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Collaboration makes an elite school?

Empirical investigation into Korean Universities

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***Abstract*—Scientific collaboration is a popular issue in the literature on knowledge production. Although previous studies show that scientific teamwork becomes dominant and is related to the impact of scientific results, empirical results of this research reveal that collaboration itself is not "the almighty" for quality research. This study finds the following three stylized facts. First, Korean universities' collaborative research with other domestic schools increases dramatically among four authorship structures (international collaboration, between-school collaboration, within-school collaboration, and solo a.k.a. no collaboration). Second, we affirmed the advantage of collaborative research but it varies among the type of collaboration. For example, the between-school collaboration is not better option than the within-school collaboration for the elite universities. Third, Korean elite schools consolidate their academic status by using international scientific collaboration. The elite universities increased their collaborative research with foreign partners, while common universities decreased the international collaboration and shifted their focus to domestic teamwork with elite schools. The results suggest that the strategy of top-tier schools is smarter than the decision of common schools. The gap between elite universities and commons has been widened by antithetic preference to international collaboration despite the increase in domestic collaboration among them.**

***Keywords*—knowledge production, scientific collaboration, university research, citation impact, partner selection**

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I. Introduction

Collaborative research leading to coauthored publications has been the major development in the academia ([1]–[3]). The scientific collaboration has become the norm in knowledge production, and therefore it has been of great interest ([4],[5]). Besides, previous studies on the scientific collaboration have shown that the scientific impact of new knowledge affects the increasing dominance of cooperative research ([6],[7]). Although there are many benefits we obtain from the scientific collaboration such as mentoring or teaching, a variety of insights, better productivity, and improved quality ([8]–[11]), the primary goal of the scientific collaboration has been indicated by epistemic impact of knowledge ([12]). However, does this scientific collaboration always makes the result better? The answer for this question is "No," of course. In some collaborative research, someone might sacrifices while others benefiting. Partner selection of scientific alliances differentiates the epistemic impact of research results ([13]–[15]). We doubt whether elite universities are different from common schools in collaboration strategy. To address this question, we used 213,963 scientific articles with at least one address indicating Korean university. From descriptive analyses, we found two things: (1) In case of collaborations including Korean university scholars, the international ones are more likely to be a high-impact paper, and (2) common universities reduced share of international scientific collaboration while elite schools did not. In spite of that a sophisticated analysis is needed, Korean elite universities use their cooperation with foreign scientists to retain their epistemic status.

II. Data and Identification

A. *Database*

We used the *1981–2010 South Korea National Citation Report (NCR)*. The NCR is a subset of the Web of Science (WoS) database and includes bibliographic and citation information on 297,658 scientific journal articles published from 1981 to 2010 having at least one Korean address.

Every paper in the original data lists affiliation addresses for all authors in English. The addresses were given by original authors, and this makes huge difficulties in cleaning information because scholars have their own methods for translating Korean addresses to English. We retranslated the name variations of Korean universities into our own university codes using custom algorithms. By filtering all papers published by 336 Korean university schools, we acquired 213,963 articles between 1981 and 2010.

B. *Elite School*

To address our research question, difference in collaboration strategy between elite universities and others,

we were needed to define the elite school. Before determining elite schools, we ranked universities based on the epistemic authority. The epistemic authority here is measured by the total number of citations received by within-school publications from each school in the corresponding period. The within-school publications indicate the union of sole-authored papers and within-school collaborating papers, and they are sufficient measuring the epistemic authority of university schools ([14]). Finally, the top 5% rankers (others) are determined as elite (common) universities.

C. Authorship Structure

The authorship structure is also referred to as the type of collaboration, and is a popular criterion to classify the scientific collaboration. Previous literature in general used four different types of authorship structure to examine changes in distribution of research papers: international collaboration, external-institutional collaboration, internal-institutional collaboration, and no collaboration ([13], [15]). Focusing to universities, we use other expressions for categories of authorship structure: international collaboration, between-school collaboration, within-school collaboration, and solo ([14]).

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D. High-impact Paper

To examine certain issues on citation impact, we defined the high-impact paper as follows: the high-impact paper is an scientific research article which earns more than the average number of citations in the same publication year and same subject category. Then we used an indicator for whether a publication is the high-impact paper to calculate the probability that a paper would receive above-average citations.

III. Empirical Results

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A. Trend of Authorship Structure

Fig. 1 shows the change of authorship structure during the study period (1981–2010). Throughout the whole period, within-school collaboration has been a dominant one among authorship structures but its share has decreased. Sole-authored papers also decreased steadily. On the other hand, between-school collaboration dramatically increased its portion. Lastly, international collaborative research by Korean universities seems not having been changed.

B. Impact Advantage of Collaboration

We calculated the probability that a publication gains more citations than the average within the same year and the same subject category for the articles published in last decade (2001–2009). The calculation is done separately for elite universities and for common universities, leading to the probabilities for every authorship structure.

Whether a university is elite or common, collaboration helps a paper get stronger likelihood of high impact. Especially the international collaboration proves the highest probability of high impact. Between-school collaboration shows higher probability than within-school collaboration for the common schools but not vice versa for the elite universities. These are depicted in Fig. 2.

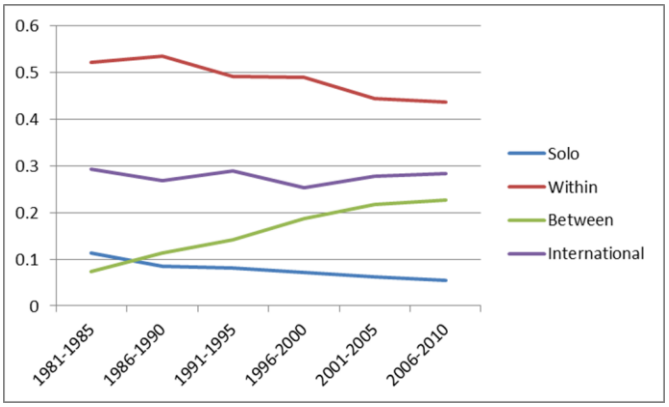

Figure 1. Share of authorship structures.

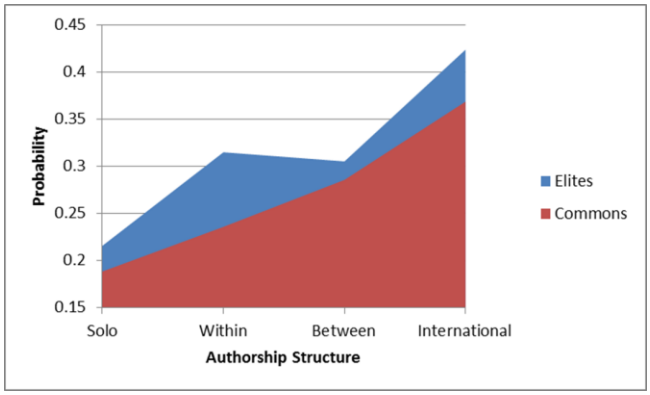

Figure 2. High-impact probability by authorship structure.

C. *Collaboration Strategy*

As in Fig. 3 and Fig. 4, the elite schools have better strategy for partner selection in scientific collaboration than common universities. The between-school collaboration is disaggregated again into the with-elites and the with-commons. Korean elite universities increased their all types of collaboration (international, with-elites, and with-commons). On the other hand, common schools decreased their cooperation with foreign scholars while increasing domestic co-works, specifically with-elites collaborations. We argues that this difference in collaboration strategy leads to the divergence of high-impact probability (Fig. 5) between elite schools and others.

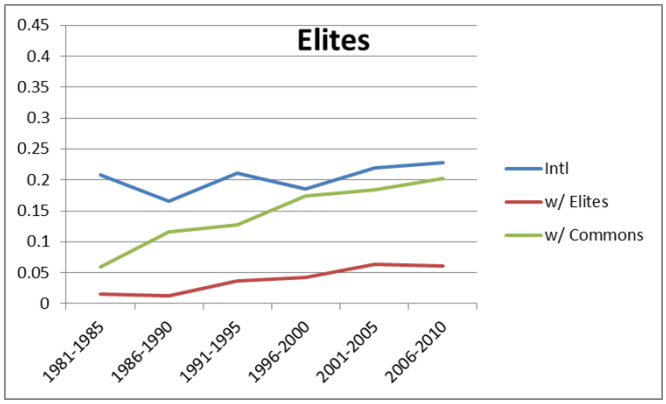

Figure 3. Share of collaboration, elite schools.

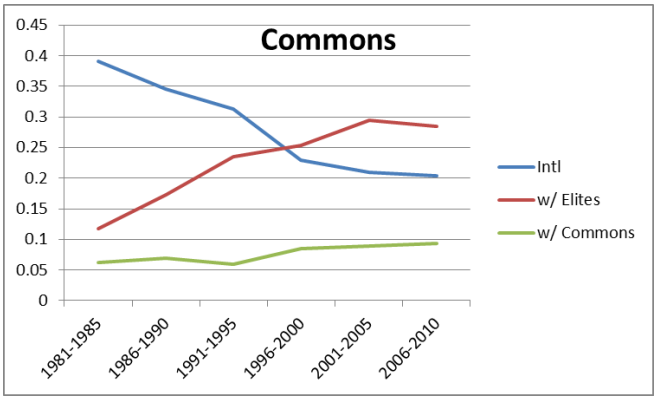

Figure 4. Share of collaboration, common schools.

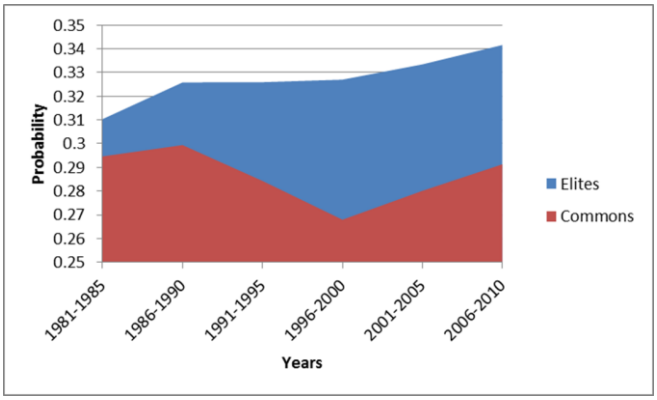

Figure 5. Change of high-impact probability.

IV. Conclusion

This article investigated the characteristics of knowledge production of Korean university schools with view of the scientific collaboration. Above all, collaboration strategy or partner selection is different between elite universities and other common universities. Superficially, Korean universities did not change their collaborative research with foreign scholars. But with closer look, elite schools increased their international collaboration while common schools decreased it. We found that strategic selection of scientific collaboration makes elite school having higher probability of high-impact paper. In spite of the increase in domestic collaboration among universities, different antithetic preference to international collaboration widened the epistemic gap between Korean elite universities and common schools.

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