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Beyond the Scopus Frenzy: Policy Alternatives to Incentivize Academic Publications*

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Abstract
In recent years, academic productivity as defined by number of papers published has been the preoccupation of Indonesian research policymakers. A number of policies have been introduced, the most prominent of which is assigning score to number of publications and citations through SINTA. These initiatives, however, have often ignored the complex and heavily bureaucratized Indonesian research and higher education sector. Recently, SINTA score has also perversely incentivized some researchers to illegally increase their Scopus score. This paper is a preliminary attempt at assessing policy alternatives to address the issue of low number of academic publications, asking if there are viable or even better policies than the current point system. Incorporating Indonesia's academic demography into our analysis, we find that giving monetary rewards for every published paper is the best policy option for lower-rank academics to "push" them into research. On the other hand, point rewards are most effective for upper-rank academics since they only need to be "nudged" into research activities. We also offer several recommendations about other policy alternatives (reforming research grants regime, providing international scholarships, and research collaboration) and the importance of detection and monitoring system to prevent the alternatives from becoming perverse incentives.

JEL Classification: I23; I28

Keywords
academic productivity — academic publication — research policy — SINTA — Scopus

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1. Introduction

The low performance of Indonesia's research is well documented. Until 2016, Indonesia's publication of scientific and technical journal articles is the second lowest among the ASEAN-5, only higher than the Philippines (World Bank, 2019). Among the effects of the low research performance (both in terms of number and impact) is seen in the relatively low profile of Indonesian universities, with its leading university only ranking 296th in the 2020 QS World University Ranking (QS World University Rankings. 2020). More importantly, research productivity reflects critical problem-solving quality, the lack of which means problems in the country are either not scientifically addressed or, when they are, not given local solutions. The lack of local solutions to Indonesian problems is related to the finding by Rakhmani and Siregar (2016) that "almost 90 percent of articles published in international journals on Indonesia are written by people not living in the country."

However, from 2016 onward, there has been a sharp increase in the number of journal articles which has since enabled Indonesia to surpass Malaysia as the leader in Southeast Asia (Figure 1). This sudden development seems to be related to the government's heavy-handed approach to boost publications in recent years. One prominent example is the Science and Technology Index (SINTA), a platform to measure academics' performance by assigning bibliometric score which reflects the number and impact of publications. However, much of the weight used to calculate SINTA score comes from Scopus, a commercial database of peer-reviewed publications. The government's focus on Scopus-listed publications can be traced to its obsession with Indonesian universities' rank in QS, which uses Scopus data to calculate universities' citation performance (Zein, 2018). Thus, a Scopus frenzy is born among Indonesian academics as the preoccupation with SINTA score creates a cobra effect where researchers strive for as many publications and citations as possible, sometimes at the expense of academic ethics and quality. Rochmyaningsih (2019) reported that some top scorers have "inflated their SINTA score by publishing large numbers of papers in low-quality journals, citing their own work excessively, or forming networks of scientists who cited each other." Meanwhile, Ministry of Research, Technology, and Higher Education Regulation 44/2015 requires master's and doctoral students to publish in a reputable journal as part of graduation requirements, a policy clearly designed to boost the number of papers indexed in peer-reviewed journals (Directorate General of Learning and Student Affairs, 2016).

The introduction of bibliometric measures through SINTA and Scopus scores begs the questions: Is publication scoring the only option to incentivize academic productivity? Are there other policy alternatives that the Indonesian government may implement? How do different alternatives compare to each other in solving the productivity issue? This paper provides preliminary appraisal of several policy alternatives to incentivize publications. In the section that follows we illuminate the focal problem of low research

*First submitted as part of the author's course in governance and development policy, the present paper is updated to reflect the latest development and data in the topic.

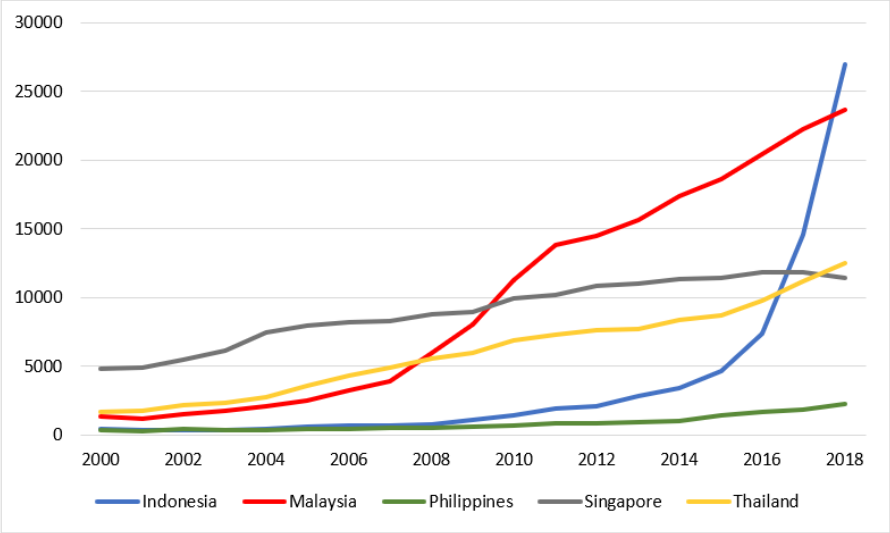

Figure 1. Scientific and Technical Journal Articles in the ASEAN-5, 2000–2018
Source: World Bank (2019)

publications by tracing its causes and effects. Based on this, we propose several policy alternatives and weigh their merits agains the factors of low research publications. In order to clarify the policy environment, we also consider the demography of Indonesian academics. Subsequently, we compare the policy alternatives based on their effectiveness, cost, and lag of results while taking into account their effects on different demographics. We also assess the sustainability of the alternatives against two rough scenarios in Indonesian research and higher education sector. The paper concludes with recommendations.

2. Clarifying the Causes and Effects of Low Research Productivity

The focal problem raised in this paper is low research productivity as represented by number of academic publications, especially journal articles. This angle is taken to reflect the target of past policies to boost research productivity. Not included in our analysis is the more applied and industry-linked research, development, and innovation sub-sector. The policy system consists of the Ministry of Education and Culture (hereinafter the Ministry) as the primary policymaker, public universities, and individual academics as subjects. The Ministry (especially its Directorate General of Higher Education) regulates the conducts of public universities, which comprise curriculum design and operations, and pays the salary of permanent, civil-servant lecturers. Several public universities maintain an autonomy in financing their operations, including the freedom of setting up tuition fees, contracting lecturers or researchers, and conducting revenue-generating operations, although they still rely on considerable number of state-salaried lecturers. Private universities are more autonomous except for certain state-mandated academic guidelines. Within this policy environment, our alternatives and recommendations are pertinent to public universities and state-salaried permanent lecturers.

Our analysis of the focal problem of low research publications leads to three factors. First, low number of publications is a function of the highly bureaucratized research funds regime, which deter prospective researchers from applying. Rakhmani and Siregar (2016) found that number of applications for the state-funded research grants have remained low as researchers are reluctant to go through the bureaucratic maze and confusing schemes. The grants being administered by the Ministry also means the spending should follow government's budget cycle (World Bank, 2013), and therefore multi-year studies are more difficult to happen. Second, low productivity is also explained by the lack of personal motivation to write (and subsequently to publish). This can be furthered classified into two sources of motivation. Internally, academics might be less motivated to write if they perceive that a good number of publications does not effectively lead to better career. Externally, activities outside academia, such as consultancy for private and government projects, offer better monetary reward and might vie for academics' time with research and publication. McCarthy and Ibrahim (2010) wrote that the lack of incentives for original research combined with low academic salaries have led Indonesian academics to moonlight outside academia by undertaking such projects. This might be an issue for Indonesia's research sector since consultation projects usually yield practical recommendations for clients, but not academic papers. Third, Indonesian academic culture has been increasingly insular. Rakhmani and Siregar (2016) call this phenomenon "academic inbreeding" where a significant part of Indonesian academics obtain their degree and subsequently teach and do research in the same institution. As a result, exposure to knowledge diversity and exchanges among researchers are inhibited, both of which are a catalyst for knowledge production. These three factors form the underlying causes of the focal problem. Together with the effects of low research productivity (local solutions are constrained, domestic problems unsolved), they are placed in the following problem tree.

A solution tree is then proposed by flipping the identified problems above into solutions (Figure 3). Five policy alternatives are proposed to respond to the three underlying causes of low research publications. Each alternative is

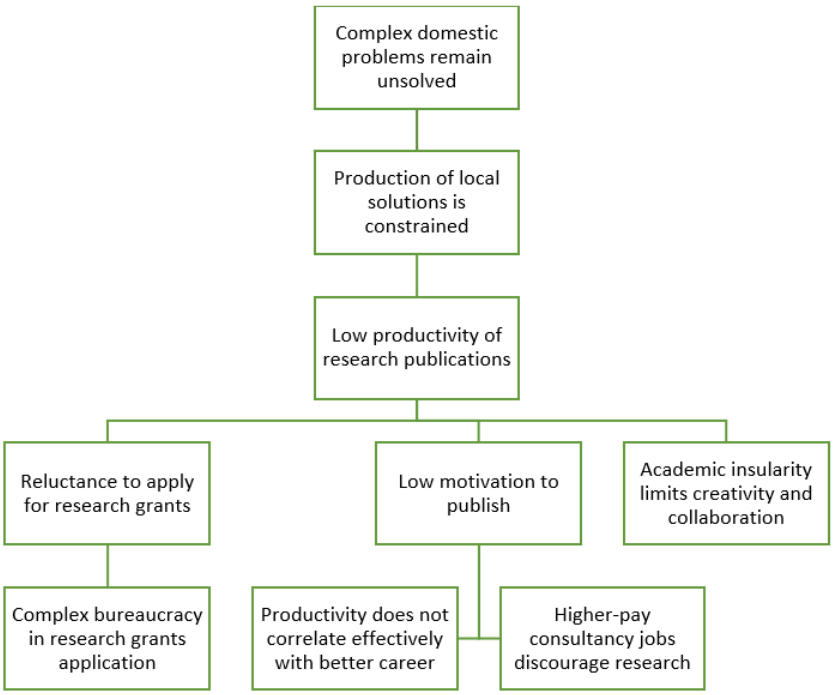

Figure 2. Problem Tree

discussed in a separate section below.

2.1 Alternative 1: Reforming Research Grants Regime

A World Bank (2013) report on Indonesia's R&D financing addresses several issues in research grants administration in Indonesia. First, and as mentioned above, research grants are approved on a yearly basis following the fiscal year. Second, the annual allocation of grants means that project cycle requires researchers to report findings at the end of each fiscal year. This scheme has deterred researchers from submitting research project ideas for research topics which are new or whose outcome is uncertain, since there is no guarantee that funding will be available beyond the first year. By the same token, applicants might prefer to submit tried-and-tested topics or methodology to get more predictable outcomes, therefore stifling innovation. The same report also notes that three quarters of Indonesia's R&D funds come from the government, which is contrary to the usual practices elsewhere where firms conduct most R&D (World Bank, 2013). However, this also means that research is an exclusive policy area over which the government has more control through policy intervention.

There are two sources of Indonesian research fund, most of which comes from the government: state budget and endowment fund. The former is distributed to various state ministries and agencies which will in turn conduct research on their own or invite third-party researchers in a competitive or closed funding scheme. This also includes the decentralized funds allocated by the Ministry to universities which allow universities to manage and re-allocate the funds to finance individual applications. In 2019, the amount allocated for research in the state budget reached US$2.5 billion, while only US$6.8 million were allocated to the endowment fund (Ministry of Finance, 2019). In other words, almost all research funds are allocated to government institutions (for further allocations as in-house research or granted to third party), which leads to the problem of bureaucratization.

In order to avoid the bureaucratic maze researchers need to go through when applying for research funding, we recommend that more grants should be available in the future for independent research. The issue that projects need to follow the government's budget cycle is mostly solved when research is conducted independently and financed with endowment fund. Such fund is administered by *Lembaga Pengelola Dana Pendidikan* (LPDP, Education Fund Management Agency) and it has the advantage of a more streamlined organization and allows multiyear projects (three to four years at most). There are also independent research schemes outside LPDP such as *Dana Ilmu Pengetahuan Indonesia* (DIPI, Indonesian Science Fund), a collaboration between Indonesian Academy of Sciences (AIPI), the World Bank, and Australian Aid which recently enlisted LPDP also as benefactor. In order to streamline the targets and strategies of Indonesian research (which is still a government-dominated domain), there might be a benefit in integrating these independent schemes under LPDP with the Ministry acting as a policy coordinator.

Assuming Indonesia's research grants administration is successfully streamlined and reformed so as to encourage as many researchers as possible to submit their proposals, how cost-effective are grants to address the problem of publication productivity? From a number of studies across different countries (United States, Canada, and several European countries), we estimate that between 0.8 and 5 papers can be published per US$100,000 in research funding (Larivière et al., 2010; Hendrix, 2008; Druss & Marcus, 2005; Gaughan & Bozeman, 2002; Boyack & Börner, 2003; van Dalen et al., 2014).

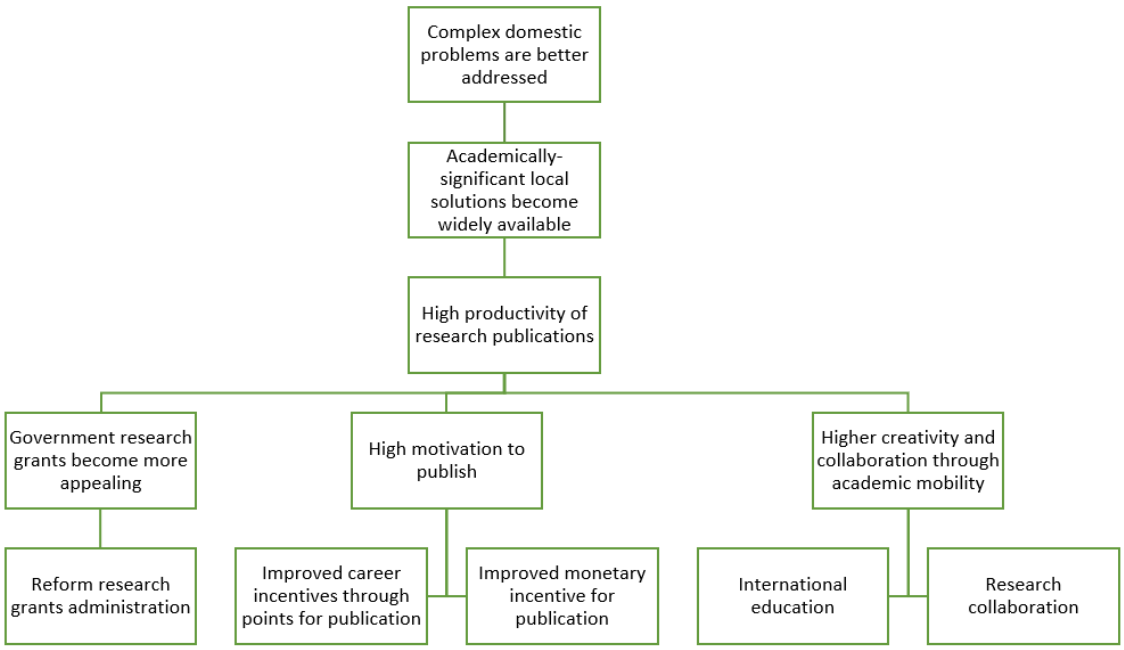

Figure 3. Solution Tree

Table 1. Calculation of SINTA Score for Authors

Assessed Component	Code	Weight
Number of journal article documents in Scopus	A	Q1=40 Q2=40 Q3=35 Q4=30 No Q=30
Number of non-journal documents in Scopus	B	15
Number of citations in Scopus	C	4
Number of citations in Google Scholar	D	0.5
Number of articles in SINTA journals (S1-S6)	E	S1=25 (non-Scopus) S2=25 S3=20 S4=20 S5=15 S6=15

Source: SINTA (2017)
Note: Formula: $W_A * A + W_B * B + W_C * C + W_D * D + W_E * E$.
Citation on Google Scholars is limited at a maximum of 1000.

2.2 Alternative 2: Point Rewards for Publications

Indonesian research system has been using SINTA to measure researchers' productivity and impact by assigning a score for each author. Table 1 details the calculation method of the SINTA score for authors.

We can see from the calculation that journals are valued higher, and papers indexed in Scopus database are preferred to those indexed in Google Scholar. Also, the score has not taken into account papers indexed in bibliometric databases other than those two.

There has been little information about the use of this metrics beyond giving useful statistics for personal insights. We know that research grant and scholarship applicants are required to submit their SINTA ID (Directorate General of Research and Development Strengthening, 2019), but not how the SINTA score affects the selection. Effectively, the score is little more than just another metrics, and it is not clear what value SINTA offers compared to existing metrics such as Scopus or Google Scholar.

Therefore, this policy alternative intends to upgrade SINTA by connecting the database to other aspects of the research and higher education sector where a measure of academic productivity is relevant. Assuming it has been used for research grants and scholarships allocation, another place where the score is useful is in career promotion. In this regard, there is a dualism in how research productivity is measured. On one hand, there is SINTA; on the other, academic career of faculty members depends on a separate credit system that assigns value not only for publications but also teaching, conference participation, and other activities. Details of the credit system and how it affects promotion is perhaps too complex to cover here, but the relevant thing to mention is how—in the research component of the credits—only number of publications is valued. SINTA is therefore more comprehensive in this regard as it has considered impact as represented by citation number. However, the credit system as a whole covers more than just paper publication. Aside from other academic activities mentioned before, it also rewards books published and papers presented in a conference. Thus, we recommend

merging SINTA score into the credit system by replacing the credits for journal publications. The rest of the credit system can still be used for academic promotion as they are more comprehensive than SINTA score.

Despite lacking purpose other than as a personal measure, SINTA score has proven an effective incentive to encourage publications. Rochmyaningsih (2019) reported that in 2018, or a year after the introduction of SINTA, number of papers indexed in Scopus sharply increased to more than 28,000 compared to just under 7000 in 2014. Meanwhile, Scopus recorded that 19,948 citable papers were published in 2017 (Scimago Journal & Country Rank, 2018b). Assuming the same data are used, it means there is an increase of about 40% from 2017 to 2018. Although we cannot attribute the increase solely to the introduction of SINTA, it is safe to say that an alternative of this kind is effective in enforcing writing motivation.

However, as discussed in the introduction, SINTA score has also encouraged scholars to game the system by publishing in low-quality outlets or engaging in self-citations. To prevent this instrument from perversely incentivizing publications at the expense of academic integrity, we suggest the Ministry to develop a way of monitoring and detecting attempts to game the system, such as high instances of self-citation and citations that come from remotely relevant disciplines. As SINTA relies on Scopus and Google Scholar data, the Ministry might need to partner with the databases to detect such breaches and take down predatory journals.

2.3 Alternative 3: Monetary Incentive As A Reward for Publication

For this paper, we only consider permanent state lecturers since they receive their salary from the state budget. Also, non-state lecturers are salaried by their host universities, making comparison more difficult since there is a wide variation between Indonesian universities in terms of resources.

Low remuneration for academics goes hand in hand with bureaucratic complexity in the remuneration scheme. Table 2 below provides a very simple calculation of salaries that an academic receives as a state-salaried permanent lecturer. As mentioned earlier, these payments are generally considered low. In the first three years of employment, a recent college graduate in Jakarta can earn roughly between US$300-700 a month. In other words, lecturers in their first year of employment start off with 39% less salary than the lowest entry-level positions in Jakarta. Combined with the fact that the salary scheme is applied equally regardless of whether an academic works in the capital or in a remote university, it provides huge temptation for academics to look for additional income in project-based consultancy works. As a comparison, a consultancy service for government work can earn an academic between US$200-400 per month as additional income, or about 60% of the salary of the entry-level (Expert Assistant) position.

Assuming low salary causes low motivation in writing and in turn encourages academics to moonlight outside academia, we propose in this alternative an incentive for publication. A successfully published paper in a reputable journal should be rewarded with a payment of at least 60% of the annual salary—therefore encouraging academics to trade one year of consultancy work for one year of paper writing. This scheme might be fine tuned for each formal title and even based on the reputation of the journal. The latter is intended to safeguard against perverse incentive of only encouraging publication number and neglecting quality. To support the effectiveness of monetary incentive, Quan et al. (2017) claim that in China the policy has led to exponential increase in the number of international scientific publications since its introduction in early 1990s. Comparing it to Scimago Journal & Country Rank (2018a) data of Chinese publications, it does show a sharp increase of 460% from 28,810 papers in 1996 to 161,294 in 2005.

2.4 Alternative 4: Academic Mobility Through International Scholarship

Alternatives 4 and 5 are intended to address academic insularity. The logic behind these two is that academic publication is not only a function of intrinsic or external motivation, but also researchers' academic capacity. The findings of a flood of bad publications and the critiques against an overreliance on SINTA score show that the policy system should be interested not only in number of publications, but also their quality. It is therefore necessary to invest in academics' education through international scholarship or training as better education would translate to better chance of getting published in international reputable journals.

The academic inbreeding mentioned before is caused by a lack of mobility. Academic mobility is conducive to knowledge diversity and exposure to a wider academic environment. From a survey of Brazilian faculty members, Silva et al. (2016) found that academics who obtained their PhDs abroad published averagely 45% more publications compared to their colleagues with Brazilian degree, therefore arguing that academics with wider exposure perform better and are more prolific. Similarly, Rakhmani and Siregar (2016: 43) found that Indonesian "active researchers who obtained their higher degrees abroad have more articles published in Scopus-indexed journals." Further, Petersen (2018) found that "mobile researchers gain up to a 17% increase in citations relative to their non-mobile counterparts."

In 2019, the Ministry provided 1,100 PhD scholarships for Indonesian lecturers (*Antaranews.com*, 2019). However, only 100 awards of that were allocated for PhD programs abroad with the rest being reserved for domestic programs. There is a considerable gap if we compare the number of awards with those from LPDP, whose core business concerns students' scholarship, not lecturers'. In 2016, LPDP allocated a quota of 300 scholarships for lecturers to pursue PhD programs abroad (Ministry of Research, Technology, and Higher Education, 2016). If we believe that exposure to international education will improve academic productivity, there is a need to increase the scholarships for international programs given the current discrepance between international and domestic scholarships. As with our proposal for the first alternative, providing international scholarships might be more cost effective by piggybacking on LPDP rather than relying on the Ministry's own scheme.

2.5 Alternative 5: Facilitating Research Collaboration

In general, we can measure the degree of research collaboration from co-authorship of academic papers. Here, we

Table 2. Lecturers' Career Stage, Years in Service, and Remuneration

Formal Title	Minimum Years in Service to Get Promoted to the Next Position	Range of Monthly Take-Home Payment (in US$)
No title	1	183–300
Expert Assistant	2	350–600
Lector	2	382–652
Head Lector	3	414–738
Professor	-	936–1604

Source: President of the Republic of Indonesia (2015) and Ministry of Education and Culture (2014)

Table 3. Lecturers' Titles and Proportion of Tasks

Formal Title	Proportion of Tasks in Credits Earned
No title	n/a
Expert Assistant	Teaching: 55%; research: 25%; community service: 10%; other tasks: 10%
Lector	Teaching: 45%; research: 35%; community service: 10%; other tasks: 10%
Head Lector	Teaching: 40%; research: 40%; community service: 10%; other tasks: 10%
Professor	Teaching: 35%; research: 45%; community service: 10%; other tasks: 10%

Source: Directorate General of Higher Education (2014: 5)

are primarily interested in international cross-institutional collaboration to foster mobility. Collaboration allows academics to solve research questions that might be too complex to address alone or those whose nature calls for international perspective. Co-authorship is also practical since it allows researchers to share workloads and costs.

The relationship between research collaboration and productivity has been scholarly established. For example, Lee and Bozeman (2005: 693) argue that "collaboration is a strong predictor of publishing productivity" with the latter being defined as a researcher's personal publication of papers. Further, De Solla Price and Beaver (1966: 1014) found that authors with the most collaborations were also the most productive. They also classified several motives which drive an academic to collaborate in a research, which include access to special equipment, facilities, or skills; recognition; to gain experience; and to train researchers (Beaver & Rosen, 1978: 70).

This initiative may build on existing research networks, such as the Policy Research Network hosted by Universitas Indonesia which connects five largest think tanks. Research collaboration activities may include matchmaking events between the institutes in a research network, where researchers present their proposals and respond to offer from other interested researchers to collaborate. The task of the Ministry is to invite foreign institutions (and perhaps private and public sector actors) to participate. The Australian National University (ANU), for instance, has long established research partnership with Indonesia, which the ministry can tap into for this initiative.

3. Clarifying Indonesia's Research Demography

Based on the discussion of the remuneration scheme above, it is clear that there is a demographic structure which corresponds to salary earned. For this simple analysis, we again limit our attention to permanent state lecturers and exclude contract lecturers/researchers or those whose salaries are paid by the host university. Lecturers at each level are required to satisfy a certain proportion of teaching, research, and community service obligations in order to rise in rank (Table 3).

The career stage and its corresponding proportion of task affects our proposed alternatives in that the three lower-rank positions (no title, expert assistant, and lector) are encouraged more to teach, while the tasks of upper-rank positions (head lector and professor) are more research dominated. In other words, policy interventions intended to boost research performance should "push" the lower-rank academics to do research, but only "nudge" the higher-rank academics since research is already mandatory for this demographic.

4. Choosing Between the Alternatives with Multicriteria Analysis

We use several criteria to evaluate the proposed alternatives: effectiveness, cost, and lag of results. Effectiveness of the policy alternative in generating publications is given the greatest weight (50%) among the criteria, since we assume that Indonesia's research sector is still most interested in this aspect. The second highest weight (30%) is given to lag of results as we would expect to see results of a particular alternative in the same presidential term (a five-year period). Considering the very dynamic nature of Indonesian politics, we cannot expect the succeeding administration to be interested in implementing the same policy choice. Lag of results is understood as the time length since the alternative starts to be implemented until the individual researchers receiving the treatments produce a publication. Most of the alternatives only need to build on systems and policies that are already in place, hence our assumption that the Ministry has enough budget room to implement any of the alternatives, hence the lowest weight (20%) for cost effectiveness. We give 100 points if the alternative is expected to perform very well, 60 if moderately, and 30 if poorly, with regard to a given criterion.

We applied these criteria into our alternatives and divide their performance effects for lower- and upper-rank academics. The results can be seen in Table 4.

4.1 Effectiveness in Generating Publications

We give low result (30 points) for grants and research collaboration for lower-rank academics since both alternatives call for enough existing expertise and network, which lower-

rank researchers often lack. Therefore, this demographic might not have the initiative to apply in either scheme, except if a senior academic asks them to join a team. The opposite is true for upper-rank academics who have more organic incentive to apply for research funding and collaboration.

The lower priority given to research in their task distribution may also contribute to fewer grants and collaboration applications from lower-rank academics. For this reason, we assign only medium effectiveness (60 points) to publication points for lower-rank researchers. Meanwhile, we consider publication point a highly effective instrument for upper-rank academics, hence high effectiveness (100 points).

On the other hand, monetary incentive may alter the calculation for lower-rank academics. Despite lower research priority, low-ranking academics may find the incentive of obtaining monetary rewards sensible to compensate for low salary. Thus, we consider a high effectiveness point (100) for this alternative. The effect is only considered medium for the high ranks because their starting wage is high enough and hence lower temptation to moonlight outside academia.

We assume education will only work if there is a substantial lack of competency, hence high (100 points) and low (30 points) effectiveness of scholarships for lower-rank and upper-rank academics, respectively.

4.2 Cost

Implementing an improved version of SINTA to address academics who game the system is the least costly (100 points) alternative. Meanwhile, facilitating research collaboration projects are rated medium (60 points) relative to giving grants or scholarships which are high cost (30 points). We consider the performance of these four alternatives the same for both upper- and lower-rank academics. Meanwhile, monetary incentive for low-ranking academics is considered high cost (30 points) since a high enough incentive is necessary for the alternative to be effective given the low starting salary. For high-ranking academics, recalling the proportion of research vs teaching, we may design a stratified publishing incentive that gives high-rank academics a relatively cheaper reward, hence only medium cost (60 points).

4.3 Lag of results

Grants, scholarships, and research collaboration, for the substantial time in education, selection, and research process that they entail, are considered to have a long lag. Meanwhile, points and monetary incentive for publications are awarded at the completion of research or once outputs are produced. Therefore, the lag between the implementation of the systems and the moment results start to show is assumed to be much shorter, especially since interested authors can rely on their ongoing projects or papers.

From Table 4, we can see that monetary incentive for publication is the ideal option for lower-rank academics, while point system is closely behind it. For senior academics, point system is the obvious choice as it excels in all three criteria. Monetary incentive and research collaboration are other viable options with 72 and 71 points respectively.

5. Testing the Alternatives Across Different Scenarios

The above analysis is based on the status quo, which assumes that Indonesia's research sector has enough funds to implement the proposed alternatives, thus enabling us to prioritize alternatives which generate publications most effectively. We also take into account that universities are partially financially autonomous in that they still receive funding support from the Ministry which are allocated to research, lecturers' salary, and tuition fee.

In this section, we present two possible scenarios which assume that an aspect of the status quo has changed. Scenario 1 imagines that all universities are fully financially autonomous, while Scenario 2 assumes the opposite: that Indonesia's research sector operates with fewer budget.

5.1 Scenario 1: Financially Autonomous Universities

Today, only 11 out of thousands of universities in Indonesia are considered a legal entity, which translates to more autonomy in revenue generation and curriculum setting. Even then, these universities still receive a huge sum of financial support from the government. This scenario therefore assumes that more, if not all, universities have turned into legal entities and that government subsidization has been significantly reduced, if not stopped. Despite the controversy over commercial practices in higher education, it is still possible that more, if not most, universities will become financially autonomous in the future. As an indication, an official from the Ministry recently stated that future policies will encourage universities to rely less on state-salaried staffs and instead promote contract employment (Adit, 2020).

In this scenario, we assume the Ministry will have more budget to spend in the research sector as a result of freeing up financial support for universities. This is reflected in the multicriteria analysis by disregarding the cost criterion. As a result, while monetary incentive is still the best choice for lower-rank academics, scholarship now becomes a viable option in addition to point system. Similarly, for senior academics, point incentive is still the ideal option but now a reformed research grant regime is an appealing option aside from monetary incentives and research collaboration.

5.2 Scenario 2: Budget Cuts

From 2001 until 2013, Indonesia's research expenditure only increased from 0.05 to 0.08 as a percentage of GDP (UNdata, 2014). On the other hand, number of international scholarships awarded, especially for academics, have remained low as mentioned in the previous section. Thus, there is a considerable virtue in assuming even less budget might be available for the research sector in the future.

For our multicriteria analysis, this is translated by giving most preference to cost since we assume that we prioritize alternatives that can produce results as cost-efficiently and in as little time as possible. As Table 6 shows, point system is now the preferred alternative for both demographics, with monetary incentive as a second-best option.

Table 4. Multicriteria Analysis for Lower-Rank and Upper-Rank Academics

Lower-rank	Effectiveness (50%)	Cost (20%)	Lag of results (30%)	Total Score (0–100)
Research grants reformed	Low	High	Long	30
Improved points for publications	Medium	Low	Short	80
Monetary incentive for publications	High	High	Short	86
International scholarship	High	High	Long	65
Research collaboration	Low	Medium	Long	36
Upper-rank	Effectiveness (50%)	Cost (20%)	Lag of results (30%)	Total Score (0–100)
Research grants reformed	High	High	Long	65
Improved points for publications	High	Low	Short	100
Monetary incentive for publications	Medium	Medium	Short	72
International scholarship	Low	High	Long	30
Research collaboration	High	Medium	Long	71

Table 5. Multicriteria Analysis in Scenario 1

Lower-rank	Effectiveness (60%)	Lag of results (40%)	Total Score (0–100)
Research grants reformed	Low	Long	30
Improved points for publications	Medium	Short	76
Monetary incentive for publications	High	Short	100
International scholarship	High	Long	72
Research collaboration	Low	Long	30
Upper-rank	Effectiveness (60%)	Lag of results (40%)	Total Score (0–100)
Research grants reformed	High	Long	72
Improved points for publications	High	Short	100
Monetary incentive for publications	Medium	Short	76
International scholarship	Low	Long	30
Research collaboration	High	Long	72

Table 6. Multicriteria Analysis in Scenario 2

Lower-rank	Effectiveness (30%)	Cost (40%)	Lag of results (30%)	Total Score (0–100)
Research grants reformed	Low	High	Long	30
Improved points for publications	Medium	Low	Short	88
Monetary incentive for publications	High	High	Short	72
International scholarship	High	High	Long	51
Research collaboration	Low	Medium	Long	42
Upper-rank	Effectiveness (30%)	Cost (40%)	Lag of results (30%)	Total Score (0–100)
Research grants reformed	High	High	Long	51
Improved points for publications	High	Low	Short	100
Monetary incentive for publications	Medium	Medium	Short	72
International scholarship	Low	High	Long	30
Research collaboration	High	Medium	Long	63

Table 7. Weighted Average Scores of the Alternatives

Lower-rank	Status quo (60%)	Scenario 1 (20%)	Scenario 2 (20%)	Average Score
Research grants reformed	30	30	30	30
Improved points for publications	80	76	88	80.8
Monetary incentive for publications	86	100	72	86
International scholarship	65	72	51	63.6
Research collaboration	36	30	42	36
Upper-rank	Status quo (60%)	Scenario 1 (20%)	Scenario 2 (20%)	Average Score
Research grants reformed	65	72	51	63.6
Improved points for publications	100	100	100	100
Monetary incentive for publications	72	76	72	72.8
International scholarship	30	30	30	30
Research collaboration	71	72	63	69.6

6. Conclusion

In Table 7, we calculate a weighted average score for each alternative based on its performance in each scenario. We give status quo scenario the heaviest weight since we treat current situation as a business-as-usual scenario that is unlikely to change much. On the other hand, the two other scenarios are extreme cases, the virtue of which is to generate precautions. Finally, our recommendations are as follows.

Recommendation 1: We find monetary incentives for publications the robust alternative to incentivize productivity from lower-rank academics and therefore should be implemented. The second-best option is point system that might be more effective when cost is the deciding factor.

Recommendation 2: For upper-rank academics, the

ideal policy to implement is to improve the existing SINTA point system (SINTA). As a second-best option, monetary incentive performs reasonably well across different scenarios. When money is no object, research collaboration is another viable option.

Recommendation 3: SINTA should be improved into a single platform that integrates assessments of academic productivity and distributes rewards for career advancement.

Recommendation 4: The two most recommended options (monetary and point incentives) are potential sources of perverse incentive. Thus, the Ministry should also take measures to improve detection and monitoring of unfair practices to boost the score within SINTA. These include, for example, improving detection of low-quality or predatory journals with the help of Scopus and/or Google Scholar, and detecting and punishing attempts to game the system by artificially increasing the citation number.

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