Mapping knowledge production and scholarly communication in China
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Summary

As knowledge has become an engine of social, economic, and cultural development and since China has achieved its economic miracle by keeping around 10% annual growth of GDP for more than 10 years, the dynamics of Chinese knowledge production have become an interesting subject for both policy makers and academic analysis. The increased economic strength enables Chinese government to spend more for research and development. China’s dedication to constructing an innovation-oriented country shows its determination in this regard. In addition to internal motivation, external factors such as international collaboration and the increasing return of overseas Chinese also contribute to China’s progress in science and technology. All these facts imply that China is highly active in knowledge production, which may lead, at least partly, to reshaping the world structure in terms of the current “triad model” of the leading sciento-economic powers (i.e., the USA, the EU, and Japan). But such a hypothesis can only be persuasive after being studied systematically. This dissertation entitled Mapping Knowledge Production and Scholarly Communication in China is dedicated to this purpose.

The dissertation is conducted through bibliometric methodology and is divided into three parts. Part I provides an overview of issues including knowledge production and scholarly communication, the relevant situation in China, and the application of bibliometrics. The core of the dissertation is Part II which covers the major studies of the dissertation. Conclusions, discussions, and policy implications are elaborated in Part III.

Part I has three chapters (i.e., Chapters 1 to 3). After reviewing some basic knowledge and theoretical issues in knowledge production and scholarly communication, Chapter 1 introduces the Chinese situation from the perspective of input and knowledge output. Since the dissertation focuses on scholarly communication through academic journal literature, information about China’s journal management system and journal accessibility is provided. The Chinese situation relevant to journal citation databases is also introduced. The chapter contains a literature review about the Chinese knowledge production system. The objectives of the dissertation are specified. The outline of the dissertation is provided in Chapter 2 where each of the major studies covered in Part II is summarized. Chapter 3 explains the methods and materials used in the dissertation. Information about which data sources are selected, what software is used, and why certain methods are applied can be found in this chapter.

The journal articles which form the core of this dissertation are reprinted in Part II. This part is composed of two sections. Section 1 includes Chapters 4 to 7 and focuses on exploring the Chinese knowledge production. In addition to Chinese knowledge production in both the natural and social sciences, Chinese regional performance in science and the role of international collaboration are explored. Chapters 8 to 11 form section 2 which engages in investigating Chinese scholarly communication. Relevant studies analyzed the citation performance of Chinese journals in the domestic and the international community. Comparative studies complement the analysis.
In Chapter 4, I ask the question of whether China has emerged as a leading nation in science. Indicators like publications, citations, and R&D investment in comparison with the leading nations including the USA, the UK, Germany, France, and Japan have been analyzed. As an important Asian country in both economy and science, South Korea is also included in this study. Publication activity in nanotechnology will be explored since this field is so important that it is included in the strategic plans of many nations. The results show that China has become an advanced nation in terms of scientific knowledge production. This country’s research output in nanotechnology is impressive. But the international impact of Chinese authors in terms of citations is problematic since Chinese publications are not well cited compared to those from the other leading nations.

After knowing China’s overall performance in the natural sciences, it is necessary to investigate further about regional contribution to Chinese science. This is done in Chapter 5. The results show that regional contributions to China’s knowledge production are highly skewed. Beijing, Shanghai, Hong Kong, and Jiangsu are the top four regions in terms of both publications and citations. Hong Kong seems to have reached its potential in publishing international papers. However, the correlation between R&D expenditure and knowledge output of Chinese leading regions is relatively low. In other words, higher investments do not necessarily result in higher productivity of publications.

Chapter 6 aims at investigating international collaboration. In the ten years from 1997 to 2007, Chinese internationally co-authored publications increased remarkably. But the growth is lower than the one of China’s total publications: unlike most of the countries whose number and share of internationally co-authored publications dramatically increased during the last two decades (Schubert & Braun, 1990; Glänzel & Schubert, 2004; Wagner, 2008; Leydesdorff & Wagner, 2008), the relative contribution of international collaboration in China decreased. The most important S&T partners of China are four: the USA, Japan, Australia, and Singapore. Japan and Singapore are geographically close to China. This may imply that two factors (i.e., scientific proficiency and distance) are significant in determining the possibility of international collaboration, in addition to cultural and political issues.

My study of China’s performance in the natural sciences (Chapter 4) indicated that China has taken a leading position in publications in the natural sciences. Is China also becoming a giant in the social sciences? This is the question that I address in Chapter 7. Compared to the natural sciences, the social sciences are more connected to and imbedded in (and thus affected by) the social and political system to which they are oriented. The fact that the adoption of the Opening-up policy in 1978 promoted Chinese publications in the social sciences further proved the close relation between social sciences and political system. China has a rather low world share in both publications and citations in the social sciences. The developing trend of the two indicators is accelerating slowly. But China’s world share of publications grows exponentially in recent years (i.e., 1997 - 2007).

With regard to scholarly communication, my studies of both the overall situation and in specific disciplines (see, Chapters 8 to 11) show that on average Chinese scholars provide less references than their international counterparts. High-quality international journals have a higher rank in the hierarchy than do their Chinese counterparts. Authors who publish in high-quality Chinese journals prefer to cite articles in international journals above domestic ones. The international visibility of Chinese journals differs between disciplines. Among Chinese journals in the selected disciplines (i.e., general science, materials science, and the life sciences), the visibility of journals in materials science have relatively higher visibility
than that of journals in the life sciences. This corresponds to the relative strength of China in these fields.

Part III covers Chapters 12 and 13. Chapter 12 provides conclusions, discussion, and perspectives, whereas the policy recommendations are provided in Chapter 13. Based on my series of studies, the following conclusions can be formulated:

- Chinese knowledge production continues to grow exponentially and there is no sign showing that the increasing speed will slow down;
- While having the publication characteristics of that of the formal socialist countries with extreme activity in chemistry and physics, the Chinese publication system is also very active in mathematics. China is relatively inactive in the life sciences;
- The Chinese pattern of international collaboration is different from most of the advanced countries: the national share of internationally coauthored publications goes down while that of most countries goes up. But my study shows that international collaboration helps raise China’s visibility and impact at both overall and disciplinary levels. Only mathematics is an exception in which international collaboration slightly lowers China’s visibility;
- The distribution of regional contributions to China’s publications and citations is highly skewed;
- Contrary to its fast progress in the natural sciences, China moves forward slowly in the internationalization of social sciences. But because of the limited coverage of the data source (i.e., the Social Science Citation Index) and the close tie between the social sciences and national, cultural, social, and political environment, publication activity can be very local or national. The present result which is based on an international data source cannot represent the overall situation about China’s research in the social sciences. It is necessary to analyze Chinese domestic publication databases in the social sciences in order to better understand the Chinese situation in this regard. Unfortunately, data was lacking during the period of this dissertation research so that I was not able to analyze the Chinese domestic publication activity in the social sciences;
- Compared to their international counterparts, Chinese scholars are less active in communicating with their counterparts through scientific literature since they provide fewer references in their publications. In the domestic community, knowledge mainly flows from high-quality journals to the lower ones. Knowledge communication between Chinese and international scholars are not equal. Chinese authors mainly play a role as knowledge receivers while international authors play as citation sources.

Since the dissertation adopts a bibliometric methodology and bibliometrics has not been well-developed yet, it is necessary to discuss pertinent problems in applying bibliometric methods for research evaluation. In Chapter 12, I provide a critical review of the use of citation analysis for this purpose. This chapter first provides a definition of bibliometrics, and proceed with a discussion of the relation between bibliometrics and other specialties in the study of science, the increasingly important role of bibliometrics in science management and research evaluation, and so on. In addition to general problems in applying bibliometrics to research evaluation, specific issues that may affect the interpretation of the results in the above studies are also discussed.

Policy implications are provided in Chapter 13 for different players in knowledge production and scholarly communication. The following are the key points:

- enhancing the innovativeness of research;
strengthening both domestic and international collaboration;
» establishing scholarly communication networks;
» improving access to academic media;
» constructing a more feasible evaluation system;
» increasing accessibility of Chinese journals for international readers;
» providing open access;
» publishing an English version of journals;
» cooperating with international publishers and online journal database providers; and
» scholars being more active in informal communication and improving English proficiency.

In general, China has achieved remarkable progress in raising the quantity of scientific publications. But quantity does not equal to quality. The citation impact of Chinese publications is still low. To some extent, increasing quantity is relatively easier than raising quality. China has to face more rigorous challenges on the way to a world scientific leader.