Mapping knowledge production and scholarly communication in China

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Citation for published version (APA):

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Is China also becoming a giant in social sciences?

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At present China is challenging the leading sciento–economic powers and evolving to one of the world’s largest potentials in science and technology. Jointly with other emerging economies, China has already changed the balance of power among the formerly leading nations as measured by scientific production.

In the present paper, the evolution of China’s publication activity and citation impact in the social sciences is studied for the period 1997–2006. Besides the comparative analysis of trends in publication and citation patterns and of national publication profiles, an attempt is made to interpret the results in both the regional and global context.

Introduction

Recent papers in bibliometrics have shown that the old model of world leadership of three major players in economy, science, and technology – the USA, the EU and Japan – does no longer hold in the 21st century. With its fast and continuous development in economy, China is emerging as a leading nation in science [ZHOU & LEYDESDORFF, 2006; GLÄNZEL & AL., 2007, 2008] and has ranked second since 2006 in terms of scientific publications [LEYDESDORFF & WAGNER, 2007; ZHOU & LEYDESDORFF, 2008], overtaking France, Germany and the UK. Bibliometric studies relevant to China’s research performance in the sciences have been done from various perspectives...
A question comes out naturally: is China also becoming a giant in social sciences? This paper will focus on this issue and will provide an overall picture about China’s performance in social sciences.

Social sciences are a group of academic disciplines that aim at studying human society, social systems and the individual relationships in and to society by means of theoretical and empirical research. 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. From a historical viewpoint, most disciplines in the social sciences are also younger than science fields or traditional areas in the humanities. One should take into account that communication behaviour of scientists in the social sciences essentially differs from that of their colleagues in the sciences and applied sciences. Bibliometric methods originally designed for the analysis of basic research in the sciences has to be adapted to the peculiarities of the social sciences. The divergence of communication finds, among others, its expression in the particular choice of communication channels, the publication language and specific citation behaviour [Glänzel & Schoepflin, 1999; Hicks, 2004]. We therefore focus on those disciplines in which the use of the scientific method including quantitative and qualitative methods is emphasised and in which the communication behaviour is rather similar to that in the sciences. However, before we deal with the bibliometric analysis, let us have a look at the peculiarities of the social sciences in China.

For historical and social reasons, the development of the Chinese social sciences considerably differs from those in Europe and America. Based on former studies relevant to the history of Chinese social sciences [Dong, 1999; Cheng, 2004; Jiang, 2005], the development of Chinese social sciences can be summarized as five major periods:

(1) Starting period (1900–1915).
Some social science disciplines just emerged. Theoretical systems, structures, frameworks, and even concepts and scopes of relevant disciplines had not yet been formed;

(2) Formative period (1915–beginning of 1930)
After several cultural and political movements since 1915, the Chinese system for the social sciences was established on the whole;

(3) Localization of social sciences (beginning of 1930–1949)
Since social sciences were originated in the West, localization of the social sciences in the Chinese context had become a common sense among Chinese social scientists;

(4) Development with zigzags (1949–1977)
Since the establishment of the Peoples Republic of China in 1949, the Chinese social sciences faced a completely new era but experienced a zigzag route. Little progress was made in this period, especially during the Cultural Revolution which lasted for 10 years (1966–1976), research and education in the social sciences were completely stopped.

(5) Relatively faster development (since 1978)

Since 1978 when China started adopting its Reform and Opening-up Policy (ROP), Chinese social sciences embraced a period of fast development: academic research becomes more active; the number of research institutes increased; research manpower is enlarged; domestic and international academic exchanges become frequent; and more and more scholars are sent abroad. In addition, the return of Hong Kong enlarges China’s research and educational force as well.

In this paper, we investigate three major topics taking into account the restrictions concerning the application of bibliometric standard tools to the social sciences. These topics cover:

(1) the evolution of Chinese publication output in all fields of the social sciences from 1974 to 2006;
(2) China’s publication profiles and its change in time based on selected social science fields in the period 1997–2006;

Data sources and data processing

Data sources

The study is based on data from the Social Sciences Citation Index (SSCI) of Thomson Scientific (formerly known as Institute for Scientific Information, ISI, Philadelphia, PA, USA). The SSCI database forms jointly with the Science Citation Index Expanded (SCIE) and the Arts & Humanities Citation Index (AHCI) the Web of Science. As a multidisciplinary index to the journal literature of the social sciences, the SSCI fully indexes more than 1,725 journals across 55 ISI Subject Categories, and it indexes individually selected, relevant items from over 3,300 of the world’s leading scientific and technical journals. In comparison with ISI’s SCIE, the two databases are practically identical in terms of their structures except for one issue concerning the coverage of journals that will be discussed below. They use the same bibliographic fields with coincident components. Nevertheless, social sciences and natural sciences have different attributions which may bring some fundamental variations. One must be cautious and have the following points in mind while using the SSCI data:

Social science literature is more fragmented.
Compared to social science literature, natural and life science literature is more consensual and international. A core of important, international, mostly English-language journals has been identified and fully indexed into the SCIE. The bibliometric community has adopted the SCIE as a standard source in relevant research and evaluations. By contrast the social sciences constitute a broad and rather heterogeneous collection of disciplines. They are fragmented because social scientists develop fewer consensus and adhere to more competing paradigms than do natural scientists [HICKS, 1999]. Lack of consensus within a field has been associated with a higher proportion of books in that field’s literature because journal publishing has often been seen both as a signal of greater consensus and as a unifying force in itself [PIERCE, 1987]. Relevant studies [BOURKE & AL., 1996; WINTERHAGER, 1994] have proved that social scientists publish in more types of literature than do natural scientists. Another study [DELMONT, 1989] shows that authors commonly do not cite relevant work outside their school of thought. These fragment the literature such that in the worst cases, no core of literature in a field can be identified [NEDERHOF & ZWAAN, 1991].

Social sciences are inherently more national oriented.

Social sciences are related to the social, political, economic and legal systems which they study. Theoretical concepts in the social sciences are subtle and are often expressed in national languages and can sometimes be fully appreciated only in the original language [HICKS, 1999]. Compared to natural scientists, social scientists both write and read fewer foreign language papers or even foreign journals [KIVIK, 1988]. The heavy emphasis on local audiences and local material among social scientists also fragments social science literature, making it more difficult to cover the literature comprehensively in a single international database.

Several biases exist in the SSCI

Similar to the SCIE, the SSCI has national, language and disciplinary biases. Using the national bias as an example, among the 1768 journals covered by the SSCI, 55.9% of them were from the USA and 37.2% of them were from the EU-15 in 2006. Asian journals only take a very small share. The journals from the major Asian countries (China, Japan, South Korea, Singapore, New Zealand, and India) only took about 1.3%. Nevertheless, those European or American journals are open to accept papers from any countries. Theoretically speaking, there is no country bias in these journals, but language bias does exist. Among all the publications in the SSCI in 2006, 95% are in English. Language bias may affect a nation’s visibility, especially for social sciences when theoretic problems are usually expressed in national languages and can sometimes be fully appreciated only in the original language [HICK, 1999]. Furthermore, several fields like, for instance, law mainly refer to national issues and consequently prefer the use of the national language for publication. Regarding to disciplinary bias, the SSCI data may affect a nation’s visibility because different nations may have different...
emphasis or strong point in different fields. A nation can be well presented when its strong fields are well covered by the SSCI, vice versa.

Social sciences largely rely on communication channels other than international journals.

In many fields of the social sciences non-journal literature is more important than in the sciences. The centrality of books in social science literature has already been pointed out by Hicks [1999]. Beyond books and monographs, other communication channels such as working paper series play an important part in several social-science disciplines. All these literatures can be frequently cited; but even social science journals are cited but not indexed in the SSCI. Butler [2003] has shown that the share of the Australian academic output in the social sciences and humanities fields published in non-ISI journals amounts to 25%–44% of all journal literature.

As mentioned above, there is one issue that structurally distinguishes the SSCI from the SCIE database, namely that the SSCI not only has journals that are fully covered, but also journals that are selectively covered. These journals are covered by other ISI databases but only selected papers are indexed in the SSCI. This situation may cause problems in bibliometric analysis, especially for the correct subject assignment and finding appropriate reference standards for citation analysis [Glänzel, 1996]. In this study, selectively covered papers have therefore not been taken into consideration.

Despite the above weak points of the SSCI in terms of bibliometric analysis, the database is valuable when statistics is based on some fields that are relatively well covered or on research that is internationally oriented. It is also persuasive to use the dataset to describe a nation’s historical development in social sciences. Data of the ISI for the Arts and Humanities is not used for our study since fields in this category are even less represented than social sciences [Moed, 2005].

Glänzel & Debackere [2005] have analysed the publication output of social sciences in Belgium and the citation impact of papers indexed in the SSCI; they came to the conclusion that bibliometric standard tools can be applied to a set of selected disciplines of the social sciences in a similar manner as it is long practiced in the sciences. The results are also in line with earlier findings [Glänzel, 1996; Glänzel & Schoepflin, 1999; Katz, 1999; Godin, 2002]. As a results of the Belgian study we have selected a set of ISI Subject Categories, aggregated those to six subfields and three major disciplines in which bibliometric standard analysis can be conducted. The hierarchical structure of these fields can be found in the Appendix.

Data processing

Two sets of data are collected. The first set includes data in all fields for China so as to provide an overall view about China’s development from 1974 to 2006 in the social sciences. In order to avoid confusions, China is used to represent the Peoples Republic
of China (PRC), and “Chinese Mainland” for the area currently administered by the PRC excluding the two special administrative regions (SARs) Hong Kong and Macao. Data of Chinese Mainland and Hong Kong are collected separately based on country assignment in order to view the development in the two regions distinctively. For historical reasons, the ISI addressed a country code to Hong Kong for data before 2002, five years after Hong Kong’s return to China. In addition, some publications from Hong Kong were assigned to Chinese Mainland since 1998. This situation existed until 2002 when Hong Kong’s publications were completely assigned to China.

The second set of data contains publications in three main fields comprising Economics & business administration, Social, political & communication sciences and Psychology with six subfields (see Appendix). This selection is based on the experience limitations of bibliometric application to disciplines in the socials sciences like, for instance, history and law (see [BUTLER, 2003; HICKS, 2004; GLÄNZEL & DEBACKERE, 2005]). The above-mentioned three main fields and six subfields were selected for analyzing China’s publication profiles and citation impact in comparison with relevant countries or region. The fields selected are either well-covered by the SSCI or have international publication behaviour.

For both sets, only publications recorded as articles, letters, notes and reviews are included in the study. A full-counting or integer-counting scheme was applied, that is, a full count was recorded whenever a country occurred in the by-line of the paper. Because of the extensive presence of international co-authorship, national bibliometric indicators such as publication or citation counts based on this full-counting scheme are not additive, that is, they can not be summed up over countries to regions or supra-national units. A share of \( x\% \) of a country in the world’s total publication output means that \( x\% \) of all papers have one or more co-authors with an address in this country.

For international comparison and the analysis of internationally co-authored publications, all countries indicated in the address field were considered. Duplicates have, of course, been removed. In addition to individual countries, the supra-national region EU-15\(^1\) has been selected. In order to guarantee a fair approach and to obtain consistent results for the EU-15, that is, the union with 15 member countries has been used for the full period. Intra-EU co-publications have been de-duplicated to avoid double counting.

For the citation analysis, a three-year citation window beginning with the publication year had been applied. The slow ageing of social sciences literature would speak in favour of the choice of a longer windows [GLÄNZEL & SCHOEPFLIN, 1999], however the choice of three years still allows the evaluation of recent research results,

\(^{1}\) In this study the constitution of the European Union till 2003 is used so as to coincide with the former paper [ZHOU & LEYDIESDORFF, 2006]. The members of the EU15 are Austria, Belgium, Denmark, England, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain and Sweden.
on one hand, and this period is, at least at higher levels of aggregation, long enough to
determine future citation impact, on the other hand [GLÄNZEL, 1997]. The three-year
citation window has already successfully been applied in earlier studies (e.g.,
[GLÄNZEL, 1996]). The last publication year that could be processed this way was
therefore 2004 (with citations received in the period 2004–2006).

Methods and results

Evolution of Chinese publications in all fields

From 1949 when the Peoples Republic of China was established to 1976 when the
Cultural Revolution was ended, several cultural and political vibrations made China’s
research and education in social sciences stagnated or even backward. Since 1978,
China has adopted the Reform and Opening-up Policy (ROP), which brings China to a
new development stage. Nonetheless, in the period 1979–1991, the reform was
suspended to some extent for some political reasons. It wasn’t until 1992 when the
former Chinese leader Deng Xiaoping made his famous speech while visiting the
southern part of China and after the Fourteenth Congress of Chinese Communist Party,
that China finally accepts the market economy. Reforms in education, science, and
technology started ever since. The ideology of Chinese people was further liberated.
Their initiatives for reform and construction were greatly promoted. Chinese reform
entered a new stage where Chinese economy grows fast and steadily. Another big event
that might affect China’s production in both natural and social sciences is the return of
Hong Kong in 1997. Not mentioning economical and political influence to mutual
sides, we confer that Hong Kong may contribute a big share to China’s publications.

The SSCI includes publications since 1972. But the data for Chinese Mainland were
0 and 2 respectively in 1972 and 1973, so we will report only from 1974 onwards.
Considering Hong Kong’s return in 1997, we include Chinese data from 1974 to 2007
and divide the data into three sets: two sets for Hong Kong and the Mainland from 1974
to 2007, the third one for China combining publications from both the Mainland and
Hong Kong together. The starting year for the third set of data is 1997. Collaborated
publications between the Mainland and Hong Kong are only assigned to Hong Kong not
to the Mainland. In other words, the data set for the Mainland does not contain the
collaborated publications between the Mainland and Hong Kong (Figure 1).
Figure 1. Evolution of the publication output of the PRC, the Mainland China and Hong Kong (all fields combined, 1974–2007)

The publication share corresponds approximately to the social and political events happened in Chinese Mainland. Before 1978 when the ROP was adopted, the publication counts of Chinese Mainland never exceeded 10: the world share of the Mainland was almost zero in this period. The historical development of the Mainland publications can be characterized as the following three periods:

Start-up period (1978–1988)
Since 1978, the world share of the Mainland share started to increase from 0.01% and reached the first maximum of 0.23% in 1988, which is an increase by 2200 percent.

From 1989 to 1998, the world share of the Mainland fluctuated slightly and never surpassed the 1988 peak (0.23%). The number of publications only increased from 153 to 161.

Dynamic growth period (1999–)
Starting from 1999, the Mainland has entered a completely new period: its world share of publications increased sharply. From 1999 to 2007, the world share increased by 1.15% (from 0.24% to 1.39%). In 1999, the Mainland published 205 papers; in 2007, this figure increased to 1507.
Hong Kong’s start point was somewhat higher than that of the Mainland. The Mainland has caught up with Hong Kong by the end of the 1980s, but not really overtaken Hong Kong until 2002. The gap between Hong Kong and the Mainland was small from 1974 to 1992 but was enlarged in the period 1992–1999. The disparity reached its maximum in 1999. Publication output from Hong Kong was more than three times higher than that of the Mainland. In the new millennium, the Mainland has finally surpassed Hong Kong in terms of their publication activity (cf. Figure 1).

Since the return of Hong Kong in 1997, Hong Kong’s publications were calculated as that of China. From 1997 to 2007, the world share of publications of China grows exponentially. The mainland and Hong Kong contribute to Chinese publications differently in different periods. From 1997 to 2001, Hong Kong contributed the most; since 2001 especially 2006, the Mainland has undoubtedly become the major player in terms of publications.

The trend line implies that China, following its remarkable activity in the sciences, has started its catching-up race in social sciences.

*International co-authorship links*

According to De Solla Price [1963], team work and consequently collaboration is one of the characteristics of ‘big science’. Cronin & al. [2003] have shown that massive scientific collaboration – originally a characteristic of the sciences – became established in the social sciences and humanities as well. During the last decades research collaboration has increased at practically all levels of aggregation [Leclerc & Gagne, 1997; Glänzel, 2001; Glänzel & Schubert, 2004]. Several factors, such as peculiarities of national science systems, economic factors, the growing importance of interdisciplinarity and other intra-scientific factors, geopolitical and/or cultural affinity and as well as certain aspects of mobility and migration at the individual level are pointed out playing an important part in establishing collaboration links [Schubert & Braun, 1990; Katz & Martin, 1997; DeB. Beaver, 2001; Glänzel & Schubert, 2004]. Above all, international co-authorship links have undergone dramatic structural changes in the last decades. Besides stable links between countries and coherent clusters, new nodes and links in the international co-publication network have crystallised. International co-authorship is in general accepted as a basically positive phenomenon. Severe political and economic changes as observed, for instance, in the economies in transitions in Eastern Europe and new members of the European Union have a strong influence on collaboration patterns [Glänzel & Schlemmer, 2006]. Thus, extensive collaboration might also be used as means for compensation for the negative financial effects which have hit the basic research system of several East-European countries before and after the political and economical changes of the nineties [Braun & Glänzel, 1996].
In order to visualise the evolution of China’s collaboration network in the social sciences we map China’s co-authorship links broken down by country pairs for two sub-periods 1997–1999 and 2004–2006. We use Salton’s index \( r_{ij} \) to measure the strength of co-publication links. This (cosine) measure can be derived from a Boolean vector space model. Each country is represented by a Boolean vector the components of which take the value 1 or 0 according as the country has contributed to the corresponding paper by co-authorship or not. The cosine measure is then defined as the cosine of the angle between the vectors representing two countries. A similar model has been described in the context of bibliographic coupling [SEN & GAN, 1983; GLÄNZEL & CZERWON, 1996]. As has been shown in these papers, Salton’s (cosine) measure can then simply be defined as follows

\[
 r_{ij} = \frac{p_{ij}}{(p_i p_j)^{1/2}},
\]

where \( p_i \) is the number of publications of China, \( p_j \) the number of publications of the partner countries and \( p_{ij} \) the number of joint publications. In verbal terms, this measure is defined as the number of joint publications divided by the square root of the product of the number (i.e., the geometric mean) of total publication outputs of the corresponding pair of countries [GLÄNZEL, 2001]. We have only chosen partner countries with at least 10 joint publications to guarantee statistical reliability of the results. The change of China’s scholarly co-operation can best be visualized by ‘scientopographical’ maps (see Figure 2a,b).

An increase of China’s international collaboration in the social sciences was observed; the share of internationally co-authored papers increased from about 44% in 1997–1999 to about 48% in 2004–2006. However, not only the share of collaborative papers rose but the strength of the links increased as well. While in the first sub-period rather weak links are predominant (except the medium strong link with the US), we find already two strong links in the second period, namely those with the USA and Singapore. Other important partners are the EU-15, Australia, Canada and the UK. Although the general ranking according to the link strength has not changed between the two periods, the strong increase of co-publication strength with Singapore, South Korea, and the EU-15 is worth mentioning. The increase of collaboration with EU-15 from 1.53% in 1997–1999 to 2.42% in 2004–2006 mirrors that with the US (form 3.38% to 4.88% in the same periods). On the other hand, intensity of collaboration with Japan considerably decreased although the total number of joined publications somewhat grew at the same time.

**Publication output in selected fields**

Data collected in this section are limited to those fields listed in the appendix. The data for China include those from both Chinese Mainland and Hong Kong.
Figure 2a. Co-authorship map for China in all social-sciences fields combined in 1997–1999 based on Salton’s measure (thick line ≥ 0.04, 0.04 > solid line ≥ 0.02, 0.02 > dotted line ≥ 0.01, other important links <0.01 without line). Source: University of Alabama, Cartographic Research Lab (geographical map)

Figure 2b. Co-authorship map for China in all social-sciences fields combined in 2004–2006 based on Salton’s measure (thick line ≥ 0.04, 0.04 > solid line ≥ 0.02, 0.02 > dotted line ≥ 0.01, other important links <0.01 without line). Source: University of Alabama, Cartographic Research Lab (geographical map)
China’s share in the world total

In 2006, there were 1176 Chinese publications included in the SSCI, which was 1.5% of total in the database. Japan’s share was 0.1% more than that of China. Nearly half the publications in the selected fields are from the USA. Seven of the top ten countries are from Europe and three (i.e., the USA, the UK, and Australia) have English as their native language. English is also one of the two official languages in Canada. Some EU-15 countries, publish in English even though their official languages are not English, making them a higher visible chance. The Netherlands and France can be a good example. Dutch researchers tend to publish in English while French publish in French. Among the publications indexed in the SSCI in 2000–2006, 23.5% of French publications were non-English; while that of the Dutch was 0.96%. This phenomenon may contribute to some extent to France’s lower share with respect to the Netherlands (Figure 3).

Some variance exists between the SCIE and the SSCI for relevant countries/region (Table 1). In 2006, the USA, the EU-15 and the UK have higher publication shares in the SSCI than in the SCIE. Publications from the EU-15 and the USA took 77.1% in the SSCI, while that of the EU-15 and the USA in the SCIE was 54.3%.
In addition to investigating world shares of publications in one year (2006), we analyzed the historical track of relevant countries/region from both the West and the East for the comparison. The time span is from 1997 to 2006 (Figures 4 and 5).

Table 1. World share of publications in the SSCI and the SCIE 2006

<table>
<thead>
<tr>
<th>Country/Region</th>
<th>SSCI %</th>
<th>SCIE</th>
</tr>
</thead>
<tbody>
<tr>
<td>USA</td>
<td>45.8%</td>
<td>29.5</td>
</tr>
<tr>
<td>EU-15</td>
<td>31.3%</td>
<td>24.8</td>
</tr>
<tr>
<td>UK</td>
<td>12.8%</td>
<td>7.8</td>
</tr>
<tr>
<td>Germany</td>
<td>5.7%</td>
<td>7.7</td>
</tr>
<tr>
<td>France</td>
<td>2.4%</td>
<td>5.6</td>
</tr>
<tr>
<td>Japan</td>
<td>1.6%</td>
<td>7.8</td>
</tr>
<tr>
<td>China</td>
<td>1.5%</td>
<td>8.4</td>
</tr>
<tr>
<td>South Korea</td>
<td>0.8%</td>
<td>2.9</td>
</tr>
</tbody>
</table>

As the largest publication producer in the social sciences insofar covered by the SSCI, the USA has experienced some ups and downs. In 10 years, the world share of the USA decreased 3.3%. On the contrary, EU-15’s world share increased by 7.5%. The UK has also experienced an increase (2.5%), even though its base number is already high (10.3%). The growth of Germany is quite visible (1.8%) while that of France is not (0.1%). The growth of China is rather slow compared to most of the countries in Figure 4. In the ten-year span, China’s publication share increased only by 0.6% but this progress is visible (Figure 5).

![Figure 4. Evolution of China’s publication output compared with selected countries/region in the West](image-url)
In the following a comparative analysis in Asia will be conducted. For this purpose we have selected China, Japan, South Korea, India, and Singapore. China is the second largest producer and has the highest growth rate. The gap between China and Japan is narrowing. The growth of South Korea and Singapore is visible in recent years.
The world shares of all the five Asian samples have been increased. China increased the most (0.6%), although this data is low in comparison with most countries in Figure 4. South Korea’s growth (0.5%) is similar to that of China. India’s growth is the least (Figure 5).

**Activity Index (AI)**

Activity Index (AI) was introduced by FRAME [1977] and has been applied in macro studies [SCHUBERT & AL., 1989] ever since. It is defined as the ratio of the share of a given field in the publications of a given country to the share of the same field in the world total publications. Based on AI, one can tell the relative activity of fields within a country. When AI=1, it means a country’s publication share in a field is the same as its world share. In other words, a country’s activity in a field is at the average level of its publication activities. AI<1 indicates a below-average activity, AI>1 indicates an above-average activity, and AI=0 indicates the country has no research in this field.

In order to compare the evolution of publication activity in the selected three main fields (psychology, economics and business, and social, political & communication sciences which) in relevant countries/region, we collected and calculated average AI by dividing the data into two groups. Data for group one is from 1997 to 2001 and data for group two is from 2002 to 2006 (Figures 6 and 7). The reason for calculating the accumulated data instead of using data from an individual year is because the total number of publications of some Asian countries is rather small, which may cause large bias.
As USA accounts for more than 40% of all world papers their publication activity in the three main fields sets the pace. As a result USA shows values all around the average level.

The EU-15 has its own pattern which is different from that of the USA or Asia. In terms of publication activity, the EU-15 is close to the average in economics and business administration; above the average in psychology; and lower than the average in social, political and communication sciences.

China is relatively more active than the world standard in economics and business administration, and is quite below the average in psychology. Publication activity in social, political and communication sciences is also lower than the average.

The publication activities of the other selected Asian countries, except Japan, are similar to that of China: research in economics and business administration is above the average. Singapore’s pattern is more close to that of China. Some changes have taken place in terms of activity in social, political and communication sciences in countries like South Korea. From period one to period two, the pattern of South Korea goes some what different.

Japan’s pattern is somewhat like that of the EU-15 instead of that of most Asian countries: publication activity in psychology in both Japan and the EU-15 is above average. Yet, Japan’s publication activity in psychology is more dynamic than the world average.

For most of the countries/region under study, there is no obvious change in terms of publication activities in the two periods (1997–2001; 2002–2006). South Korea is an exception: it is approaching the world average in terms of publication activity in psychology.

China’s citation impact in the social sciences

In addition to analyzing Chinese publications, investigating Chinese citation impact is also important since it provides information about how Chinese publications are perceived by the international community. Relevant topics including world share of citations and standard citation indicators will be explored in this part.

National citation impact in all social science fields combined

Because of the underlying 3-year citation window citations could be counted for publications till 2004 with the citation windows 2004–2006. In the latter period, China ranked 15th in terms of world share of citations with the three selected fields as a whole. Compared to its world publication share, China’s citation share is four positions behind. Japan’s citation share is one position behind its publication share. But the ranks in citation shares of the USA, EU-15, UK, Canada and Germany corresponds to their ranks of publication shares (Figure 8).
Except New Zealand, citation shares of the major Asian countries including Japan, China and South Korea, are less than their publication shares. On the contrary, the world share of citations of the USA is much higher (11.6%) than that of its publications. In addition, over half of citations are referred to publications from the USA. Citation shares of some EU-15 countries such as the UK, Germany and The Netherlands, are also higher than their publication shares.

Investigating the world share of citations from historical perspective we found that the USA lost 2.5 percentage points of world share between 1997–1999 and 2002–2004 while most of the major countries earn more. EU-15 nations especially the UK, Germany, The Netherlands, Switzerland, Spain and Belgium are the major winners. Canada and Australia are also important winners. China’s gain is not quite obvious (0.4 percentage points) compared to other major citation receiving countries.

Relative citation indicators

In what follows, standard citation indicators will be used to shed light on the impact of national research in the social sciences in all fields combined. Since a three-year citation window is applied in this study, the latest citation data collected are for the year 2004.

For the analysis the following set on indicators is used.
i) Mean Observed Citation Rate (MOCR). MOCR is defined as the ratio of citation count to publication count (see [BRAUN & AL., 1985]).

ii) Mean Expected Citation Rate (MECR) is a journal-based citation measure which expresses one expected citation rate of a publication set. The expected citation rate of a single paper is defined as the mean citation rate of all papers published in the same journal in the same year. Here a three-year citation window to one source year is used. MECR is then defined as the average of the individual expected citation rates over the given publication set. This indicator can preferably be standardized through dividing MECR by the Field-Expected Citation Rate (FECR) which is calculated in the same manner as MECR but instead of the journal citation impact the average impact of the corresponding subfields is used [GLÄNZEL & AL., 2008]. This ratio expresses if papers are, on an average, published in journals with higher or lower citation impact than the corresponding subfield citation standards. Therefore, we can consider this indicator also a measure of relative “visibility”. It should be mentioned that a version of this relative measure, namely, FCSm/JCSm is used at CWTS in Leiden (see [MOED & AL., 1995]).

iii) Relative Citation Rate (RCR). RCR is defined as the ratio of the two previous measures, that is, $RCR = \frac{MOCR}{MECR}$. It should be stressed that in this study, a 3-year citation window to one source year is used for the calculation of both the numerator and denominator of RCR. $RCR = 0$ corresponds to uncitedness; $RCR < 1$ ($RCR > 1$) means lower (higher)-than-average citation rate. $RCR = 1$ if the set of papers in question attracts just the number of citations expected on the basis of the citation impact of the journals where the papers have been published [BRAUN & AL., 1985]. Again, a version of this relative measure, namely, CPP/JCSm is used at CWTS (see [MOED & AL., 1995]).

iv) Normalised Mean Citation Rate (NMCR) is defined analogously to the RCR as the ratio of the Mean Observed Citation Rate to the weighted average of the mean citation rates of subfields, that is, $NMCR = \frac{MOCR}{FECR}$. This indicator is a second relative citation rate; in contrast to the RCR, NMCR gauges citation rates of the papers against the standards set by the specific subfields. Its neutral value is 1 and $NMCR < 1$ ($NMCR > 1$) indicates higher (lower)-than-average citation rate than expected on the basis of the average citation rates of the underlying subfields. NMCR has been introduced by BRAUN & GLÄNZEL [1990] in the context of national publication strategy. A similar measure (CPP/FCSm) is used at CWTS [MOED & AL., 1995].

Table 2 presents indicator values of the 30 most active countries in the period 2002–2004 ranked according to the NMCR. Most of the countries with relative citation impact higher than the neutral value of 1.0 are from the EU.

The USA no more occupies the leading position when relative citation indicators are applied. Nonetheless, publications from the USA still have very high indicator values. The citation impact of Canada is above world average as well.
Table 2. List of countries with highest relative citation impact ranked by NMCR in 2002–2004

<table>
<thead>
<tr>
<th>Rank</th>
<th>Country</th>
<th>Publications</th>
<th>NMCR</th>
<th>RCR</th>
<th>MECR/FECR</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Denmark</td>
<td>1226</td>
<td>1.24</td>
<td>1.06</td>
<td>1.18</td>
</tr>
<tr>
<td>2</td>
<td>Netherlands</td>
<td>6035</td>
<td>1.23</td>
<td>1.09</td>
<td>1.14</td>
</tr>
<tr>
<td>3</td>
<td>USA</td>
<td>94239</td>
<td>1.23</td>
<td>1.07</td>
<td>1.15</td>
</tr>
<tr>
<td>4</td>
<td>UK</td>
<td>23909</td>
<td>1.20</td>
<td>1.11</td>
<td>1.08</td>
</tr>
<tr>
<td>5</td>
<td>Switzerland</td>
<td>1958</td>
<td>1.20</td>
<td>1.13</td>
<td>1.06</td>
</tr>
<tr>
<td>6</td>
<td>Belgium</td>
<td>1994</td>
<td>1.18</td>
<td>1.16</td>
<td>1.02</td>
</tr>
<tr>
<td>7</td>
<td>Italy</td>
<td>3376</td>
<td>1.18</td>
<td>1.00</td>
<td>1.18</td>
</tr>
<tr>
<td>8</td>
<td>Canada</td>
<td>11001</td>
<td>1.12</td>
<td>1.03</td>
<td>1.08</td>
</tr>
<tr>
<td>9</td>
<td>Finland</td>
<td>1543</td>
<td>1.11</td>
<td>1.01</td>
<td>1.09</td>
</tr>
<tr>
<td>10</td>
<td>Austria</td>
<td>1136</td>
<td>1.11</td>
<td>1.11</td>
<td>1.00</td>
</tr>
<tr>
<td>11</td>
<td>Ireland</td>
<td>743</td>
<td>1.10</td>
<td>1.03</td>
<td>1.07</td>
</tr>
<tr>
<td>12</td>
<td>Sweden</td>
<td>2700</td>
<td>1.05</td>
<td>0.97</td>
<td>1.08</td>
</tr>
<tr>
<td>13</td>
<td>Norway</td>
<td>1537</td>
<td>1.04</td>
<td>1.08</td>
<td>0.96</td>
</tr>
<tr>
<td>14</td>
<td>Israel</td>
<td>2921</td>
<td>1.00</td>
<td>0.95</td>
<td>1.05</td>
</tr>
<tr>
<td>15</td>
<td>Germany</td>
<td>10026</td>
<td>0.97</td>
<td>1.09</td>
<td>0.89</td>
</tr>
<tr>
<td>16</td>
<td>France</td>
<td>4688</td>
<td>0.96</td>
<td>1.02</td>
<td>0.94</td>
</tr>
<tr>
<td>17</td>
<td>Australia</td>
<td>7287</td>
<td>0.96</td>
<td>1.00</td>
<td>0.96</td>
</tr>
<tr>
<td>18</td>
<td>New Zealand</td>
<td>1630</td>
<td>0.94</td>
<td>0.97</td>
<td>0.97</td>
</tr>
<tr>
<td>19</td>
<td>South Africa</td>
<td>1033</td>
<td>0.88</td>
<td>1.00</td>
<td>0.88</td>
</tr>
<tr>
<td>20</td>
<td>Singapore</td>
<td>745</td>
<td>0.87</td>
<td>0.80</td>
<td>1.09</td>
</tr>
<tr>
<td>21</td>
<td>China</td>
<td>2538</td>
<td>0.85</td>
<td>0.86</td>
<td>0.99</td>
</tr>
<tr>
<td>22</td>
<td>South Korea</td>
<td>1110</td>
<td>0.85</td>
<td>0.86</td>
<td>0.98</td>
</tr>
<tr>
<td>23</td>
<td>Spain</td>
<td>3367</td>
<td>0.83</td>
<td>0.96</td>
<td>0.86</td>
</tr>
<tr>
<td>24</td>
<td>Japan</td>
<td>3231</td>
<td>0.74</td>
<td>0.77</td>
<td>0.96</td>
</tr>
<tr>
<td>25</td>
<td>Turkey</td>
<td>1005</td>
<td>0.69</td>
<td>0.84</td>
<td>0.82</td>
</tr>
<tr>
<td>26</td>
<td>Greece</td>
<td>823</td>
<td>0.64</td>
<td>0.78</td>
<td>0.83</td>
</tr>
<tr>
<td>27</td>
<td>Brazil</td>
<td>1500</td>
<td>0.57</td>
<td>0.81</td>
<td>0.70</td>
</tr>
<tr>
<td>28</td>
<td>India</td>
<td>1011</td>
<td>0.56</td>
<td>0.62</td>
<td>0.90</td>
</tr>
<tr>
<td>29</td>
<td>Russia</td>
<td>1901</td>
<td>0.26</td>
<td>1.00</td>
<td>0.26</td>
</tr>
</tbody>
</table>

The citation indicators of the selected Asian countries (China, Japan and South Korea) are below world average. The low position of Japan is remarkable. The citation impact of individual Chinese publications is even lower than that of South Korea.

**Citation shares of individual fields**

The research activity in the three selected fields has been discussed earlier. Accordingly, we will investigate the citation impact of each of the selected fields in this section so as to see if the citation impact of each field corresponds to its activity. In order to ensure the results reflect the situation in the period discussed, we calculated first the world share of citations of each field for the two leading powers in the social sciences, the US and the EU, in the full period 1997–2004. The USA takes majority of the citations in the three main fields (economics & business administration, psychology, and social, political & communication sciences). But the USA’s share is decreasing in recent years. As the second largest citation receiver, the EU-15 is earning higher shares. In particular, the citation pattern of the EU-15 corresponds to its research activity index.
(AI): the field which had higher AI had higher world citation share, vice versa. Such pattern has been kept during the complete period. Moreover the share of citations of the EU was slightly but steadily increasing over the whole period.

In order to obtain more stable patterns, we have subdivided the period 1997–2004 in two time spans: 1997–1999 and 2002–2004 for the selected Asian countries. This solution avoids fluctuations caused by their smaller publication output but still allows the analysis of the evolution. The results are shown in Figure 9.

![Figure 9. World share of citations of the selected Asian countries (1997–1999: top, 2002–2004: bottom)](image)

The world share of citations of Asian countries were still low, but the emergence of these countries in the two periods is visible (Figure 9).
Figure 10. Relative citation impact indicators for publication years 2002–2004 (capitals) vs. 1997–1999 (italics) in economic/business (top), social/politics/communication (centre) and psychology (bottom)
(C=China, E=EU, J=Japan, K=South Korea, S=Singapore, U=USA)

Scientometrics
Except Japan, China and the other Asian countries (i.e., South Korea, and Singapore) share similar citation patterns. The citation patterns and the publication activity of these countries are similar as well. Japan has kept its citation patterns from period one to period two. Its citation patterns and publication activity are similar. In addition, the Japanese patterns are similar to those of the EU-15.

In addition to the share of citations in the world total, we present relative citation rates in relational charts (see Figure 10). The leading role of the US in all three fields is obvious from the charts. By contrast, citation impact of the European Union more or less meets the world standard. Only the field Social, political & communication sciences shows a somewhat more advantageous picture for the EU-15. Generally, the patterns of relative indicators in the two other fields are more polarised. In what follows we will shortly discuss the major trends in the three fields separately.

Economics & business administration: Within the group of selected Asian countries one can distinguish two subgroups, particularly, China and Singapore with both higher relative impact and higher relative visibility, and Japan with rather lower-impact characteristics. Alone South Korea changed from the high-impact to the low-impact group.

Social, political & communication science: All countries are closer to the centre of the diagram representing the world standard. Above all, the indicator values of China, Japan increased considerably from 1997–1999 to 2002–2004.

Psychology: We find a similarly polarised situation as in Economics and business. The relative citation indicators reflect a rather disadvantageous situation of the selected Asian countries.

In all, the Asian group does not yet reach the standard set by the USA and the EU-15 with their high impact and visibility and with their stable RCR>1 values.

Conclusions

The development of Chinese publications

Although the social sciences have appeared in China for about 100 years, the visible growth in terms of international publications just started several years ago: Chinese publications especially publications from the Mainland were almost invisible in the international community before 1999. The year 1999 can be considered as a turning point of Chinese social sciences. The adoption of Opening-up Policy in 1978 had some positive but limited impact on Chinese social sciences.

Since the return of Hong Kong in 1997, the world share of Chinese publications grows exponentially according to the SSCI database. Hong Kong is a major contributor to Chinese publications, although its role started to go down since 2005. Hong Kong
has reached its production potential but the rapid growing trend of the Mainland is speeding up.

China’s international collaboration has increased. The USA and Singapore are two major countries collaborating with China. Other important Chinese partners include the EU-15, Australia, Canada, and the UK. Collaboration strength with Singapore, South Korea, the USA, and the EU-15 increased, but decreased only with Japan.

**International comparison**

China has not yet taken off in the internalization of social sciences. The development of social sciences is slower than that in natural sciences in China [ZHOU & LEYDESDORFF, 2006]. Although Chinese publications began to grow visibly in 1999, the gap between China and the West represented by the USA and the EU is too wide to be reduced within a short period.

Not only China, other major Asian countries including Japan, South Korea, New Zealand, Singapore and India do not perform well in terms of internationalization. It seems that the SSCI reflects the publication performance of the West (Europe and the USA) more than that of the East. Japan as one of the major players in the sciences has a quite low world share in the social sciences The citation shares of most Asian countries (including China and Japan) were lower than their publication shares. In 2006, the world share of publications of China is 1.5% while its world share of citations is just 0.6%. On the contrary, both the USA and the EU-15 have higher world share of citations compared to their world share of publications. This implies that publications from the USA and the EU-15 have higher citation impact than those from Asia.

Based on the SSCI, the USA is the biggest publication contributor, and receives most citations. EU-15 ranks second. In 2006, 84% of publications are from and 90.5% citations are referred to the USA and the EU-15. The publication contribution and citation impact of the USA is decreasing while that of the EU-15 is growing. The most active countries among the EU-15 are the UK, Germany, and the Netherlands.

Citation impact of Asian countries including China, Japan, Singapore, and South Korea are very low. In the past years, these countries had earned more shares in terms of publications and citations, but the increased amount was marginal.

Regarding to publication activity in the three selected main fields, the USA sets the standard or world average. The EU-15 and Japan have similar patterns: both are above world average in psychology. Publication activities of China and Singapore in economics & business administration are all above the average. Japan is an exception among Asian countries in this regard.

The overall trends in the three major fields under study mirror the situation in all social sciences files combined. The citation impact of the EU-15 in the three main fields
corresponds to their activity index: psychology has above-average AI and receives the highest citation impact.

Asian countries have not yet reached the standard set by the USA. China, South Korea, and Singapore share similar citation patterns which correspond to their publication activities. These countries have relatively higher citation impact in economics and business and least citation impact in psychology. Japan was an exception with a similar pattern to that of the EU-15: they have the highest citation impact in psychology.

Discussion

Many factors may affect the development of social sciences. Except internal theoretical and practical issues, other factors such as academic level of researchers, social and cultural environment, economical and political systems are also critical to the development of social sciences. Regarding to China’s low international visibility, we summarized the following possibilities:

(1) The attribution of national orientation of social sciences
Social Sciences mainly focus on domestic social, political, and economical issues. Relevant research outputs are usually applicable in a target country or region, and therefore can be only valuable for and published in that country or region. Undoubtedly, research in social sciences is very active in China: the fact that there are around 3000 journals in humanities and social sciences can be a proof. The low world share of publications or citations may imply that Chinese social scientists are less active in international community.

(2) Ideological difference between China and the West
Compared to natural sciences, the methods in the social sciences are more difficult. Research in the sciences is less sensitive to official political ideologies. By contrast, social sciences are often directly related to ideology and more intervened and controlled by rulers. In a socialist country like China the influence of the official ideology on research in disciplines like philosophy, political sciences, law, but also sociology, and psychology is perceptible. This might be considered one reason for the ‘phase shift’ in the growth of Chinese social sciences literature.

(3) The separated administration systems for natural sciences and social sciences
Nowadays, cross-disciplinary research becomes increasingly important. To some extent, collaboration between natural sciences and social sciences may affect research output. In China, two top organizations are engaged in the administration of R&D: the Ministry of Science and Technology (MOST) is responsible for R&D in natural sciences and technology; while the R&D in social sciences is managed by the National Planning Office of Philosophy and Social Sciences (NPOPSS). Such separated management system may hinder collaboration between natural and social sciences.
In the evaluation system for researchers in natural sciences, publications in the SCIE/SSCI take a high score, which stimulates researchers to publish in journals included in the SCIE/SSCI. In some research institutes, international and domestic journals are treated differently. Publications in international journals which are not included in the SCIE/SSCI can still get higher score than those in domestic journals. This extremely stimulates Chinese researchers to publish internationally. Nevertheless, in the evaluation system in social sciences, very few institutions treat publications as those in the natural sciences. In other words, there are no measures to stimulate social scientists to publish internationally.

Based on the following facts, we think that China has potential to raise its international visibility in social sciences:

- China has a huge reservoir of researchers. Chinese higher education institutions have been producing human resources continuously [MOE, 2007A]. In addition, more and more Chinese scholars and doctorate students are sent abroad. These internationally trained scholars help to narrow the gap between China and international community.
- The growing international collaboration improves the knowledge level of Chinese scholars and helps Chinese researchers to better merge into international community. Such collaboration may also help international community better understands China as well.
- Statistics from the Ministry of Education of China (MOE) shows that China’s investment in R&D in humanities and social sciences keeps growing [MOE, 2007B].
- As a major language in the SSCI and an important communication tool with international community, English proficiency may help to raise a country’s international visibility. Chinese education sector highlights English language education from primary schools to universities. English has the same weight as other major basic courses like Chinese language and mathematics in evaluating students’ performance.

We would like to thank Prof. Loet Leydesdorff from the University of Amsterdam for his original idea of writing a paper about China’s publication activity in the social sciences. Thanks are due to Prof. Wu Yishan from the Institute of Scientific and Technical Information of China. Prof. Wu expressed his viewpoints on China’s low visibility in the SSCI. Finally, we also wish to thank Balázs Schlemmer for his creative assistance in preparing the ‘scientopographical’ maps of this paper.
### Appendix

#### List of fields selected for the study

<table>
<thead>
<tr>
<th>Main field</th>
<th>Subfield</th>
<th>ISI subject category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Social, political &amp; communication sciences</td>
<td>Policy, Planning and Development</td>
<td>International relations, Political science, Public administration, Planning &amp; development</td>
</tr>
<tr>
<td>Education &amp; Information Science</td>
<td></td>
<td>Communication, Education &amp; educational research, Education, scientific disciplines, Education, special, Information science &amp; library science</td>
</tr>
<tr>
<td>Sociology &amp; Anthropology</td>
<td></td>
<td>Anthropology, Ethnic studies, Family studies, Sociology, Women’s studies</td>
</tr>
<tr>
<td>Community &amp; Social Issues</td>
<td></td>
<td>Demography, Social issues, Social sciences, interdisciplinary, Social sciences, biomedical, Social work</td>
</tr>
<tr>
<td>Psychology</td>
<td>Psychology &amp; Psychiatry</td>
<td>Psychology, biological, Psychology, clinical, Psychology, educational, Psychology, developmental, Psychology, applied, Psychology, Psychology, multidisciplinary, Psychology, psychoanalysis, Psychology, mathematical, Psychology, experimental, Psychology, social, Psychiatry</td>
</tr>
</tbody>
</table>