Presented at the DLSU Research Congress 2015
De La Salle University, Manila, Philippines
March 2-4, 2015

The Role of the Government in Enhancing Research Productivity of SUCs and Private HEIs in the Philippines

Crisanto Q. Regadio Jr.[1] and Dr. Tereso S. Tullao Jr.[2]
[1] *Research Apprentice – Social Development Research Center (SDRC)*
[2] *Director – Angelo King Institute for Economic and Business Study*
** Crisanto Q. Regadio Jr.: crisanto.regadio@dlsu.edu.ph*
Dr. Tereso S. Tullao Jr.: tullaot@dlsu.edu.ph

Abstract: This paper speculated on the conjecture between the concepts research and development (R&D), R&D as public good and R&D financing. The R&D contribution from private HEIs and the optimization of R&D productivity of SUCs in the Philippines are both important components in the production of knowledge, innovation and technology and the over-all economic development of a developing country. This paper reviewed R&D funding of SUCs provided in the General Appropriations Act of fiscal years 2011 to 2014. This paper also examined the R&D productivity of SUCs through the self-reported R&D productivity provided in GAA 2014 and affiliation search in Scopus on-line database. The paper assessed and evaluated the utilization of R&D funding of SUCs, the global significance and impact of SUCs R&D output and compared it with the R&D output of selected private HEIs in Scopus. Most SUCs have poor R&D output and were not able to optimize the utilization of their R&D funding except for few outstanding universities which include University of the Philippines, Central Luzon State University and West Visayas State University. While some private HEIs even without full state funding, limited incentives and technical support from the state had considerable contribution in Scopus citation and the over-all R&D productivity of the country. The actual R&D contribution of private HEIs to elevate the local and global significance of R&D of HEIs, support the goals and objectives of NHERA-2, elevate the quality of education of HEIs and the promotion of innovation and technology in the Philippines towards economic development must be considered as a public good and should receive full support from the state. New R&D policies and funding formula and incentives for both SUCs and private HEIs have been recommended to optimize their contributions to R&D productivity of the Philippines.

Key Words: Higher Education Institutions; Research and Development; R&D as public good; R&D financing; Optimal R&D Productivity

1. INTRODUCTION

This paper speculates on the conjecture between the concepts research and development (R&D), R & D as public good and R & D financing. There has been a large acknowledgement of the role of R & D in the over-all economic development of a country (Tullao & Cabuay, 2014; Shin, 2012; Faria et al, 2011; & Laliene & Sakalas, 2012) but there is less agreement on whom to finance R & D. One of the significant institution that contributes to R&D productivity of a country are higher education institutions (HEIs) which include both state universities and colleges (SUCs) and private HEIs. The Philippine government allocates research and development budget for SUCs to improve their R&D capacity. Does this allocated funding is optimized to improve the over-all R&D productivity of the Philippines? On the other hand, there is little state funding or support allocated to private HEIs in the country and R&D activity of private HEIs are funded locally or by private organizations or corporations. Should the government extend its R&D funding to R&D productive private HEIs?

Research and Development (R&D) activities according to World Bank are creative work undertaken systematically to increase knowledge, including knowledge of humanity, culture, and society, and the use of knowledge for new applications[i]. According to the Organization for Economic Co-operation and Development (OECD) R&D is any creative systematic activity undertaken in order to increase the stock of knowledge, including knowledge of man, culture and society, and the use of this knowledge to devise new applications[ii]. The Frascati Manual in 2002 has become the standard of conduct for R&D surveys and data collection for Organization for Economic Co-operation and Development (OECD) nations and later even for non-OECD countries.

The knowledge divide between developing and developed countries is both deep and wide (Sanyal & Varghese 2006) and that a country's existing R&D activities are a reflection of its capacity to create knowledge. In the era of globalization and economic competition in global scale a country's development must be characterized by knowledge-based production. This knowledge economy must place greater value and stronger emphasis on the production and distribution of knowledge or R&D (Sanyal & Varghese, 2006).

1.1 R&D as Public Good

To understand the characteristic of Research and Development as public goods there is a need to contextualize it in relation to the concept of private goods. There are two distinct features of public goods that separate it from private goods first is that it is non-excludable and the second is that it offers non-rival benefits (UNIDO 2008). Public goods are non-excludable in the market supply which means that it is publicly available in the market and there is no way to prevent someone from having access their consumption (UNIDO 2008). Non-rival benefit means that they give rise to zero marginal costs of use. The access costs society nothing while yielding positive benefits and thus welfare is not maximized by exclusion (UNIDO 2008).

Research and Development is not only a process or mechanism to produce new knowledge and a marketing tool of businesses to offer innovative products and services to increase sales and market share (Bacila 2012; Starbuck 2006; Van de Ven & Johnson 2006). As early as 1912 there has been growing interest in acknowledging this positive relation and Schumpeter suggests that invention and innovation are keys to economic growth and those implementing the change are practically entrepreneurs (Schumpeter 1912 as cited in Zamora-Torres, 2014). This perspective is known is known as the Schumpeterian framework.

R&D output of private firms and research institutions if analyzed based on the above premise subscribe to the category as a public good. One good example is agricultural researchers with private funding. The resulting innovations in agricultural production of these R&D activities benefit the public (Dalrymple 2008). The spillover benefit of R & D is defined as externalities with the firm unable to limit the benefits of R & D to their own consumption (Eberhardt & Strauss 2013; Dumont & Meeusen 2000). The positive externalities associated with R&D are enormous and may be ignored by the private sector (Tullao & Cabuay, 2014). The innovation and technology resulting from research and development of private firms and research institutions is not limited to the firms or institutions that funded the activity (Eberhardt, Helmers & Strauss 2013).

Knowledge, innovation and technology have been considered to always have the potential to

provide benefits to large numbers of users. More so, the benefit received by any one user does not reduce the benefits received by others (Stiglitz 1999 as cited in UNIDO, 2008). In principle, the results of government funded and performed researches are in public domain and freely available as such is intended as pure public good (Schoenenberger, 2005).

1.2 Higher Education Institutions (HEIs) as Major Producer of R & D

There are different sectors in the country which are expected producers of R&D. Private firms, public and private research organizations and universities are considered as heterogeneous agents that create scientific publications, patents, as well as high-tech jobs (Korber & Paier 2014).

In an innovative knowledge society R&D activities and implementation of its results are becoming one of the most important tasks for universities (Laliene & Sakalas 2014). Research and development, as a major function in higher education, sets higher education apart from basic education (NHERA 2-CHED). Higher Education Institutions (HEIs) is acknowledged as the place where education is converted to specific and new knowledge thru R&D. However, this process of conversion is endogenously shaped by political, economic and social factor (Tullao & Cabuay, 2014; Harris, Li & Moffat 2013; Karumoto and Sagasti, 2002).

Research and development is aimed at making discoveries or inventions. Its aim is producing new and practical knowledge. The knowledge produced in academic institution's R&D activity is a largely non-excludable and a partially non-rival good and thus can be considered as a public good (Schoenenberger, 2005).

Research centers in universities or colleges are expected to assist firms and industry to innovate by training researches, attract world-class researchers and establishing research teams. Empirical results suggest that lagged R&D performed by higher education is positively affecting productivity growth in all specifications (Eid 2012). Even if the current trend in most developing countries is characterized by less significant role of universities in funding and carrying out research, their role remains unchallenged in the area of research training (Varghese & Sanyal 2006).

More so, academic research activities and their output are also public good for there is a general rule of openness and the free circulation of ideas are the rule (Schoenenberger, 2005). The publication of research output in distinguished journal or academic paper and on-line publications is an aspect of full disclosure of findings and this methods form a key aspect of the co-operative, communal programme of inquiry (Khan 2011; Schoenenberger, 2005). Full disclosure also procures legitimacy based on "organized skepticism", which demands that all contributions to the stock of reliable knowledge be subjected to trials of replication and verification (Schoenenberger, 2005). This suggests that the state role in funding academic R&D activity must not be limited to state colleges and universities, for the R&D output of private HEIs could also be considered as public good given the assumptions provided by Schoenenberger.

2. METHODOLOGY

This paper reviewed R&D funding of SUCs provided in the General Appropriations Act of 2011 to 2014. This paper examined the R&D productivity of SUCs through the self-reported R&D productivity of SUCs provide in GAA 2014 and affiliation search in Scopus on-line database as of November 15, 2014. The paper examined the existing utilization of R&D funding of SUCs vis-a-vis their self-reported R&D productivity and Scopus contribution.

Using the data from the GAA 2011, 2012, 2013 & 2014 the total R&D productivity for each year could not be computed. GAA 2014 indirectly provided the data of the R&D output of SUCs from 2011-13. The submitted data of the research output of SUCS in GAA 2014 was scruffy and promoted confusion. The general outline of the report for Research Services included: *number of research studies completed; percentage of research projects completed in the last three years; percentage of research outputs presented in local; regional, national or international fora; percentage of research outputs published in a recognized journal or submitted for patenting or patented; and percentage of research projects completed within the original project time frame.* The data could only provide the R&D *(t)* of the SUC from 2011-2013 using the formula:

R&D (*t*) = R&D (*r*) *x* R&D *(%)*

R&D (*t*) = R&D productivity for the last 3 years
R&D (*r*) = # of research studies completed
R&D (*%*) = % of research projects in the last 3 years

An SUC that did not provide the clear data of the percentage of research completed in the last

three years was treated that there was no output for the last three years. Some SUCs substituted the data for the R&D completed in the last three years with the data on the percentage of research projects presented in local, regional, national or international for a and indicated the levels 1-2 0r 3-4. However, the consistency of such data in comparison to the entry of most SUCs made the entry insignificant indicator of a clear research output in the last three years. The researchers consider the entry as invalid for the computation of the R&D output of the corresponding SUCs in the last three years.

The self-reported output of SUCs was not enough to assess and evaluate their R&D capability, productivity and quality. Teixeira and Sequiera (2009) introduced a new methodology, based on scientometric and bibliometric tools. The methodology complement traditional assessments like self-reported output of SUCs in the Philippines by considering the influence of the respective HEIs and their researchers to global scientific production and the recognition of the relevance of their R&D output by its international peer community.

Most existing literature appraise the advantages of Scopus database compared to other existing bibliometric and scientometric databases like Web of Science and Google Scholar in terms of indexed documents as well as citations in all research fields (Bartol et al., 2014; Halkos & Tzeremes 2011; Teixeira & Sequeira2009). This paper considered the Scopus database entries of SUCs *(as of November 15, 2014)* and other leading private HEIs in terms of R&D productivity as an indicator of the influence of SUCs and private HEIs to global scientific production and recognition of relevance of their R&D output by its international peer community.

3. RESULTS AND DISCUSSION

3.1 State's Support on R&D of SUCs

Table 1. R&D Budget Allocation for SUCs

R&D Indicators	2011	2012	2013	2014
R&D Budget	1.06E+09	1.07E+09	1.29E+09	1.43E+09
% Increase	N/A	1%	21%	10%

The total allocated R&D budget for SUCs for fiscal year 2011 amounted to PhP1.05 billion and it barely increased to PhP1.07 billion (1%) in 2012. In 2013 the R&D budget of SUCs increased to PhP1.29 billion (21%) and in 2014 to PhP1.43 billion (10%).

3.2 R&D Productivity and the Public Cost of R&D

3.2.1 Self-Reported R&D Productivity

Table 2. Distribution of Self-Reported R&D of SUCs

Self-Reported R&D Productivity	2011-13	%
R&D productive SUCs (≥90)	6	5%
Low R&D (≥45 but <90)	5	4%
Too Low R&D (≥1 but <45)	51	46%
Non-Productive	50	45%
Total	112	100%

A productive SUC could have at least produced 30 researches per year or a total of 90 researches from 2011 to 2013. Only 5% or six SUCs were classified as R&D. Low R&D Productivity SUCs were those who were able to produce at least 45 researchers in the last three years. Only 4% or 5 were classified to be Low R&D productive. 46% or 51 SUCs were not able to produce at least 15 R&D per year and 45% or 50 SUCs were not able to produce any research output.

3.2.2 Public cost of Self-Reported R&D Productivity of SUCs

Table 3. Public Cost of Self-Reported R&D of SUCs

R&D Indicators	2011-2013
Total R&D Fund	3.42E+09
Non-Productive R&D Fund	7.55E+08
Productive R&D Fund	2.66E+09
Total # of Research Output	2,066
Budget Per Research	1.29E+06

The total R&D budget allocated for SUCs for fiscal years 2011 to 2013 which amounted to PhP3.42 billion. PhP2.66 billion was utilized for R&D productivity by the R&D performing SUCs which produced a total of 2,066 researches. The average cost of each R&D amounted to PhP1.29 million. However, the unutilized R&D fund of those non-

productive SUCs amounted to PhP755 million from 2011-2013.

3.2.3 Scopus R&D Productivity of SUCs

Table 4. Distribution of R&D Productivity of SUCs based in Scopus Database

R&D Productivity in Scopus	2013	%	2014	%
R&D productive	10	9%	10	9%
Non-Productive	102	91%	102	91%
Total	112	100%	112	100%

Only 10 (9%) out of 112 SUCs in the Philippines were able to produce R&D outputs and acknowledged by their international peers and cited in their works at Scopus database. The other 102 (91%) SUCs were not able to produce R&D that gained recognition from other scholars and researchers in a global scale.

3.2.4 Public Cost of Scopus Entry of SUCs

Table 5. Public Cost of Scopus Entry of SUCs

R&D Indicators	2013	2014
Total R&D Fund	1.29E+09	1.42E+09
Non-Productive R&D Fund	5.02E+08	5.78E+08
Productive R&D Fund	7.91E+08	8.45E+08
Scopus Entry	569	438
Budget Per Research	1.39E+06	1.93E+06

The total R&D fund of SUCs in 2013 amounted to PhP1.29 billion. PhP791 million was utilized by R&D productive SUCs in Scopus which produced 569 researches. The average cost of each R&D activity of the SUCs amounted to PhP1.39 million. However, the unutilized R&D fund of SUCs in 2013 amounted to PhP502 million.

The total R&D fund of SUCs in 2014 amounted to PhP1.42 billion. PhP845 million was utilized by R&D productive SUCs in Scopus which produced 569 researches. The average cost of each R&D activity of the SUCs amounted to PhP1.93 million. However, the unutilized R&D fund of SUCs in 2013 amounted to PhP578 million.

3.3 Recommended Optimal Computation of Public Cost of R&D Productivity of SUCs

3.3.1 Recommended Optimal Cost of R&D

The University of the Philippines is acknowledged as the leading HEIs in the country in terms of R&D productivity both in local and global significance, the utilization of its R&D fund was considered to make an assumption of the real cost of R&D output of SUCs with global impact in the scientific and technical field. The total R&D budget of UP in fiscal year 2013 was PhP539 million and its Scopus contribution was 468 document entries. UP spent an average of PhP1.15 million per R&D.

Table 6. Recommended Optimal Computation of Public Cost of R&D Productivity of SUCs

SUC	R&D Budget	Scopus Entry in 2013	Cost per Scopus Entry
UP	5.39E+08	468	1.15E+06
Diliman		223	
Los Banos		109	
Manila		136	

The utilization of R&D fund of UP is optimal and efficient, this can be considered as the baseline to evaluate the optimal utilization of R&DF fund of other SUCs. Optimal R&D Output can now be calculated using the formula: R&D O = F / X

R&D (O) = Optimal Utilization of R&D fund
F = R&D Budget SUCs
X = PhP 1.15 million or current UP budget per R&D

3.3.2 Evaluation of R&D Capacity of SUCs

Table 7. Computation of Optimal Public Cost of Scopus Entry SUCs

R&D Indicators	2013	2014
R&D Budget	1.29E+09	1.43E+09
Philippines	1,741	1,211
Scopus Entry of SUCs	569	524
%	33%	43%
R&D (O)	1,125	1,241

The total Scopus contribution of the Philippines already reached 19,725 cited documents. The Philippines was currently ranked fifth in South East Asia. The total Scopus citation of the country in 2013 was 1,741 and until November 30, 2014 was 1,211. This was supposed to be higher if SUCs were able to optimize their research output.

The R&D budget of SUCs in 2013 was PhP1.29 billion and they were supposed to produce 1,125 Scopus publication, instead only 10 SUCs were able to produce 569 publications. Please note that 468 of this were R&D output of the UP system. In 2014 the R&D budget of SUCs was PhP1.43 billion and they were supposed to produce 1,241 Scopus publication, instead the 10 R&D productive SUCs were able to produce 524 Scopus publications. UP system produced 334 of these citations. The total contribution of SUCs was just 33% of the total Philippine Scopus entries in 2013 and 43% in 2014.

3.3.3 Evaluation of R&D Capacity of Top 15 R&D Funded SUCs

Aside for the UP system there are two other optimal R&D productive SUCs which include Central Luzon State University (CLSU) and West Visayas State University (WVSU). CLSU reported 94 R&D from 2011-13 and they had 24 citations in 2013 at Scopus. CLSU was just two citations from its optimal R&D output in 2013. While WVSU produced 34 R&D in 2011-13 and had 10 citations in Scopus. Comparing to its budget its Optimal R&D output was 12.

Mindanao State University (MSU), Benguet State University (BSU), University of Southern Mindanao (USM) and MSU-Iligan were all R&D productive SUCs from 2011-13. However, the utilization of its R&D fund was not optimal because they were not able to meet the expected R&D output based on their allocated R&D budget.

Nueva Vizcaya State University (NVSU), Technological University of the Philippines (TUP), Cavite State University (CSU) and Southern Luzon State University have very low R&D productivity even if they were included in the top 15 most R&D funded SUCs. The R&D output of these SUCs was not cited in Scopus in 2013.

Table 8. R&D Productivity of SUCs in 2013

SUCs	Self-Reported R&D	R&D Budget	Scopus 2013	R&D (O)
UP	**405**	**5.39E+08**	**468**	**468**
USM	-	2.13E+07	1	19
NVSU	11	1.03E+07	0	9
MSU	140	5.97E+07	23	54
DMMMSU	-	5.05E+07	0	46
VSU	-	4.26E+07	14	39
BSU	130	4.20E+07	6	38
MSU-Iligan	16	2.32E+07	15	21
MMSU	-	3.55E+07	0	32
TUP	9	3.80E+07	0	35
CLSU	**94**	**3.15E+07**	**24**	**29**
NSU	-	2.98E+06	0	3
PSU	-	2.38E+07	0	22
CSU	3	1.70E+07	0	15
WVSU	**34**	**1.27E+07**	**10**	**12**
CMU	-	1.12E+07	5	10
SLSU	5	7.86E+06	2	7
TOTAL	**2,066**	**9.69E+08**	**569**	**726**

University of Southern Mindanao (USM) was the second highest funded SUCs with PhP21.3 million but its report revealed zero R&D output from 2011 to 2013. USM had only 1 citation in Scopus in 2013 when it was expected to produce 19 citations. Don Mariano Marcos Memorial State University (DMMSU), Mariano Marcos State University (MMMSU), Naval State University (NSU) and Pangasinan State University were all included in the top 15 most R&D funded SUCs but they were also not productive from 2011-2013.

3.3.4 Evaluation of R&D Capacity of selected Private HEIs and Recommended State Support

Table 8. Computation of Optimal State Support for Private HEIs

HEIs	2013	%	Optimal State Support 2013	2014	%	Optimal State Support 2014
DLSU-Manila	143	8%	2.15E+08	124	10%	1.86E+08
ADMU	69	4%	1.04E+08	64	5%	9.60E+07
UST	42	2%	6.30E+07	39	3%	5.85E+07
SU	18	1%	2.70E+07	5	0%	7.50E+06
USC	37	2%	5.55E+07	24	2%	3.60E+07
MIT	18	1%	2.70E+07	24	2%	3.60E+07
Total	327	19%	4.91E+08	280	23%	4.20E+08

The government must consider the fact that the R&D productivity of the six most R&D productive private HEIs contributed to 19% of Scopus entry of the Philippines in 2013 and 23% in 2014. Using the UP R&D cost as the baseline for the state support of R&D productive HEIs DLSU-Manila should have receive PhP215 million R&D support from the state in 2013 and PhP186 million in 2014. Ateneo de Manila University (ADMU) should have received PhP104 million in 2013 for its 69 Scopus entry and PhP96 million in 2014 for its 64 Scopus entry. The rest of the computation of the incentives for R&D productive private HEIs was presented in Table 8.

4. CONCLUSIONS

In an innovative knowledge society research activities and implementation of its results are becoming one of the most important tasks for universities (Laliene & Sakalas 2014,2012) and the Philippine government must acknowledged and fully promote the significance of R&D productivity of HEIs. Higher education institutions have significant contribution to the attainment of the over-all economic goals and development of the country and in the development of the country as knowledge producing society.

Changes must be made in the investment priorities in higher education in developing world like the Philippines, to strengthen and sustain the research capacities of both public and private HEIs. Equity considerations alongside with the issue of efficiency on higher education R&D funding must be dealt with (Schoenenberger 2005) Furthermore, the opportunity for state intervention in HEIs R&D activity can be judged both on the equity of its allocation and on efficiency grounds.

The state must increase its public resources to SUCs research and development program but at the same time it must promote stricter and more transparent policy to optimize their R&D productivity. The optimization of the R&D funding to a higher level of R&D productivity must not be limited to the quantity of the output but its quality as well. The increasing demand for achieving a higher level of quality of education and also R&D is equated to the capacity of SUCs to achieve international recognition. In terms of R&D productivity it must be based on its contribution to global scientific production and recognition of the relevance of the R&D output of the country by its international peer community thru local and international publications as well as citation in credible bibliometric and scientific databases like Scopus. The R&D productivity of private HEIs must also gain recognition by the state and other state agencies to be provided with a more "optimized R&D incentives" and state funding. Aside for the existing assistance by the CHeD through the different programs under its Higher Education Development Fund the additional state funding could enhance and sustain the R&D capability and productivity of private HEIs.

5. REFERENCES

Bartol, T., Budimir, G., Dekleva-Smrekar, D., Pusnik, M., & Juznic, P. (2014). Assessment of research fields in Scopus and Web of Science in the view of national research evaluation in Slovenia. Scientometrics, 98(2), 1491. doi: 10.1007/s11192-013-1148-8

Dalrymple, D. G. (2008). International agricultural research as a global public good: concepts, the CGIAR experience and policy issues. Journal of International Development, 20(3), 347-379. doi:10.1002/jid.1420

Delgado Hurtado, C., Correa, Z., & Conde Cardona, Y. (2013). The role of a public university in a global environment: networks and externalities of the R&D of the Cauca University. Estudios Gerenciales, 29(129), 396-405.

Dumont, M & Meeusen, W. (2000). Knowledge spillovers through R&D cooperation. OECD-NIS Focus Group on Innovative Firms and Networks.

Rome. Retrieved from http://www.oecd.org/sti/inno/2093436.pdf

Eid, A. (2012). Higher education R&D and productivity growth: an empirical study on high-income OECD countries. Education Economics, 20(1), 53-68. doi: 10.1080/09645291003726855

Faria, P., Da Silva, F., & Moreira, B. (2011). How R&D and Tax Incentives Influence Economic Growth: Econometric Study for the Period Between 1995 and 2008 of EU-15. Working Papers (FEP) -- Universidade Do Porto, (442), 1-23.

Halkos, G., & Tzeremes, N. (2011). Measuring economic journals' citation efficiency: a data envelopment analysis approach. Scientometrics, 88(3), 979. doi: 10.1007/s11192-011-0421-y

Harris, R., Li, Q. C., & Moffat, J. (2013). The Impact of Higher Education Institution-Firm Knowledge Links on Establishment-Level Productivity in British Regions. Manchester School (14636786), 81(2), 143-162. doi:10.1111/j.1467-9957.2011.02276.x

Khan, W. N. (2011). Public Goods, Public Gains: Calculating the Social Benefits of Public R&D. Economic Issues, 16(2), 120-121.

Korber, M. M., & Paier, M. M. (2014). R&D networks and regional knowledge production: An agent-based simulation of the Austrian competence centres programme. Economy of Region, (2), 264-275.

Laliene, R., & Sakalas, A. (2014). Conceptual Structure or R&D Productivity Assessment in Public Research Organizations. Economics & Management, 19(1), 25-35. doi:10.5755/j01.em.19.1.5755

Laliene, R., & Sakalas, A. (2012). Interaction Between R&D and Economic Indicators in Lithuania. Economics & Management, 17(1), 194-201.

Salazar-Clemeña, R., & Almonte-Acosta, S. (2007). Developing Research Culture in Philippine Higher Education Institutions: Perspectives of University Faculty. Regional Seminar "Competition, Cooperation and Change in the Academic Profession: Shaping Higher Education's Contribution to Knowledge and Research" (pp. 1-13). Hangzhou, China: UNESCO. Retrieved from http://unesdoc.unesco.org/images/0015/001578/157869e.pdf

Sanyal, B. C. & Varghese, N. V. (2006). Research Capacity in Higher Education Sector in Developing Countries. UNESCO: Paris.

Schoenenberger, A. M. (2005, December). Council of Europe Publishing. In L. Weber, & S. Bergan (Eds.), The Public Responsibility for Higher Education and Research (pp. 45-98). Council of Europe Publishing. Retrieved September 30, 2014, from Council of Europe Publishing: http://www.coe.int/t/dg4/highereducation/resources/public-responsibility-for-higher-education-and-research_webversion.pdf

Starbuck, W. H. (2006). The production of knowledge: the challenge of social science research. Oxford University Press: Oxford

Teixeira, A. C., & Sequiera, J. (2009). Determinants of the international influence of a R&D organization: a bibliometric approach. Working Papers (FEP) -- Universidade Do Porto, (226), Tullao, T. and Cabuay, C., (2013). Education and Human Capital Development to Strengthen R & D Capacity in ASEAN. ERIA Working Paper Series 2013-36. Available at www.eria.org/ERIA-DP-2013-36/pdf.

Van de Ven, A.H. and Johnson, P.E. (2006) `Knowledge for Theory and Practice', Academy of Management Review 31(4): 802—21

Commission on Higher Education (CHED) National Higher Education Reform Agenda-1

Commission on Higher Education (CHED) National Higher Education Reform Agenda-2

Republic Act No.10147 or the General Appropriations Act Fiscal Year 2011

Republic Act No.10155 or the General Appropriations Act Fiscal Year 2012

Republic Act No.10352 or the General Appropriations Act Fiscal Year 2013

Republic Act No.10633 or the General Appropriations Act Fiscal Year 2014

[i] Definition provided in http://data.worldbank.org/indicator/GB.XPD.RSDV.GD.ZS

[ii] Definition provided in http://www.oecd.org/sti/frascatimanual