

Philippine Research Productivity in Education Research: A Comparative Performance in Southeast Asia

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Abstract - This study presents Philippine research productivity as compared to the other 7 Southeast Asian countries. It aims to provide a systematic analysis of the progress and current state of research productivity of the Philippines in the context of education research among Scopus journal publications. The study utilized the Scimago database and was processed and cleaned using Python programming and with the different packages for scientific computing, presented data through Tableau software, and analyze data with the use of SPSS. The metrics were limited in (i) published research, (ii) number of citations, (iii) number of self-citations, and (iv) country ranking in a 23-year period. The data presented in the study discoursed the Philippines has a temporal trend compound annual growth rate (CAGR) of 19.19% while maintaining 5th rank among the 7 southeast Asian countries and being forecasted to produce several education research publications more than Singapore by 2021. The comparative performance was also shown to compare Philippine performance to the 7 Southeast Asian countries. There are only a few citations of Philippine works, and self-citation is becoming a culture of research in the country. It is expected that the Philippines will maintain its growth rate as the publication is being required for faculty promotion and students' degree requirements.

Keywords: Philippine research productivity; education research; Southeast Asia research

INTRODUCTION

In the Philippine Development Plan 2017 – 2022 the country aims to become an upper-middle-income by employing a robust foundation to realize inclusive growth, high-trust and resilient society, and developed to expand, diversify and increase a globally-competitive knowledge economy [1]. A high level of human development as a contribution to the Philippine workforce to decline the unemployment rate of up to 3 percent is also part of the country development plan.

The Philippines is a third world country engaged in a culture of research across varied dimensions[2],[3]. The National Higher Education Research Agenda II (NHERA II) is the second phase of the Philippine education research plan from 2009 - 2018. It aims to improve research capability and productivity among Higher Education Institutions (HEIs) to make significant impacts across disciplines of higher education research. The objectives of NHERA II overcast the mandates of its predecessor NHERA I which merely aims to (i) identify higher education research frontiers in the country, (ii) enhance instruction through original contributions to

become creative, innovative, and productive individuals, and (iii) develop unifying theories or models which can adapt into mature technologies to uplift the life of Filipino people. Research agenda through NHERA III may include harmonizing research with teaching and extension to develop research and innovation universities to become competitive in the global challenge [4].

Despite the aforesaid signs of progress, little is known about the current state of research productivity in the country and how it evolved. There are publications but of limited in scope and time frame, and typically focused on a single criterion. This research will measure the research impact and productivity of the Philippines as viewed in education research. Through technology advancement and sustained progress of bibliographic databases have reinforced the capability to measure the research productivity and stimulate supervision for other researchers.

The goal of the present study is to provide an updated and systematic analysis of the progress and current state of research productivity of the Philippine in the context of education research among Scopus

journal publications. This study is well-timed and essential that would provide a clear substantiation base to appraise the present and imminent efforts to upscale research in the country. It is a requirement for higher education lecturers for them to get promoted, while in other countries exhibit the regulation of "Publish or Perish" [5]-[7].

This research utilized the world's largest bibliometric database (Scopus) to quantitatively review the research productivity in the Philippines over the past two decades in the field of education, summarize the quality of researches using conventional metrics of research quality, and forecast possible growth in research productivity over the period.

Research Culture

A few years ago, there has been an increasing pressure to have research publications from the faculty members for promotion purposes, and graduate school students for candidature as a university graduate. A strategic goal has been set by every higher education institutions (HEIs) to be responsive in the trends for publication. This approach is no longer new as it has been practiced by most of the SEA HEIs.

The most influential predictor of research productivity is the research culture or the research environment [8]. The strength of an academic institution determines the quality of research output from such institutions [9]. Inflation plays part in research production as it increases the cost of research [10], afterward research funding became part of the culture [11] and as a social practice [12] to be fully encouraged to do research. However, certain characteristics like gender[13], age [14], mobility [15], collaborations [16], interpersonal relationships [17], and academic position[18] have headed great inconsistency in research performance [19] while insecure jobs and dysfunctional leadership [10] are some of the problematic research environment.

Graduate students who can publish is a valuable-making substantial contribution to the university's performance in research productivity. Developing relationships and participating in the research culture of the university eschewed are some of the valuable things to consider [20]. Expectations are great for faculty members who are pursuing graduate studies to participate in the theses and dissertation publication approach as they form part of the research productivity of their affiliated HEIs and for their graduate schooling.

Several studies have shown that there is a noticeable greater outcome of performing collaborative research which increases scholarly and real-world impact than individual researches [21], [22] and is seen beneficial by researchers and institutions as a means of enhancing the profundity and impact of research in higher education[23]-[25]. Highly effective teams have clear and relevant roles and skills [26], shared outcomes, social sensitivity [21], and teamwork skills for coordination to associate knowledge[27] and share resources and scientific perspective towards innovation [28]. Research performance, citation counts, and h-index are measurable indicators of academic relevance.

Publications of theses and dissertations is a format in improving publication outputs of the university and to become competitive in the job market as it reflects a competent emerging academic individual [20] as the progress of science rests on the huge amount of effort and publications [29].

Research publication

The published document refers to the number of published researches. The study revealed that researchers with more published articles in higher impact factor journals generally received more citations and so do those publish with a large team of authors [30]. With the current trend of research, the publication has grown by an exponential annual rate of 4% per year [31],[32]. Researchers should also consider the quality and not quantity as the underlying impression of publication [29].

Nobel laureates habitually publish than a typical researcher, because they believe that they can influence the chance of generating significant results on the numerous efforts when publishing [29]. The more often a researcher publishes research, the higher the probability that there is something very new and relevant, and atypical for the scientific community [29],[33].

The research publication is grounded on knowledge production, impact, and co-authorship [34]-[36], improves scholastic proficiencies, research performance [37], and professional opportunities in the academe[20],[38]-[41]as they are foreseen to be prolific researchers [15],[34].

Faculty members, and now graduate students, should establish a good publication record as first-author and in high performing journals which discourses productivity and performativity that would result in considerable career advancement in the

academe [20]. Graduate students are expected to be trained in a reputable research university where there is a rigorous research environment to become highly productive faculty researchers when they return to their affiliated university.

Doing Ph.D. publication is beyond proficiency to publish single-authored publications, thus exhibiting the advanced level of scientific independence [34] effective in international research collaboration is an exceptionally significant and worthwhile pursuit for HEIs [16],[42],[43].

It is noted that Ph.D. students who have publication experience have greater research production and productivity and can accumulate greater citations throughout their careers compared to those who did not publish during their Ph.D. graduate school [34].

A university must internationalize education research [44] and guide its faculty researchers and extend necessary assistance through their research centers that should be capitalized with vital research and information equipment (e.g. software) research records (e.g. publications, reports, etc) [45].

Citations

Citations can effectively evaluate the quality of science [46]. Only when a paper reaches such citation level, it contains a distinctive result that contributes to scientific progress [29]. It has been expressed by plenty of researches that citations were used to assess the scientific impact of research [30], and the value of a researcher is captured with their h-index [20]. It is one of the indicators of research performance [47].

Citations denote the continuance of scientific articles' life span exhibiting that the work is being used and appreciated [48]. Citation analysis is a study that provides citation data from academic articles that can be used to infer the impact of certain publications [49] and allows researchers to analyze the dissemination of knowledge within research fields [50]. It is relevant for identifying the publications driving the intellectual development of the research topic, and it is an initial step for identifying the topics and theories investigated [51].

Research about citation-based analysis was used to observe the essential dynamics behind the method of scientific research publication, contributing institutions and scholars, and global forces [52] which discourses a core ingredient in literature review and can be used in potential studies to recognize the most instrumental articles [53]. This style of research has

been increasingly used in research evaluation as it associates with productivity, contribution/quality/impact, reputation, prestige and other research evaluation constructs [32],[54] these metrics show career excellence [55].

Self-citations

Self-citation is one of the reasons for a comparative number of citation counts [56]. Self-citations are where the author cites from their papers or those of their co-author. Self-citations are valuable supplementary measures that can be used both in informetrics and research evaluation [57].

Self-citations may have emerged from the perspective of h-index as it indicates the correlation between the number of papers of a researcher has published and the number of citations received [6],[29]. Bibliometricians believed that self-citations are a reasonable share of a natural part of scientific communication [58] and a common practice essential for the latter [59]. In a wide variety of disciplines, it was conveyed that men self-cite >50% more frequently than women researchers, reaching its peak of 70% in recent years [59].

There is a strong positive correlation between the number of self-citations and the number of authors of the publication, only a minor part of the overall increase in citation rates that can be found for multi-authored papers is due to self-citations [56].

The effect of gender in self-citation is due to pay-gap [59],[60] productivity gap [59],[61], gender distributions in science research [59],[62],[63] as women who published researches tend to be younger and is both at first-listed and last-listed authors, and have a fewer chance to do self-citations, location[59], career length, position and productivity [59],[64]time[59], and age[63].

Most self-citation transpires for both first author and last author as it has to do with opportunity, accessibility, and visibility. The study of self-citation is relevant for the discussion concerning the use of citation indicators in research assessment. The more self-authored papers one has the more opportunity for self-citation. The share of self-citation shows significant variations among different scientific disciplines [56].

One of the negative impacts of self-citation is seen as a possible means of artificially inflating citation rates which strengthens the authors' metrics [58] and reveals egotism for instituting their scientific expertise or to make their former works visible [56].

Country ranking

Journal ranking has become increasingly popular and it is seen as a means to “objectify” research assessment and thus avoid or compensate for any biases in peer review [65],[66] and is being used by managers in making increasingly explicit use to prepare future assessments.

The world of journal rankings and publication pressures researchers. Journal rankings also reflect the impacts on their researcher’s identity [67] journal rankings have an impact on university funding and reputations [44],[68]-[70]. Journal ranking doesn’t define the quality of research literature but is impeding the diversity, originality, and practical relevance of research [36],[67]. Drives junior faculty to be professional and intellectual academics [11],[67],[71], and considered to be one of the instruments that serve to promote diversity and achieve greater sustainability of researchers [21],[67],[72].

For nearly a century, journal rankings have been used to identify the notable journals in each subject field, to appraise the differences among journals, and to track changes in reputation and impact over time [42],[48],[52],[68],[73],[74]. Journal rankings are not related to citation impact [61],[75] but have been identified to be revealed preference rankings that focus on scholarly impact, and citation metrics [76].

The research presents a large-scale comparison of journal rankings based on seven impact measures. Journal rankings are meaningful as long changes in ranks cannot be attributed to the effects of some random process not related to the quality of the journals [77]. Relative variability of the impact factors decreases, and hence the citation-based journal rankings tend to be more reliable and stable in the group of top tier journals [77],[78]. Journal rankings usually imply some form of disciplinary classification and are often perceived as convenient proxies for measuring the research performance of individuals and institutions [14],[18],[79]. Citation-based journal rankings are extensively being used for evaluation purposes [65],[77]. There are different journal ranking criteria and it is equally unreasonable to expect that a single and universal ranking criterion will emerge and become widely accepted [77],[80] and differs significantly among indicators and subject areas [46],[50],[77].

Other otherwise relevant issues such as journal rankings can disadvantage interdisciplinary research in research evaluations as it exhibits a systematic bias

in favor of mono-disciplinary research [65]. It is identified as stated preference ranking which are subjective assessments based on the opinions of authors, faculty, or other subject experts [76].

OBJECTIVES OF THE STUDY

This study discoursed the status of the Philippines in education research published in Scopus journals, and its performance compared to other ASEAN countries in terms of the following metrics: (i) published documents, (ii) the number of citations, (iii) number of self-citations, and (iv) country ranking. It also showed country comparative matrix between (i) number of published documents and number of citations, (ii) number of published documents and number of self-citations, (iii) number of published documents, and country rank. Moreover, a further novelty of this study in his study is the forecast of the performance of the Philippines in terms of (i) published documents, (ii) number of citations, (iii) number of self-citations, (iv) country ranking.

In sum, this study aims to accomplish the collective understanding of how the Philippines perform amongst its neighboring SEA countries in the interdisciplinary context of education research. To express more comprehensive analysis, this study underwent temporal trends for the quality of research output, and R Squared for the expected progress in the research matrix.

MATERIALS AND METHODS

Quality of Research Output

Data on the number of research publications were derived from Scimago Journal & Country Rank, a searchable electronic bibliometric repository. The documents are based on the research citation database covering more than 50,000 English language entries in science, technology, engineering, mathematics, business, humanities, health, social science, and information science among others. This study shows the annual number of research publications over 23 years from 1996 – 2018 (the last complete year with available data at the time of this analysis) and is limited only in the published documents in the field of education.

Scimago Journal & Country Rank data are raw data that contains too many Scopus information. The extracted data was processed and cleaned using Python programming and its different fundamental packages for scientific computing. Data have been

extracted based only on the matrix used in this study within only the 7 Southeast Asian (SEA) countries; Philippines, Malaysia, Singapore, Indonesia, Vietnam, Thailand, Brunei Darussalam who have significant performance. Frequency analysis and proper grouping of data were performed using Python to track papers that were published annually in the seven SEA countries.

Comparison of research output to southeast Asian countries

The study examines the research productivity results across the criteria set by Scopus. It discloses data on the number of documents published, citations, self-citations, and citations per document. To set a perspective for Philippine-based productivity data, we compare with the Southeast Asian country's data over time by employing the aforementioned criteria.

To present visually attractive charts, the researchers used Tableau as it prepares data in a more appealing to be easily understood by the readers. Proper coding of the program was also performed in Tableau to segregate necessary data to present as illustrations and to forecast the Philippine performance in education research in Scopus journals.

Temporal trends

A Compound Annual Growth Rate (CAGR) [81] was used to characterize the change in publication quantity over time. It represents a year-on-year constant growth rate of publication from the beginning to the latest over a specified period, and is calculated in the formula:

$$CAGR = \left[\left(\frac{V_f}{V_b} \right)^{\frac{1}{n}} - 1 \right] \times 100$$

Where

V_b is the beginning value

V_f is the final value

n is the total number of years.

R Squared

This statistical process will uncover the measure of how close the data to the expected research progress in each matrix. It is used for general regression models using maximum likelihood for parameter estimation [82] which is widely used for logistic regression [83] very useful to predict the rank

order performance and as a demonstration for comparison [84].

It interprets together with the forecasting analysis to adequately explain progress levels at time intervals to yield useful predictions and inferences in comparison to other SEA countries. Strong and similarly looking trends indicate r^2 value which shows a percentage of the variation for consistency of progress over time. The SPSS software was used for the computation of R Squared together with some descriptive statistics necessary to derived from computations to quantify data, and to support the forecast made at Tableau software.

RESULTS AND DISCUSSIONS

Quantity of Research Output

On the 23-years data, the Philippines has approximately 57-fold growth in the number of annual research publications, increasing from 3 publications in 1996 to 170 publications in 2018. This denotes an annual growth rate (CAGR) of 19.19% over the twenty-three-year period. The growth of Philippine research productivity was similar to half of the SEA countries. The most notable growth in research productivity is Indonesia (CAGR 35.33%) followed by Malaysia (CAGR 20%). A remarkable number of documents were recorded by Malaysia (7,543) since 1996 to 2018, followed by Singapore (4,254), Indonesia (3,735), Thailand (2,345), Philippines (898), Vietnam (488), and Brunei Darussalam (210).

Table 1. SEA descriptive Compound Annual Growth Rate

Country	Total Published Documents	Vb	Vf	CAGR
Brunei Darussalam	210	13	17	1.17%
Indonesia	3,735	1	1,053	35.33%
Malaysia	7,543	12	794	20%
Philippines	898	3	170	19.19%
Singapore	4,254	42	335	9.45%
Thailand	2,345	5	306	19.59%
Vietnam	488	3	106	16.76%

Data Retrieved from:

<https://www.scimagojr.com/countryrank.php?> [85]

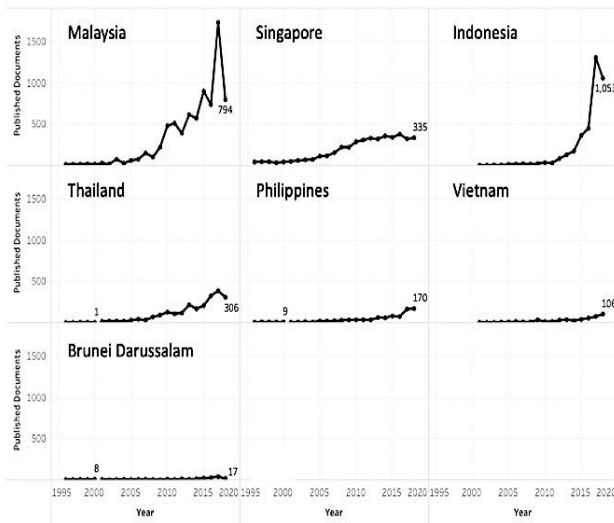


Figure 1. Comparative matrix of Philippine research productivity to Southeast Asian countries.

We also performed forecast Figure 1 based on the number of documents per country. The three-year

forecast revealed that Indonesia (2,117) will outperform the SEA countries by surpassing Malaysia (2,093). It is shown that Thailand (595) and the Philippines (456) will transcend Singapore (334) to be followed by Vietnam (73) and Brunei Darussalam (12).

Comparative Results

The comparative matrix of published documents and citations of education researches in the Philippines to SEA countries in Scopus journals is illustrated in Figure 2. This shows the comparison of published documents towards the number of citations. The Philippines has < 200 publications in the 23-year, and citations reached to 624 in 2010. While Singapore is about a few hundred more publications than the Philippines, it soars and reached 4,000 citations in 2010, as well as Malaysia who earned < 3,000 citations with a few hundred more publications than Singapore also in 2010.

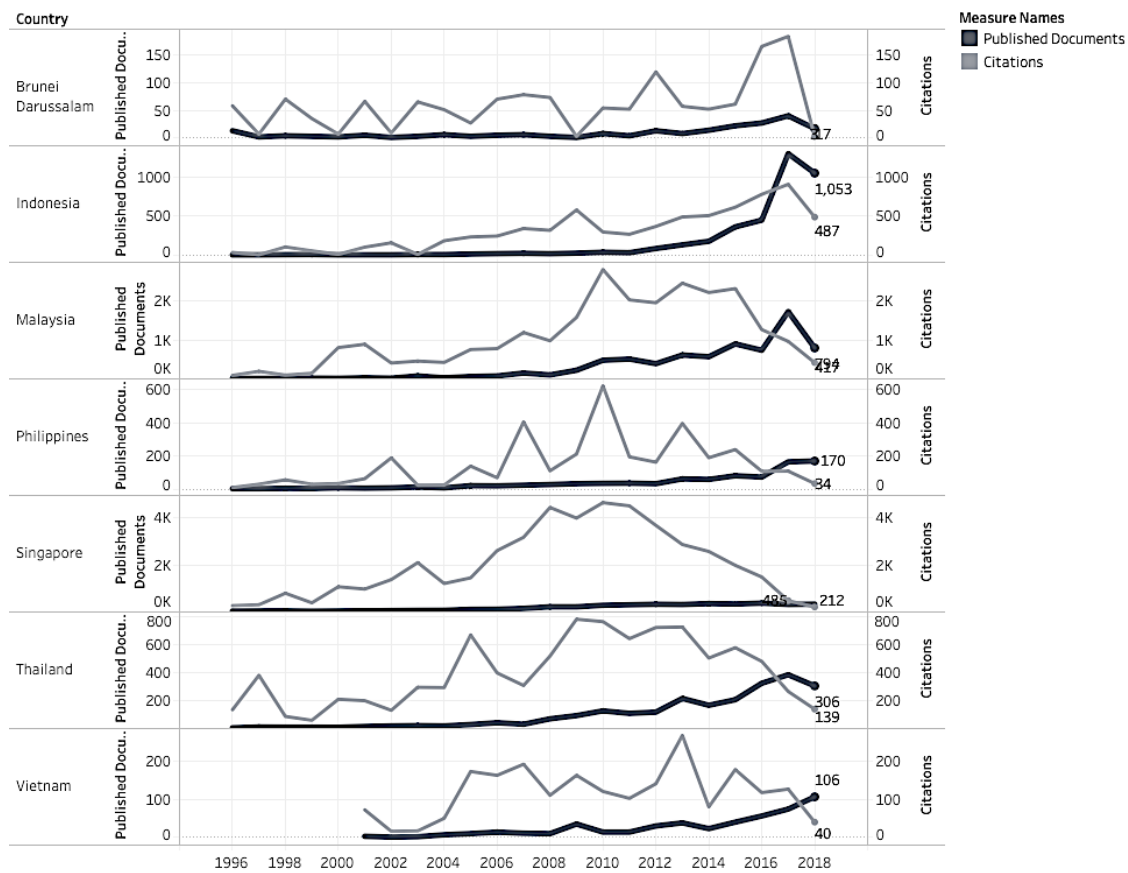


Figure 2. Comparative matrix of published documents and citations.

The figure also disclosed that education papers from Singapore on Scopus has an all-time reference citation for researchers. It also denotes that between the years 2008 to 2013 were the most number of cited articles in any SEA countries. This also divulges that in 2017, Indonesia (909) is showing its active functions in citations as it overcast Singapore (485) and Malaysia (963).

As shown in 2018, Indonesia escalated its published documents more than any country in SEA. Indonesia manifests to produce 1,053 published researches surpassing Malaysia (294), Singapore

(212), and Thailand (306). The Philippines produced 170 published research which is still way better than Vietnam (106), and Brunei Darussalam (37).

For the Philippines to perform better in publishing, it should address and time to do the best call that the university must internationalize education research [44] and guide its faculty researchers and extend necessary assistance through their research centers that should be capitalized with vital research and information equipment (e.g. software) research records (e.g. publications, reports, etc) [45].

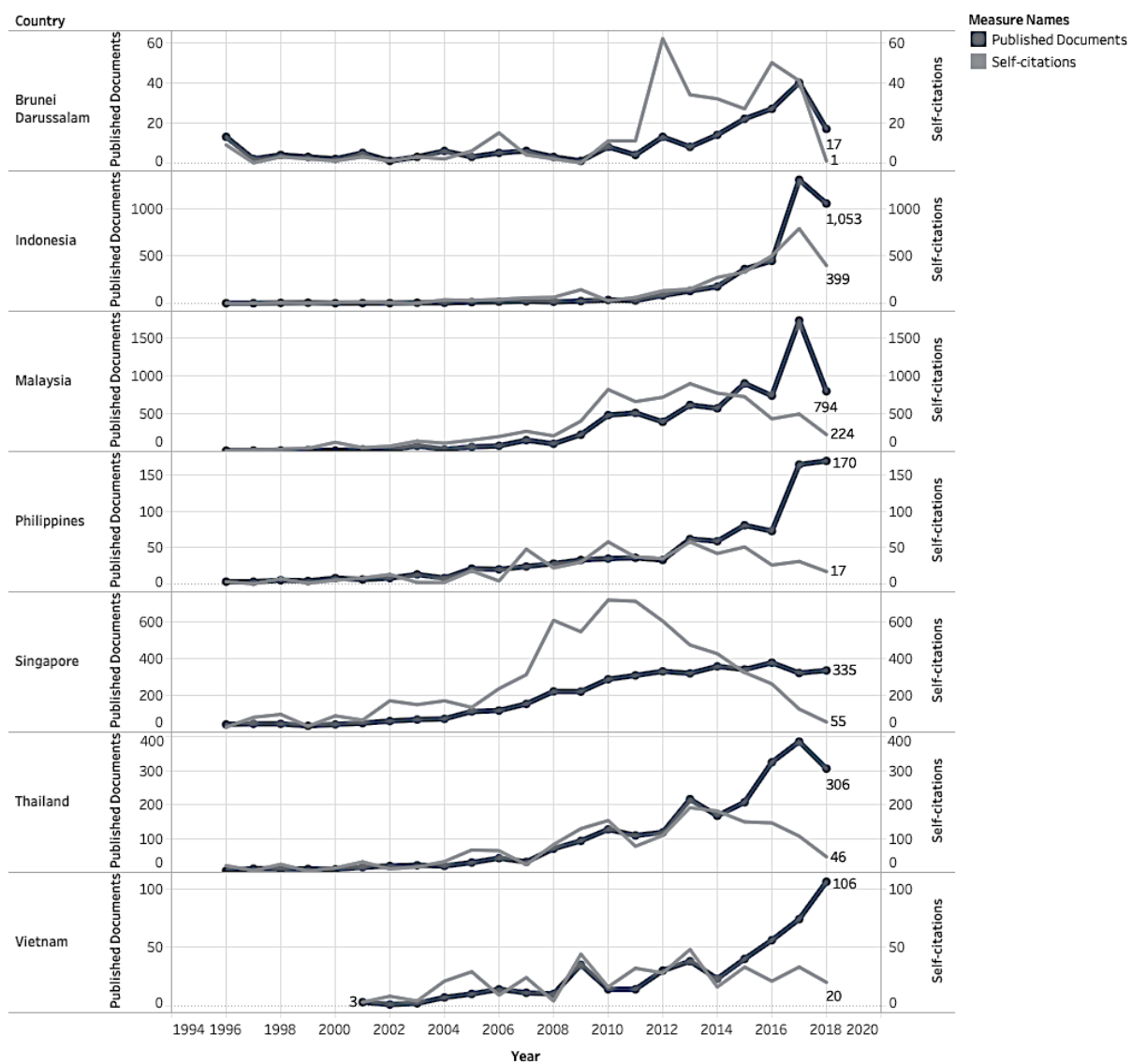


Figure 3. Comparative matrix of published documents and self-citations

The evolution of Self-Citations in the Philippines as compared to Southeast Asian countries is given in Figure 3 which also shows the comparison of self-citation towards the number of published documents. The culture of SEA countries in self-citation uncovers specific peculiarities as Singapore reflects a high turn-out of self-citations than its published documents, followed by Brunei Darussalam, and at some point, Malaysia. Minimal self-citations were expressed from the Philippines, Indonesia, Thailand, and Vietnam. With this observation, there is a deviation of self-citation by different countries, and the Philippines doesn't inflict much self-citation as compared to its neighboring countries.

This analysis of self-citation concerning the published documents can be applied as expected self-citation indicators in empirical studies for research evaluation, but again as previously stated, these self-citations may denote the cumulative and continuance of the previous research work in which scientific article exhibit necessary reference from the current work [48] and is considered as a natural and acceptable procedure [56].

Figure 4 shows the Ranks of Southeast Asian Countries in Scopus Education Research. Among the seven countries in SEA, the Philippines ranks between 4th and 5th, as compared to Indonesia who has the most impressive performance, from rank 6 in 1996 traverse its place to rank 1 in 2018 overturning the rank of Singapore who ranks 1 in 1996 falls to rank 3 in 2018, and Malaysia who sustain being 1st from 2009 to 2017, fell to rank 2 in 2018 as superseded by Indonesia.

The SEA country ranking is the performance of each country which includes the published documents [19],[37] which also reflects the impacts on the country's identity [36],[67].

Forecast

The discussions below show the forecast of the Philippine research productivity as a reference on how the country will perform in the succeeding years (2020 – 2021) in terms of publication, citation, self-citation, and country ranking.

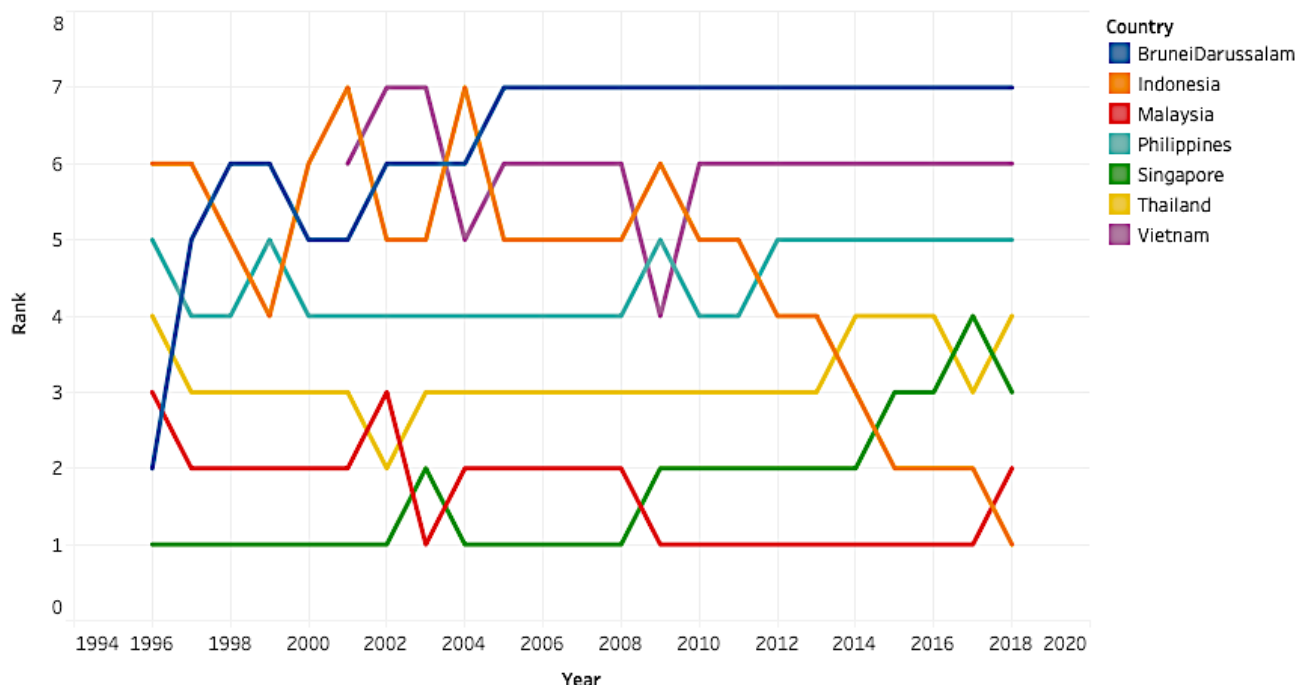


Figure 4. Rank of Southeast Asian countries

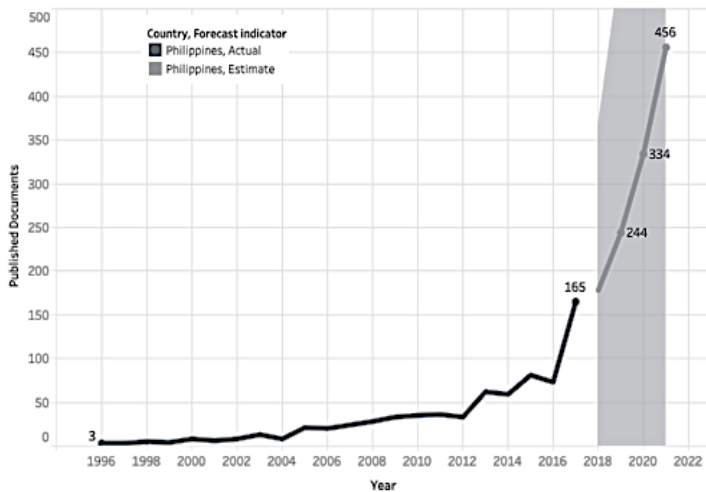


Figure 5. Philippine research productivity forecast

Forecasts relative to the number of published documents in the Philippines are shown in figure 5 which predicts the possible number of published documents in the succeeding years (2020 – 2021). It has been viewed by the country, especially for faculty researchers that they need to publish researches for them to get promoted, as it is being required by the universities for impact and ranking purposes. This set parameter for education researches under Scopus

journals reveals that from 165 published documents in 2017, it will ascent to 456 by the year 2021.

The faculty researchers’ tasks to get promoted in the Philippines lies within the required publication to either ISI, Scopus, or CHED accredited journals. Research incentive is also viable to most universities in the Philippines as a reward to the faculty who engaged in prominent publications, and universities will also benefit from it bearing ranking devotions for the university.

To compare the forecasted performance of the Philippines to other SEA countries is shown in figure 6 which predicts the possible number of published documents in the succeeding years (2020 – 2021). It reveals that the Philippines will bear the 4th place among SEA countries in terms of published documents. Indonesia will outperform all SEA countries by 2021 having a forecasted publication of 2,117, followed by Malaysia (2,093), Thailand (595), Philippines (456), Singapore (334), Vietnam (73), and Brunei Darussalam (12). The Philippines will surpass Singapore and eventually reached Thailand in a few years. However, the gap to cover Malaysia and Indonesia is too distant to catch-up in the next coming years.

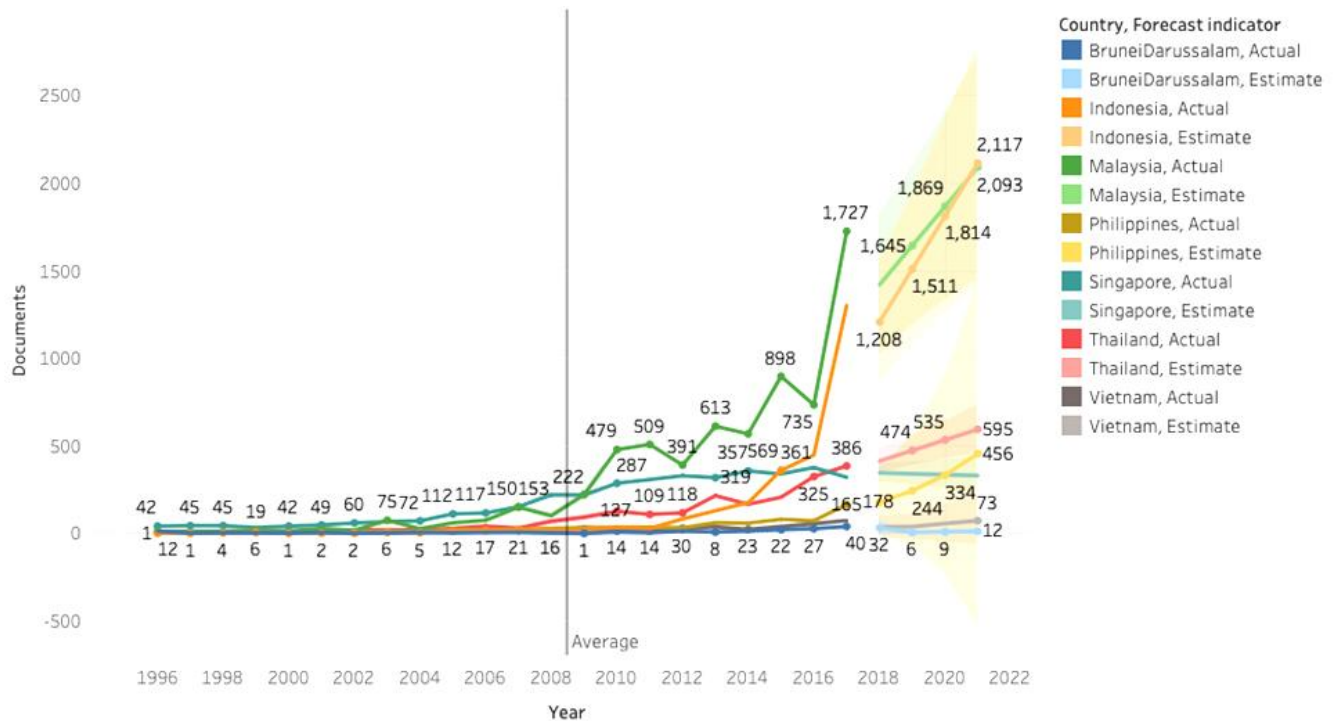


Figure 6. Philippine research productivity forecast compared to other Southeast Asian countries

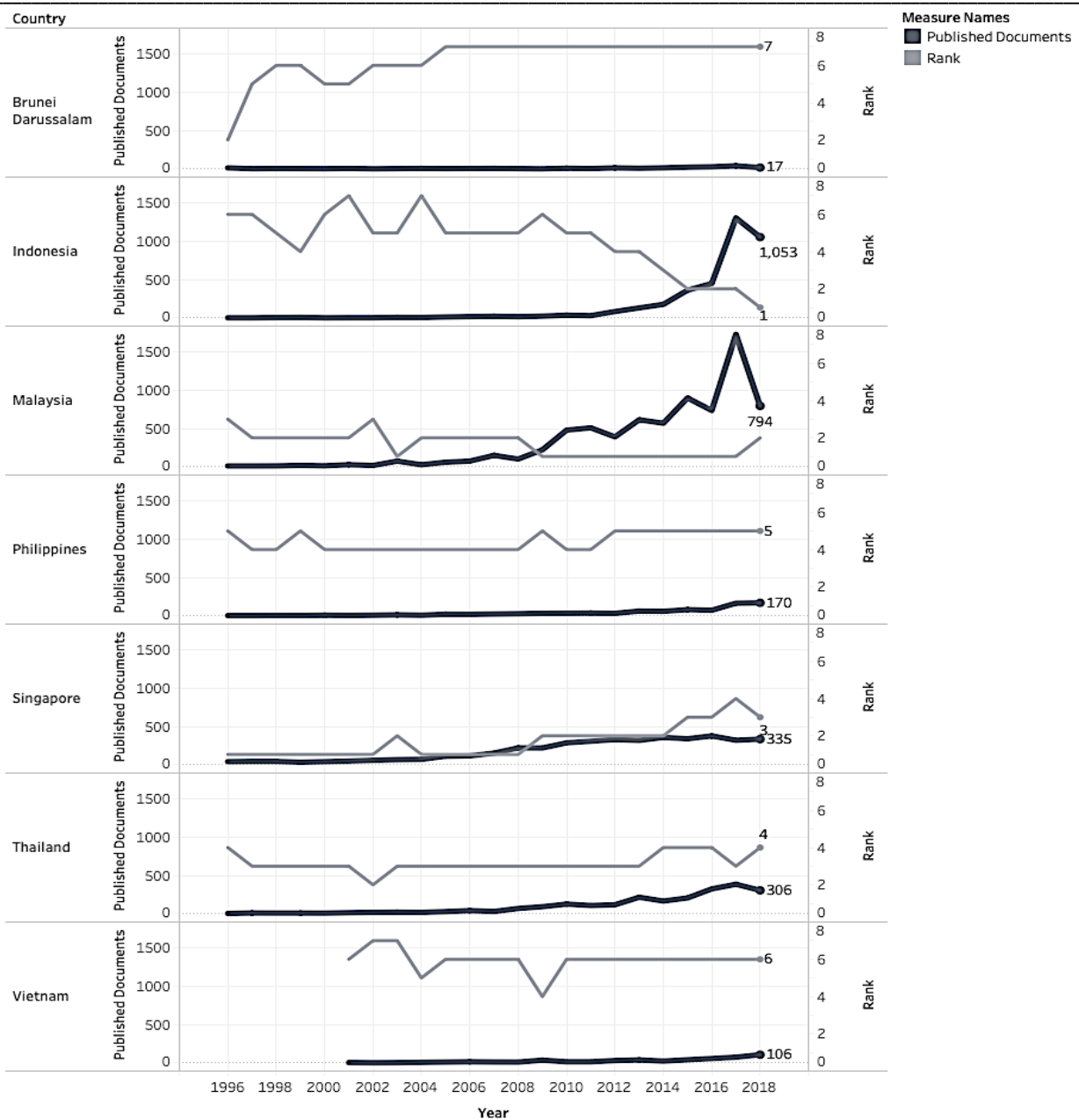


Figure 7. Comparative matrix of Southeast Asian country ranking and published documents

The SEA country rankings in Scopus education publications are shown in figure 7. The outcomes of ranking illustrate that Indonesia ranks first, followed by Malaysia (2nd), Singapore (3rd), Thailand (4th), Philippines (5th), Vietnam (6th), and Brunei Darussalam (7th).

The Philippines stays with 4th and 5th rank over time, while the most impressive performance was made by Indonesia, from rank 6th in 1996 reached the first rank in 2018 surpassing the six (6) country it had

before then. Malaysia who used to be the first in the rank fell to second, and Singapore who used to be second fell to the third rank as of 2018.

It can be noticed that through the 23-years, the Philippines have always been between 4th and 5th as shown in the number of publications. Perhaps with the same motivation and efforts exerted by Indonesia, and the Philippines may also rise from country ranking. It is definite that the Philippines increasingly performs in publication metrics

Table 2. Model Statistics

Philippines	Mean	SD	Variance	R Square
Publication Documents	39.040	46.532	2165.225	.676
Citations	150.300	151.232	22871.130	.153
Self-Citations	22.520	19.423	377.261	.502
Rank	4.430	.507	.257	.266

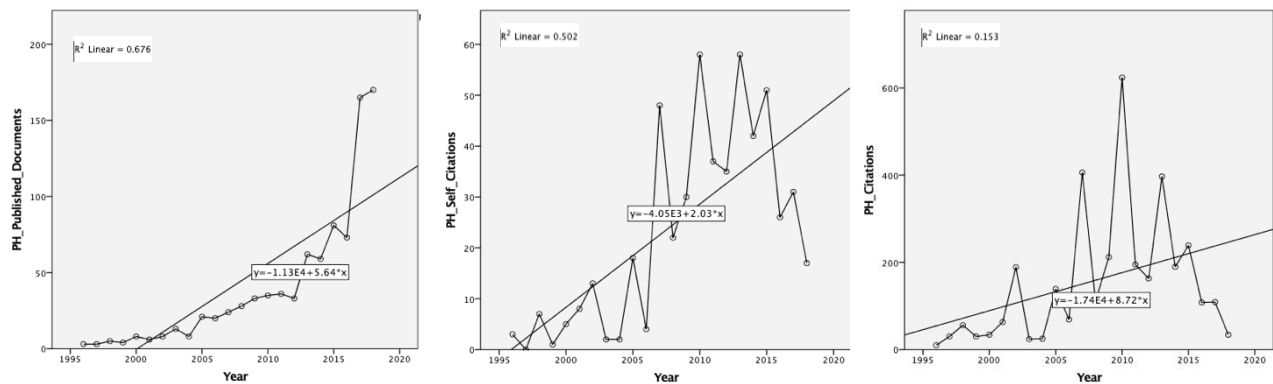


Figure 8. R square representation of published documents, Self-Citations, and Citations

This study also calculated the mean (\bar{x}), standard deviation (SD), variance (V), and R square (R^2) from the different metrics in Table 2 and presented in figure 8. The country has an exciting traverse of publication as it improves the number of published documents through time ($\bar{x} = 39.040$; $SD = 46.532$; $V = 2165.225$; $R^2 = .676$). Self-citations is setting to be a culture of researchers to impart their previous works to be integrated into their current works ($\bar{x} = 22.52$; $SD = 19.423$; $V = 377.261$; $R^2 = .502$). Citations are adverse as there are only a few researchers who aspire to cite works from the Philippines as compared to works of other SEA countries ($\bar{x} = 150.3$; $SD = 151.232$; $V = 22871.13$; $R^2 = .153$). Country ranking for the Philippines is firm along with the 4th and 5th spot ($\bar{x} = 4.430$; $SD = .507$; $V = .257$; $R^2 = .266$).

CONCLUSIONS AND RECOMMENDATIONS

Results clearly show the performance of Philippine education researches in Scopus journals among its neighboring Southeast Asian countries. The Philippines has a temporal trend compound annual growth rate of 19.19% which reveals that it is increasing its number of published documents while maintaining the 5th rank among other countries. Also, the Philippines has improved its number of publications, self-citation has become a set of research culture, and there are only a few researchers who aspire to cite Philippine research works.

This reveals the performance of the Philippines in education research in Scopus journals. With this disclosure, it is hoped that this will serve as a motivation to our researchers in education the current state of the Philippines and to encourage based on the exemplary endeavors exerted by Indonesia.

To augment this gap, schools offering education programs should instrumentalize teacher education into various systematic segments of career interests such as integrating supplementary research exposures in the curriculum besides the common research or thesis writing.

Institutions should extend serious efforts to measure research activities to emerge research capacity building across cultures and regional dimensions in the country. This could also imply research activities in a multidisciplinary approach with different researchers from varying institutions to engage a broader context of research and development endeavors and to share each other's R&D resources.

The culture of the need to research in the Philippines arises as educational institutions require faculty and students to published research in ISI/Scopus journals as well as with CHED accredited journals for promotion and degree-granting requirements.

There is a need for further investigation in other regions or among Asian countries that might be a comparable basis towards other research cultures being facilitated in other institutions. This study may

also extend to other promising regions including Europe and America to better understand the variation of research culture across global perspectives.

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