Research productivity and international collaboration of top Indonesian universities

by Lantip Diat Prasojo Prasojo

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Ahmad Darmadji, Lantip Diat Prasojo, Fitri Ayu Kusumaningrum and Yuli Andriansyah*

This article analyses research productivity and international collaboration of top Indonesian universities. The data were collected from Scopus with regard to number of documents, authors, affiliation and country partners in research. The top ten Indonesian universities were then chosen for analysis. The results suggest that top universities in Indonesia published articles in peer-reviewed journals earlier too, but showed slow progress before 2000. After 2010 the number of documents increased significantly, especially among the three largest Indonesian universities, i.e. Bandung Institute of Technology, University of Indonesia and Gadjah Mada University. These universities also showed higher productivity of their authors. The top Indonesian universities collaborated with universities in developed countries such as Japan, the United States, The Netherlands, Australia and Germany. There was collaboration with neighbouring countries in Southeast Asia, mainly with Malaysia, Thailand and Singapore. Based on these findings, this article suggests some insights to improve the quantity and quality of publications from Indonesian universities.

Keywords: Bibliometric assessment, international collaboration, research productivity, top universities.

HIGHER education institutions have been an integral part of the Indonesian educational system since its independence and have contributed to the development of the nation. Furthermore, higher education institutions were also assigned the task to improve research as important key for nation competitiveness. The government also paid attention to improve the quality of higher education by setting some standards and accreditations. Quality assurance for higher education was introduced in 2000s to enhance previously used accreditation for any programme or department. In 2008, institutional accreditation was introduced for the evaluation of an institution as a whole, instead of accreditation for programmes or departments.

With the emergence of many international rankings for universities, several higher education institutions in Indonesia are working towards gaining international recognition. Many universities have been listed in the QS World Universities Ranking, Webometrics, uniRank (previously 4ICU), etc. In the same vein, Scopus and other international academic databases help in the external evaluation of publishing quality. The Indonesian government found that achievement of its researchers was relatively low compared to their counterparts in Southeast Asia. Some effort was then made to improve research quality and to meet the selection criteria of Scopus and other databases. Incentives are provided for researchers publishing in good quality journals and having articles published in reputable journal is among criteria for a professor tenure based on current policy by Indonesian government[1].

Making Scopus an integral part of higher education policy seems to work as seen from increasing publications by Indonesian researchers[2]. However, studies to analyse the achievements of Indonesian higher education have not been conducted before to the best of our knowledge. The present study aims to fill this gap by analysing the achievements of top Indonesian universities in Scopus from research productivity and collaboration perspective. As an initial endeavour, the analysis is limited to only the top ten universities.

Literature review

Previous works have shown increasing trend in usage of bibliometric analysis as tool to evaluate research output

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Table 1. Top Indonesian universities based on publication in Scopus

University	Abbreviation	City	Articles
Bandung Institute of Technology	ITB	Bandung	7828
University of Indonesia	UI	Depok	7143
Gadjah Mada University	UGM	Yogyakarta	4857
Bogor Agricultural University	IPB	Bogor	3111
Sepuluh Nopember Institute of Technology	ITS	Surabaya	2558
Diponegoro University	Undip	Semarang	1808
Brawijaya University	Unibraw	Malang	1691
Padjadjaran University	Unpad	Bandung	1538
Sebelas Maret University	UNS	Surakarta	1780
Airlangga University	Unair	Surabaya	1643

Source: Scopus (accessed on 20 March 2018).

Table 2. First year in Scopus of top Indonesian universities and average annual publications during 2001–2010 and 2011–2017

University	First year in Scopus	Average annual document	
		2001–2010	2011–2017
Bandung Institute of Technology	1963	158.20	976.00
University of Indonesia	1948	158.70	845.29
Gadjah Mada University	1954	92.80	614.00
Bogor Agricultural University	1974	72.50	396.43
Sepuluh Nopember Institute of Technology	1961	34.40	382.14
Diponegoro University	1973	29.80	289.86
Brawijaya University	1980	16.80	259.57
Padjadjaran University	1960	26.90	218.43
Sebelas Maret University	1987	7.80	217.86
Airlannga University	1960	22.50	160.14

Source: Scopus (accessed on 20 March 2018).

and quality from many dimensions. For example, previous works have analysed publication of community, university, country, and even group of countries using bibliometric analysis[3–13]. Furthermore, bibliometric analysis has also been done to target specific subject areas such as science and technology[11,14], humanities and social sciences[15], environmental science[16], public health[17], etc.

In terms of database sources, many researchers rely on Scopus for their data[6,14,15,18,19]. Some use Scopus along with other databases such as Web of Science[4,20,21] and abstract databases available or provided by various governments[9,16].

Previous studies have considered many aspects in academia as important forces behind international collaboration. Also, collaboration can be analysed from many perspectives: academic culture and maturity, language and location[22] and can be improved by many factors: government policy, financial capacity and an institution's need to excel[23,24]. Furthermore, improving collaboration throughout networking is also viewed as a key factor for internationalization in higher education[25]. Review of previous works indicates that the usage of bibliometric analysis to asses publication quality has been commonly acceptable and reliable. Furthermore, the review also shows current research position as unique one with consideration of its context in Indonesia.

Methods

The data for this study were collected from Scopus on 20 March 2018. Affiliation search for keyword 'Indonesia' was conducted and gave results of 298 institutions. These institutions were universities, research facilities, government bodies and other institutions which produce academic and scholarly journals that are indexed in Scopus. The collection of data was then limited to the top ten universities based on the number of documents (Table 1).

Table 1 shows the names of universities in English as listed in Scopus and their abbreviation in Indonesia as well as the cities where they are located. All universities are located in Java island, the most populous place in Indonesia. The data shows top Indonesian universities were mainly concentrated in large cities in Java island.

Search result analysis in Scopus was then employed to gather data on each university. The data collected include annual documents of universities, their authors and collaborating countries. The data were then compiled in

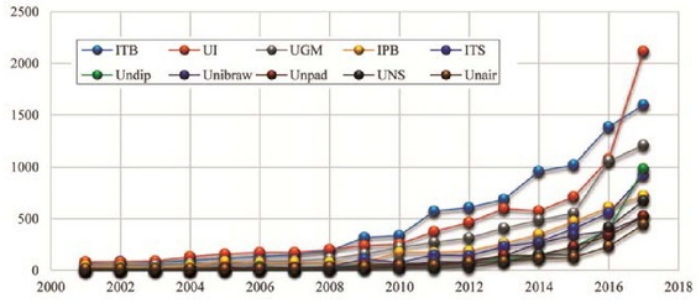

Figure 1. Publications of Indonesian top universities from 2001 to 2017. Source: Scopus (accessed on 20 March 2018).

Microsoft Excel for further analysis. Descriptive analysis was then conducted to elaborate the data. The discussion on important findings of the research was also given. As many other researchers have noted[7,26], it is important to view analysis based on on-line databases with caution, due to their limitation. The data change fast because every additional input will impact all databases. Thus, results of this study should be read based on the time of research which in turn could possibly be different from the time of its publication.

Results

Research productivity

In this study top universities in Indonesia had common ground in their pioneering efforts in publishing articles in Scopus-indexed journals or conferences. Table 2 shows that most of these universities have published articles in Scopus-indexed journals since 1950s to 1980s. The University of Indonesia (UI) was the first to publish in 1948, followed by Gajdah Mada University (UGM) in 1954 and other universities.

Indonesian universities paid less attention to publishing in scholarly journals indexed by Scopus before 2000, with an average of only 6.54 articles per year. The trend changed significantly after 2000 (Table 2), with increasing average annual publications in 2000s and 2010s. This is a sign of greater awareness among universities to publish in quality peer-reviewed journals.

Figure 1 provides details on how publication in Scopus-indexed journals increased among top universities in Indonesia. When Scopus was launched in 2004, direct impact on publishing was absent among Indonesian universities. However, in about four years, i.e. around 2008, Bandung Institute of Technology (ITB), UI and UGM showed improvement in publication. These three universities have shown rapid growth in the number of papers in Scopus till now. Other universities have also improved their performance, but failed to meet the achievements of the three best universities.

Figure 2 shows publications of top Indonesian universities in Scopus and average publication of the authors in each universities. ITB, UI and UGM lead the race among the top ten Indonesian universities and may unlikely be challenged in the near future. Figure 2 also highlights the productivity of authors. Authors from the three best universities tend to have higher productivity compared to their counterparts in other universities. This implies that researcher productivity may be the key factor for universities to compete in publications.

International collaborations

Collaboration in research between top Indonesian universities and other countries can be categorized based on country ranking and geographical closeness. For country ranking, Scimago Journal and Country Ranking is used to identify the top 20 countries in publicat[13]. These are the United States of America, China, the United Kingdom, Germany, Japan, France, Canada, Italy, India, Spain, Australia, South Korea, Russian Federation, The Netherlands, Brazil, Switzerland, Taiwan, Sweden, Poland and Turkey. For Southeast Asian countries, there was collaboration with Singapore, Malaysia, Thailand, Vietnam, Philippines, Brunei Darussalam, Cambodia, Laos and Myanmar.

Figure 3 shows the pattern of collaboration of the top Indonesian universities with the above two categories of countries. The figure also shows that all top Indonesian universities published a large number of articles in collaboration with countries in top rankings. Each of the three best universities in Indonesia published more than 2000 articles with their counterparts in advanced economies. The rest published at least 500 articles in this type of collaboration, except for Sebelas Maret University. In general, it can be concluded that Indonesian top universities emphasize collaboration with partners from developed countries.

The top Indonesian universities also collaborated in research with partners in neighbouring Southeast Asian countries, but the number is limited. On an average less than 300 articles were published with such collaboration.

However, UI made an exceptional effort in publishing more than 1000 articles in its collaborations with neighbouring Southeast Asian countries. Figure 4 indicates that the top Indonesian universities prefer developed countries compared to Southeast Asian countries for research collaboration. The percentage of articles published during both collaborations indicates the trend of collaboration captured by Scopus. All of top Indonesian universities published more in collaboration with advanced countries than with neighbouring countries.

Figure 4 also indicates the trend of collaboration with foreign partners in all the top ten universities in Indonesia. UI, UGM, Bogor Agricultural University and Padjadjaran University published more than 50% of their articles with international collaboration. Their collaboration partners are mainly Japan and the United States from developed countries and Malaysia and Singapore from neighbouring countries. Table 3 lists the number of articles published by top Indonesian universities in collaboration with developed countries. Japan, the United States of America, The Netherlands, Australia and Germany are the most active countries for collaboration, resulting in more than 1000 publications. These countries are among the top in world rankings and well-known for their advancements in research and development.

In case of neighbouring countries, Table 3 indicates that the most productive collaboration was with Malaysia, resulting in more than 1000 publications. Malaysia is placed in the fifth position among the most productive collaborating countries, and is only slightly below Australia in terms of achievements.

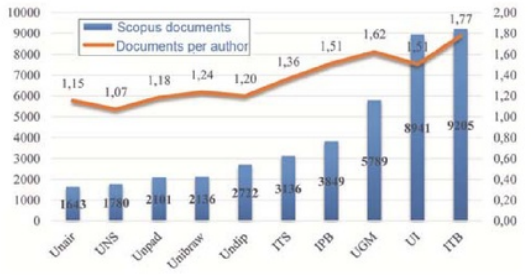

Figure 2. Publication of Indonesian top universities per author. Source: Scopus (accessed on 20 March 2018).

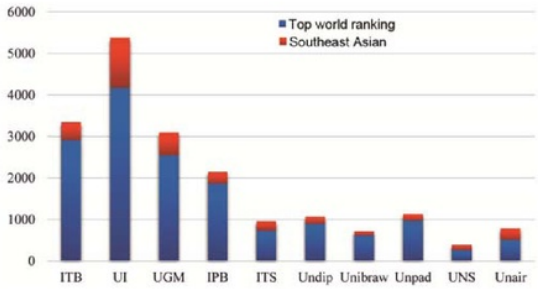

Figure 3. Top Indonesian universities' collaboration with countries in top world ranking and Southeast Asian region in number of publications. Scopus (accessed on 20 March 2018).

Discussion

The present study reveals many important findings related to top universities in Indonesia in their efforts to improve research and collaboration. Top universities in this study are state-owned, with good support from the government. Government support can improve university capacity which was key factor in publication[27]. The support from government can be manifested in sufficient budget for research, faculty members' educational support, exchange programs, and others. Government support can be seen as political will to improve the quality of higher education institutions, and this can be done in the form of scholarships to visit and collaborate with institutions in advanced countries. Such type of scholarship has been part of government policies since early days of independence. The fruition of this programme and others can simply be observed from the numbers of Indonesian scholars holding international degrees in many academic fields. Furthermore, with additional scholarships from advanced countries to attract students from low-income or developing countries, many Indonesian students have had a chance to be part of best universities and research institutions around the world. This may be the main factor behind research productivity currently enjoyed by top universities in Indonesia.

Indonesian researchers pursuing studies in foreign countries have made great contributions to research productivity in the form of published articles in high-quality journals and conferences indexed in Scopus. This can also help provide more access for collaboration, which explains the trends in collaboration among the top universities. Furthermore, government support for human resource is also an important factor behind productivity in

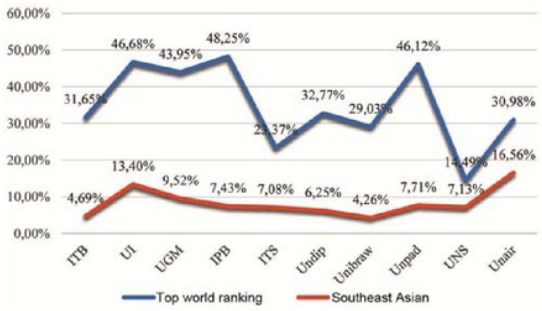

Figure 4. Top Indonesian Universities' collaboration with countries in Top world ranking and Southeast Asian region in percentage. Scopus (accessed on 20 March 2018).

Table 3. Top Indonesian universities' collaboration in number and percentage with countries in top world ranking and Southeast Asian Region

Country	Documents	Percentage
Top world rankings		
Japan	3907	9.46
United States of America	1899	4.60
The Netherlands	1643	3.98
Australia	1559	3.77
Germany	1202	2.91
United Kingdom	971	2.35
South Korea	660	1.60
France	643	1.56
India	546	1.32
China	488	1.18
Southeast Asian countries		
Malaysia	1679	4.07
Thailand	552	1.34
Singapore	544	1.32
Philippines	327	0.79
Vietnam	247	0.60

Source: Scopus (accessed on 20 March 2018).

research in these top universities. These universities have many quality lecturers and researchers which make their status favourable among Indonesians. Thus, quality of students and faculty members is guaranteed. Universities can then focus on research and other roles in society.

Another important factor in relation to status of universities as state-owned is research funding and facility. Although government support is not unlimited, it is normal to assume that researchers in state universities have more access to funding compared to their counterparts in private universities. Researchers from top Indonesian universities seem to optimize this opportunity by maximizing their usage of research funding and facility that results in higher productivity. The fact that many researchers have been indexed in Scopus before 2000 is a good reflection of how quality of research has been their major focus. However, acceleration in publication after 2000 mainly because of government policies. In many ways, government bodies promote international publications as a response to fast growing publications in neighbouring countries[28].

Another important finding in this study is the positive trend in international collaboration between top Indonesian universities and those in advanced countries. This finding is contrary to previous study in the context of private universities in Indonesia[29], which show less productive collaboration so that networking impact on publication is limited. However, Ynalveza and Shrum[30] showed that there is no direct relationship between collaboration and productivity. The reason for positive trend of collaboration among top Indonesian universities can mainly be explained in quality of researchers and availability of required funding and facilities. Top Indonesian universities in this research are also state-owned ones. Thus, providing researchers with funding and facilities to improve collaboration is simple policy to make.

Top Indonesian universities have paid more attention to collaborate with researchers from other advanced countries than with their counterparts from neighbouring countries. One of the reasons for this trend may come from government vision to improve national universities to become world-class. Some state-owned universities might translate this idea by encouraging more collaboration with advanced countries than regional countries. However, improving collaboration with neighbouring countries is important because geographical closeness can help enhance the research network[31]. Countries like Singapore and Malaysia have proven that regional universities can achieve high ranking internationally with implementation of some policies[32–35]. It will be cost-efficient to enhance collaboration in regional context as complementary to collaboration with advanced countries. Furthermore, improving relevant themes for collaborative work in the region can also be useful to promote more networking as suggested earlier[36].

Another crucial finding is the limited collaboration with national partners, which should be addressed to improve the quality of publication in universities in Indonesia. Studies have suggested that collaboration with local industries and institutions can benefit universities[37]. Top Indonesian universities and government should consider improving collaboration with other national universities to improve quality of Indonesian higher education in general.

Conclusion

Previous findings suggested that top universities in Indonesia published articles in peer-review journals before Scopus was launched and the number of articles grew rapidly after 2000. Besides, the three largest universities in terms of publications, i.e. ITB, UI and UGM had higher productivity of their authors. Top Indonesian universities collaborated with advanced countries such as Japan, the United States of America, The Netherlands, Australia and Germany whereas the neighbouring countries in Southeast Asia, Malaysia, Thailand and Singapore were the main partners. We suggest that further efforts are required to improve the quality of local universities by increasing collaboration between top universities and others in Indonesia, especially private universities.

However, there are some limitations of this study, which could be addressed in future. This study focuses only on the top ten universities in Indonesia based on publications indexed in Scopus, which obviously cannot be generated for Indonesian higher education institutions. There are currently more than 2000 higher education institutions in Indonesia with very large differences in type, size and source of funding. The results of this study should then be addressed for top Indonesian universities and should not be generalized for the rest universities.

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