. Common higher education accounting practices rarely distinguish between balance sheet expenses in terms of academic functions. Thus, although in practice the research and education expenditures are often separate, directly linking education expenditures to education outputs and research expenditures to research outputs still requires broad estimation. Implementing activity-based costing (ABC) has an important role to play in establishing new evidence-based management.

Finally, the cross country exercise in this reports shows the importance of appropriate interpretation of productivity change analysis results. Measurements of 'productivity change' and 'absolute productivity' require different calculation techniques and different interpretations. For the results to have utility for institutional or system-wide decision-making in their respective country contexts, a practiced understanding and interpretation of results is required.

Recommendation 4: Governments and institutions should build infrastructure to measure, analyze, and report the productivity of education and of research at departmental, institutional, and national levels.

An important practical consideration regarding feasibility goes to the people available to lead and do the work. Of course, within any country it is possible to find quantitative scientists, higher education specialists, and people with policy and management expertise. The key is to find experts who combine these capabilities with the foresight and resources to gain traction for this new and sometimes controversial research agenda. Given the continuing growth of higher education, the formation of such professional capability is an urgent priority. This flows immediately to the need to train and engage experts.

Recommendation 5: Making use of online training resources, regional platforms should be developed to train people and establish networks to boost capability in key areas such as institutional research, productivity evaluation, and benchmarking.

Of course, the assessment and reporting of productivity statistics is only the technical part of a much broader agenda to improve higher education productivity. The policy and management reforms are critical for moving beyond improving the efficiencies of existing processes to changing the ways in which education and research are produced. In many respects, these activities are diverse and contextualized, as the chapters in this report have spelled out. Increasingly, however, insight is mounting into reforms that are particularly effective and generalizable cross-institutionally and even internationally.

Recommendation 6: Key productivity initiatives (e.g., activity-based costing, course redesign, and student engagement) should be trailed at a selection of flagship institutions.

What should happen next? A large new field has been charted, which has many dynamic actors and moving parts. It is difficult and perhaps unhelpful to be overly prescriptive or conclusive regarding the concrete next steps. Change on this scale tends to take years and much dedication to progress.

Figure 106 shows a broad sequence of potential steps. In terms of this logic, the current project has sought to spark a formative dialogue that defines the creation of the infrastructure required to institutionalize productivity assessment and reporting. Such infrastructures can then spur change in practice, and then more expansive improvements.

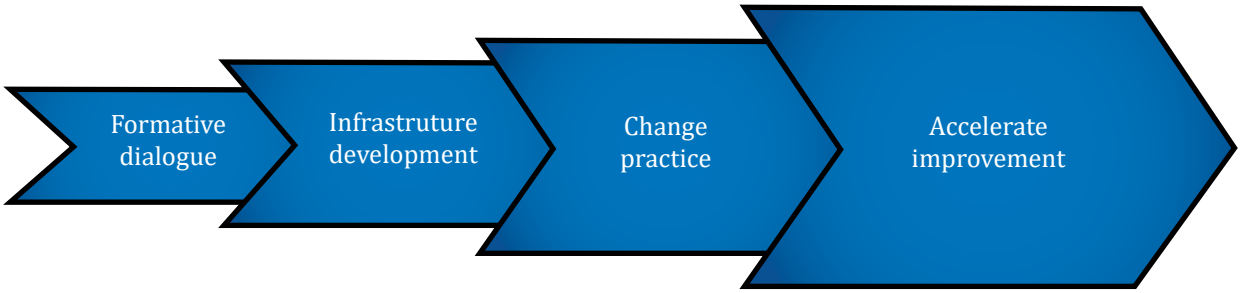


Figure 106: Broad logic for large-scale change

In general, the rudiments of the field appear to be in building infrastructure, igniting a small suite of well-positioned and high-yielding initiatives, and, critically, building communities and networks. As this report has clarified, this work is highly multilevel and multilateral in nature, requiring work within departments, institutions, and countries, and also leveraging the opportunities of cross-national collaboration. Even with the most concerted progression, initiatives of this kind of scope and scale tend to take at least five years to find a sustainable momentum.

CONTRIBUTORS

ABOUT THE CHIEF EXPERT

Professor Hamish Coates (www.hamishcoates.com) is a Tenured Professor at Tsinghua University's Institute of Education and also Deputy Director of its Centre for the Assessment of College and Student Development. From 2013 to 2017 he was Professor of Higher Education at the University of Melbourne. He was Founding Director of Higher Education Research at the Australian Council for Educational Research (ACER) from 2006 to 2013, and between 2010 and 2013 also Program Director at the LH Martin Institute for Tertiary Leadership and Management. He held earlier roles at Graduate Careers Australia and the University of Melbourne Centre for the Study of Higher Education and Assessment Research Centre. He has honorary appointments at several leading universities. Prof. Coates contributes to higher education through research, leadership, and development. He concentrates on improving the quality and productivity of higher education. He is considered an authority in large-scale evaluation, tertiary education policy, institutional strategy, assessment methodology, learner engagement, and academic work and leadership.

ABOUT THE NATIONAL EXPERTS

Shakeel Ahmad is a qualified ACMA (Pakistan), ACSI (UK), and CFA (USA), having post qualification practical and teaching experience of more than 16 years in the field of accounting, finance, investments, costing, budgeting, corporate and taxation laws, and auditing. He has worked as the CFO of Eehabs' Engineering Company (Pvt.) limited; as a financial analyst at Yasir Mahmood Securities Private Limited; as finance manager at Amtex Limited, and as an audit supervisor at Zahid Jamil & Company Chartered Accountants. During his education, he topped twice in the ICMAP examinations and received a gold medal and scholarships from CFA Institute, the USA. Ahmad has a vast experience of teaching both at academic and professional levels. He has taught a number of courses for the students of ICAP, ICMAP, ACCA, and CFA. At an academic level, he has taught in a number of universities and has been part of FAST School of Management for the last six years.

GMRD Aponsu, MSc (Physics) and MEcon, is a public officer who belongs to Sri Lanka Planning Service (SLPS) and is attached to the Ministry of Higher Education and Highways, Sri Lanka as Director (Planning). He earned his BSc (Special) degree in physics from the University of Ruhuna, Sri Lanka, in 1994, followed by an MSc in Physics from the University of Colombo. He also has a postgraduate diploma in development studies from the Institute of Developing Economies Advanced School, Japan, and a postgraduate diploma as well as a master's in economics from The Australian National University. His career spans across several areas in the planning discipline, such as national planning, national budgeting, macroeconomic forecasting, development financing, and higher educational planning. Before joining the SLPS, he had performed in different capacities such as lecturing; being a researcher in physics at a university level, and analyzing data in the field of taxation at the department of Inland Revenue.
Dr. Gwilym Croucher is a public policy research academic and advisor specializing in higher education at the University of Melbourne. He is a senior lecturer at the Melbourne

Centre for the Study of Higher Education and Principal Policy Adviser at the University of Melbourne's Chancellery. He has expertise in higher education and research policy, drawing from his research focus on the funding and financing universities, particularly in Australia. Croucher is currently a chief investigator for a large Australian Research Council Discovery Grant. A regular media commentator, he has been invited as an expert witness to several Australian parliamentary inquires. He has previously worked as a researcher and lecturer in policy and political studies, as well as held administrative positions in higher education.

Dr. Dahrulsyah is an expert in food technology from Institut Pertanian Bogor (IPB). A graduate from Gottingen University, he has years of research experience in the area of food technology; writes in scholarly journals, and also manages deanship of School of Graduate Studies at IPB. He has also been involved in various activities for human resource development and capacity building under the auspices of the then Directorate General of Higher Education and currently under the Ministry of Research, Technology and Higher Education.

Prof. Conrado E Inigo, **Jr** holds a bachelor's degree in business administration from Pamantasan ng Lungsod ng Maynila. He received his MBAs from Ateneo de Manila University and Philippine Christian University, and is also Doctor of Philosophy in Business Management. Prof. Inigo took his postdoctoral courses in Management Development Program from Wharton School of Business, University of Pennsylvania; and Minnesota Management Academy, University of Minnesota. He is a graduate of the Executive Strategy Program from Georgetown University. As Vice-Chairman of the Philippine Association of Colleges and Universities Commission on Accreditation, he has also served as Chairman of the accrediting teams of several schools. He has been appointed as Chairman of CHED Technical Committee for Business Administration, Entrepreneurship and Office Administration, Vice Chairman of CHED Technical Panel in Business and Management Education, and Chair of DEPED Senior High School Curriculum Task Force for the accountancy, business and management academic tracks. Prof. Inigo is also Vice-President for Academic Affairs; and Integrated Management Representative of Lyceum for the Philippines University Manila and Cavite campuses.

Prof. Dr. Ganesan Kannabiran is an alumnus and a senior professor at National Institute of Technology, Tiruchirappalli, India. He has served as Head of Business School, and Dean of Research & Consultancy at the institute level. He is a recipient of Commonwealth Professional Fellowship (Edinburgh Napier University, UK), Fulbright Fellowships (Fulbright Visiting Lecturer at Oklahoma State University, Fulbright Education Administrators Programme), and British Council Study Fellowship (Huddersfield University, UK), and is involved in international engagements though the APO. His research areas include knowledge management, software development, human resources, and entrepreneurship development. He has secured funding of about INR 40 million from national and international funding agencies for projects across diversified areas. He led the efforts to set up the Center for Entrepreneurship Development and Incubation (CEDI) and Center for SME Research and Development (C-SMERD) and carried out projects in the areas of SME development, employability, and rural women development, among others. He won the Emerald Indian Management Research Fund Award 2015 for a research proposal on Determinants of Effective Strategic Positioning of University Business Incubators in India. Dr. Kannabiran is currently serving as the Director In-charge of National Institute of Technology, Tiruchirappalli, India.

Dr. Izhar Bin Che Mee is a subject matter expert in Reducing Unnecessary Regulatory Burdens (RURB) and an associate of Malaysia Productivity Corporation. He secured a PhD in Information System Engineering from the University of Bradford, England in 1991. He is currently completing his Doctor of Management research work on an identification framework for sources of unnecessary regulatory burdens on businesses. Dr. Izhar has successfully led several RURB initiatives in Malaysia across various industries including services, logistics, construction, palm oil, health, education, and oil and gas. Currently, he is actively leading a major RURB transformation for the Malaysian construction industry. He has also been engaged by Economic Research Institute for ASEAN and East Asia for facilitating capacity building for nine ASEAN countries on RURB. In 2015, he acted as the principal consultant for Malaysia public sector productivity measurement research. Dr. Izhar was also appointed as the researcher representing Malaysia for the APO's study on higher education productivity.

Sovansophal Kao earned a Master of Arts in Education from Hiroshima University in 2013 and a Master of Educational Management and Planning from Royal University of Phnom Penh in 2011. He is currently a Vice Chief of Admission Office, Department of Higher Education, Ministry of Education, Youth and Sport, Cambodia. As part of his career, he has conducted studies in the areas such as quality of higher education; higher education academic major choice, higher education tracer studies, school accountability and higher education financing and governance. His current research interest is in higher education science and engineering policy. He was also the head of Development and Innovation Grant component of the Higher Education Quality and Capacity Improvement Project. With that, he has worked closely with 45 sub-project managers to implement their research projects.

Robert Victor Misau manages the Corporate Services and the Finance and Research Units of the Fiji Higher Education Commission. Prior to this he worked at the Fiji Development Bank in lending and internal auditing roles. In 1990, he worked as a senior agriculture assistant in the Economics, Planning and Statistics Division of the then Ministry of Primary Industries. Educated in Fiji, he attained his Certificate in Agricultural Engineering under the City Guilds of London Institute; Diploma in Agriculture; MBA, and other postgraduate qualifications from The University of the South Pacific.

Kenneth Moore is a PhD candidate with the Melbourne Centre for the Study of Higher Education. He holds a BS in Pure Mathematics and an EdM in International Educational Development. Moore is a Kentucky Colonel and a Fulbright Scholar. He has many years of experience working in Indonesia in the areas of secondary education, tertiary education, not-for-profit sector, and small businesses. He has also worked in the USA evaluating the implementation of federal block grants for community development. Moore is currently working on a grant from the Australian Office of Learning and Teaching, titled Design Options for the Future Doctorate. His research interests include higher education productivity, university-industry engagement, program evaluation, STEM education, systems thinking, and dynamic modeling.

Dr. Chanrith Ngin is a lecturer at the Faculty of Development Studies (FDS) at the Royal University of Phnom Penh (RUPP), Cambodia. His research and published works are in the areas of higher education, vocational training, civil society, decentralization, community

development, migration, and natural resource management. His ongoing interests comprise education and middle income trap, social enterprise, community network, territorial rural development, and urban resilience. Dr. Ngin was the Founding Dean of FDS/RUPP during October 2013 – January 2016 and the Founding Director of Graduate Program in Development Studies at RUPP during 2005 – 2016. He has been a post-doctorate and visiting scholar at various universities in Europe and Asia. Dr. Ngin also serves on a number of editorial and advisory boards of national and regional academic outlets and development institutions. He holds a PhD in International Development from the Graduate School of International Development, Nagoya University, Japan.

Siriporn Petchkong graduated from the University of the Thai Chamber of Commerce with a Bachelor of Accounting in 1999. She also earned her Master of Management in Financial from the College of Management, Mahidol University in 2008. At present, she is working as a researcher at Thailand Productivity Institute under the supervision of the Ministry of Industry. She has also been part of various productivity projects in Thailand such as the Productivity and Investment Climate Study, and Value Added Productivity Index report. Other related research areas include employee engagement research, customer satisfaction index, and performance evaluation of government organizations.

Prof. Paulina Pannen, MLS, is an expert in areas of higher education, e-learning, distance education, educational technology, and curriculum development. She earned her doctoral degree in educational technology from Syracuse University, the USA. She has over 30 years of experience in national and international education, writes in scholarly journals, and speaks at national and international education forums. Currently she is working as Senior Adviser on Academics to the Minister of Research, Technology and Higher Education.

Dr. Herr Suryantono is an expert in civil engineering from Faculty of Engineering, Universitas Indonesia. Having earned his doctoral degree from Michigan State University, he has been teaching and researching in the area of water management and hydraulics for more than 30 years, and writing in scholarly journals as well. He has served as the Vice Dean for Academic Affairs at the Faculty of Engineering, and Director of Human Resources at Universitas Indonesia, where he is currently Director of Human Resources at the Teaching Hospital. He has also been involved in higher education projects under the auspices of the then Directorate General of Higher Education, especially for human resources development and capacity building.

Dr. I Nengah Baskara Wisnu Teja was a faculty member of Faculty of Economics, Universitas Terbuka. He earned all his degrees from Universitas Gajah Mada. He had years of experience in teaching and managing the Department of Economics for Development and the Department of Shariah economics at Universitas Terbuka, and was a member of the Senate of Universitas Terbuka. An expert in economics for development, he had carried out numerous studies in collaboration with the Ministry of Industry, Ministry of Manpower, and The Office of National Planning. His writings are enjoyed by his students in Universitas Terbuka, especially The Economics of Environment.


APO