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Scientific Research Must Receive Quantitative Evaluations, Complemented by Qualitative Evaluations by Experts

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Publications selected:

[1] Ida, T. (2009) *Broadband Economics: Lessons from Japa*n, Routledge (Taylor & Francis Group): London.

[2] Ida, T. and R. Goto (2009) "Simultaneous Measurement of Time and Risk Preferences," *International Economic Review* 50.4: 1169-1182.

Key Points

- The evaluation of university research requires objective and quantitative analysis
- The 21st Century COE Program has an effect on increasing the "quantity of research."
- Researches not suitable for short-term, quantitative evaluation also exist.

Something that aroused controversy over the budget screening that the Democratic Party's Government Revitalization Council began last November was its judgment to practically scrap the development project of the next-generation supercomputer.

The presidents of Waseda University, Keio University, and the seven former imperial universities among the national universities issued a statement of protest against this screening, while Nobel Prize and Fields Prize winners held a news conference to criticize it. Even besides the supercomputer the council also proposed severe budget cuts for every other science and technology projects.

Among researchers, there is probably no one who denies the importance of research evaluation itself. Thus academic journals employ a peer review system in which qualified researchers decide on whether or not to publish papers. The same goes for the

selection process for the various awards bestowed on research results. At the awards ceremony held for the Japan Society for the Promotion of Science (JSPS) Prize in March of 2010, Selection Committee Chairman Leo Esaki spoke words that remained in my mind: “To evaluate and be evaluated are important, but a slap-dash evaluation is worse than no evaluation at all.”

The aim of the budget screening is not bad per se, and the screening is interesting as a spectacle. However, the knowledge of those doing the evaluation is shallow, and the preparation of those being evaluated is inadequate. Having to entrust the future of Japan’s science and technology policy to these individuals is a disconcerting prospect. What is needed now is an objective analysis of the results of university research, and a dispassionate policy based on it.

In parallel with transforming Japanese national universities into independent administrative institutions, the government carried out a wide-ranging review of its science and technology policy. As part of the new policy, it decided to annually reduce its subsidies for university operating expenses; on the other hand, it created a large-scale, competitive funding system and told universities to make up for the cuts by obtaining funding from that system. The principle of competition was thus introduced into Academia, to ensure exhaustive selection and concentration of resources.

The 21st Century Center of Excellence (COE) Program is also part of this competitive funding system. The purpose of the program is to form world-class education and research centers. Thus, in fiscal 2002, a total of 274 research centers in 11 fields were selected for the program, and over the following five years, the program annually provided each institution with financial support of up to several hundred million yen. (Note that JPY 91 = US$ 1 at present.) Then, in fiscal 2007, it changed its name to the “Global COE Program,” reduced the number of centers by half, and increased the amount of support to be provided to each center. Moreover, the World Premier International Research Center Initiative (WPI) was launched; this initiative provides five centers throughout the country with over a billion yen in support annually.

Looking back at my own experience in participating in the operation of the 21st Century COE Program, I remember that there was an epochal change in the cushy environment which we university people had gotten used to; I now felt both a sense of elation and a sense of fatigue, as if I had to always continue dancing. The problem was that there was a lack of vision. That is, the government continued to make us university people dance by coming up with one plan after another in the new funding system, without ever conducting any quantitative, objective, ex-post-facto evaluations of the plans; and then, when a budget screening would put the pressure on, the government

would reverse course and force us to curtail our projects.

I felt that this impromptu science and technology policy was dangerous and began an analysis of Academic Innovation Management (AIM) whose subject of research was the research of universities. Beginning in fiscal 2009, with the cooperation of Kyoto University's Institute for Integrated Cell-Material Sciences (iCeMS), I co-hosted, with the institute's Associate Professor Shintaro Sengoku and others, various AIM research meetings, and was able to obtain some intermediate results. The subjects of our investigations ranged from the development of evaluation techniques and the investigation of managerial techniques to the effective information transmission techniques. iCeMS is an ideal subject for a case study as it is a field that has been called the key to regenerative medicine and drug discovery that it has been very much in public eye..

What is presented below are the findings obtained from econometrically measuring how much improvement took place in certain research results – research papers and the citations in them – following the implementation of the 21st Century COE Program. These findings are based on joint research conducted by the author and Ms. Naomi Fukuzawa, a graduate student at Kyoto University.

In the world of research evaluations, a project's size is often measured by the number of research papers produced, and its quality, by the number of citations per paper. Thus, to measure the effects of the COE policy, we decided to deduct, from the difference between the pre- and post-COE results of researchers who received COE funds, the difference between the pre- and post-COE results of researchers who didn't receive any funds but who worked in environments comparable to those of the recipients. Doing this would enable us to identify how much of the increase in research results following the implementation of the COE policy could be attributed to that policy. This technique is known as difference-in-differences (DID) estimation.

Based on pre- and post-COE DID estimations for a period of 10 years, the diagrams rank 28 domestic life-science research centers in descending order in terms of the increase in the number of papers per person per year and the increase in the number of citations per paper. The number of papers was found to have increased at most centers, but at half the centers there was no evidence of an increase in citations per paper. For all 28 centers together, we found that the average number of papers per person per year increased from 3.1 prior to the COE policy to 4.4 after; and that, of this 1.3 increase in papers, 0.7 papers could be attributed to the effects of the policy. The average number of citations per paper increased from 28.6 before COE to 37.4 after, and all of this 4.7

increase could be explained as a policy effects.

What can be concluded from the above analysis is that, while COE did have a positive effect on the quantitative side of research, increasing the number of papers produced, it had virtually little effect on the qualitative side, since only five among 28 centers displayed the statistically significant increases. It is a fact that, due to the competitive funding system, the competitive spirit of the researchers was heightened, but there may also have been an increase in the tendency to avoid research that involves risk and to instead focus on research in which results could be reliably obtained. A supplementary system that boldly promotes the undertaking of challenges entailing risk is also necessary.

Of course, there are big differences between academic fields in the way that citations are used, so one cannot generalize the results from analyzing just one field. Moreover, the papers used for the data in this analysis were preliminary versions that we didn't check with their authors. In the future we would like to analyze all 11 fields targeted by the 21st Century COE Program and increase the accuracy of our data by checking it with the authors.

We also compared our findings with the qualitative evaluations of the COE Program Committee. Many of the centers where there was a marked increase in research results received an evaluation of "fully achieved and better than expected" from the committee. On the other hand, centers that received an evaluation of "better than expected," but whose research results didn't increase according to our measurements, received that evaluation because they were rated highly in such areas as personnel training and industry-university relations. Centers whose research results increased, but were unable to obtain an evaluation of "better than expected" were seen to have problems in areas other than research. It can be said that the evaluators looked at what they should have. This was probably because, unlike the people involved in the budget screening, the committee's evaluation team was composed of individuals who have been leaders in their respective fields for decades.

The story about how Tadamitsu Kishimoto, former president of Osaka University, discovered, when conducting an on-site inspection related to research expenses, the research of the developer of induced pluripotent stem (iPS) cells, done by Shinya Yamanaka, then professor at the Nara Institute of Science and Technology (currently professor at Kyoto University), is well known, and it reminds me once again of the importance of good expert judgment. Quantitative scholarly evaluations, and qualitative evaluations based on good judgment by experts, are like the two wheels of a bicycle: both have to be in good working order for research evaluations to function in a balanced

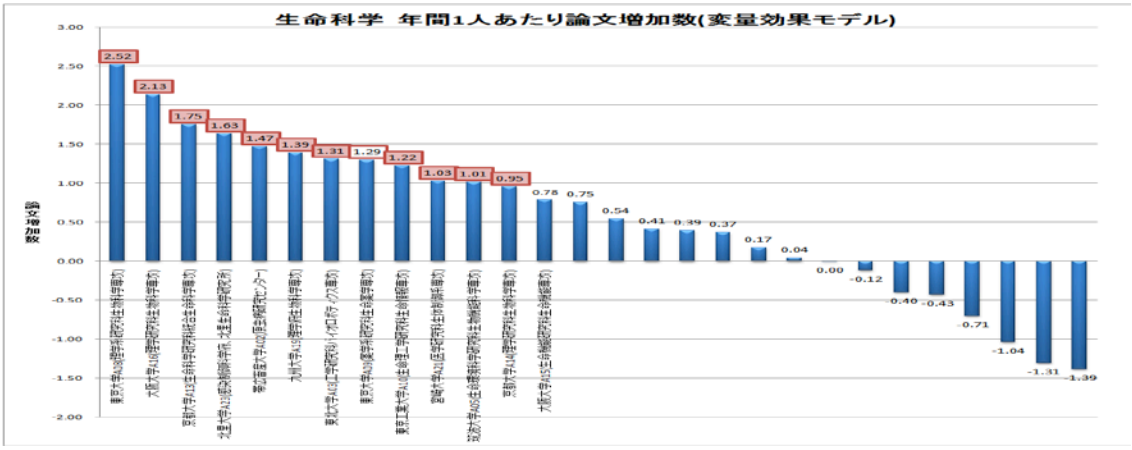
way. Unfortunately, there are few experts in this world who possess the necessary good judgment.

There are also problems with quantitative evaluations of research. First, there are quite a few fields – for example, the humanities and law – in which presenting research results in international academic journals has not become an established practice yet. It is thus impossible to judge such fields by the number of papers produced and the number of citations per paper. Therefore, I would like to propose an "80 percent rule." I think that quantitative evaluation is possible for about 80 percent of all research, and the expense which requires rigorous evaluation could also be 80% of all research expense. In the world of academia, it's important to protect the remaining 20 percent that doesn't lend itself to qualitative evaluation from "violent evaluation," and to provide young researchers with funds without any constraints attached.

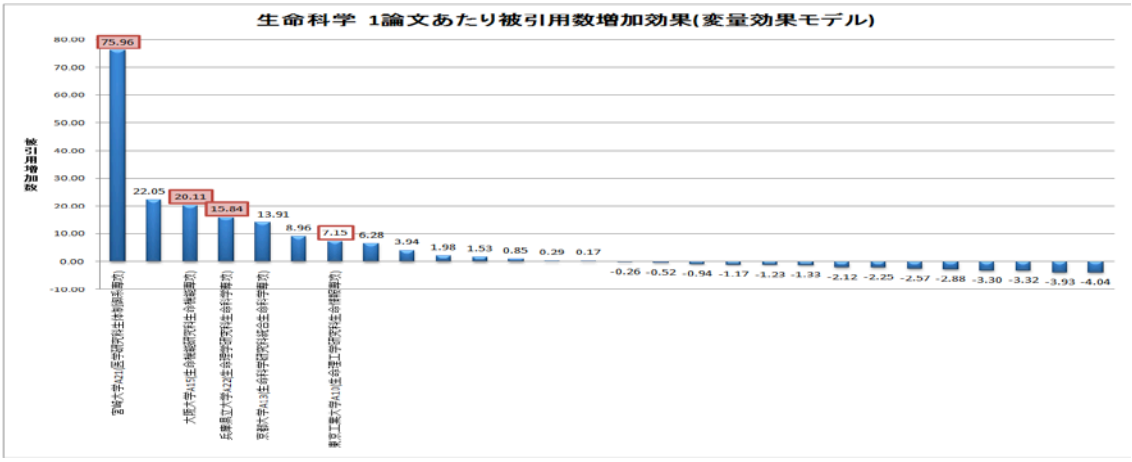
Second, the number of papers produced and citations per paper are effective as short-term indicators but they are not suitable for evaluating breakthroughs that require decades for their evaluation to be settled, as illustrated by the research on fluorescent jellyfish protein for which Dr. Osamu Shimomura won the Nobel Prize in Chemistry. Short-term evaluations are important, but long-term evaluations requiring decades should not be neglected. As Wittgenstein said, "Whereof one cannot speak, thereof one must be silent." What is being asked of us academics is whether we have made a serious effort to explain academic matters to everyone concerned.

Effects of the 21st Century COE Program
(28 life-science research centers arranged in descending order of increases in papers and citations)

The number of papers per person per year increased at 80% of the centers.



The number of citations per paper increased at only half of the centers.



Note Elsevier's Scopus was used for the data.