Chapter 13

Smoothing the Waters:

Science and Research Collaboration between China and the Arab World

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> "China is willing to work with Arab states to contribute to diversified development and mutual learning among world civilizations. We will enhance people-to-people exchanges, strengthen cooperation in such areas as science, education, culture, health, radio, film and television, deepen understanding and friendship between the two peoples, promote mutual learning and integration between the two cultures, build a communication bridge between the two peoples, and jointly contribute to the progress of human civilization." (Chinese Government, 2016, p. 5)

Introduction

China is a developing country rapidly rising to superpower status at the core of the world's most economically dynamic region. The connection between the Arab world and China dates back to ancient times (318 BC; Jih, 2017). More than two thousand years ago, land and maritime Silk Roads already linked the two geographies and societies. For long stretches of history, China has been supportive of the Arab national liberation movements. In 2004, a China-Arab States Cooperation Forum was set up. Since then, it has developed into a collective cooperation platform covering many fields, with more than 10 mechanisms of cooperation. In 2010, China and Arab countries established a strategic cooperative agreement (Chinese Government, 2016). As the chapter 1 in this volume suggest, this effort should be understood within the framework of an overall policy of China in all domains and is particularly oriented toward both feeding the industrial and economic development of the country and providing markets for its production (Carfantan, 2014). Arab countries as a whole have become China's

biggest supplier of crude oil and the 7th biggest trading partner; trade exchange amounted to $171 million dollars in 2016.[1]

The Arab world performs well per capita in some measures of science and research. With only 0.5% of the world's population, the Arab world now produces 2% of the world's scientific publications. This share has actually risen in the last decade despite a fast-growing global output. China has just under 20% of the world's population, and after fast growth in scientific output now accounts for 9% of publications, second in the world..

As China has become one of the Arab world's important international partners, science and research collaboration has grown to feature notably in the relationship, yet it represents only approximately 2–3% of the Arab publications. This percentage is very small if we consider that 67.2% of the publications in the Arab world are co-authored with a foreign partner (Zou'bi, Mohamed-Nour, El-Kharraz, & Hassan, 2015). It is a consistently positive area of multilateral relations, more than bilateral relations.

Based on bibliometric data and literature review, this chapter argues that in spite of the increasing number of publications co-authored by Chinese and Arab scholars, there is little scientific collaboration between the two regions. Most of the co-authored articles are funded by European and American partners. The growth of co-authorship is indeed related to international projects (engineering, astronomy, physics, geophysics) in which Arab countries participate as well as China, but neither China nor Arab countries have really initiated common work.

Rapid Scientific Development in China

China has witnessed an impressive growth in science and technology (S&T) in the past decade. Its scientific output has become the second largest in the world. It has also experienced

[1] http://www.chinainarabic.org/?p=32466

a very impressive integration of its scientific production inside the international mainstream literature in the past 10 years (Wang, 2016; Zhou & Leydesdorff, 2006).[2] What is striking about China's scientific growth is its orientation toward applied areas of knowledge, with innovation and technological development being absolute priorities (Zhao & Arvanitis, 2014; Bironneau, 2012). For the Chinese national government, as well as for local governments, industry and technology are a very high priority, considered vital both for sustainability and for social and political reasons and the the consolidation of the technological capabilities of firms has been the main effort (Zhao & Arvanitis, 2010). The south of China has been pioneering and exemplifying technological and industrial development with active support from local governments (from both regional, and city-level governments), as well as innovation policy (Arvanitis, 2007; Qiu, 2007), and the regional innovation policies have been developed at the same time as the first design of a national strategy for innovation (Jastrabski & Arvanitis, 2006; Oulion & Arvanitis, 2017).

This has left a somewhat unbalanced support toward research in academic environments, with difficulties in connecting academia with the industrial world, which is not uncommon in other countries (Arvanitis & Qiu, 2009). The research policy has mainly relied on a national policy designed by the Ministry of Science and Technology; a powerful funding agency, the National Natural Science Foundation of China; and the more traditional and elite Chinese Academy of Sciences. The whole research system is entirely directed by the central government, and local governments usually replicate the national policy. The State Council issued a national 15-year Medium- and Long-Term Program for Science and Technology Development in 2006. Natural sciences, mainly in engineering, physics, and physicochemical disciplines, telecommunications, aeronautics, and astrophysics have been driving this growth (Wang, 2016;

[2] Not all areas have experienced this integration. For example, the social sciences continue to lag behind (Zhou, Su, & Leydesdorff, 2010).

Zhao & Arvanitis, 2010). In the biological domains, the more technical areas have received special attention, as is the case in the fields of pharmacology, bioinformatics, and a spectacular national plan for nanotechnology (Bironneau, 2012; Kahane, 2012). Since 2003, health has been prioritized after the dramatic crisis of severe acute respiratory syndrome (SARS; Cao, 2004), although after the opening policy, health did not get the same attention as the more technology-oriented domains of knowledge.[3] Publishing in English-language journals renders Chinese science more visible and paves the way for its wider recognition and higher citation (Wang, 2016), although publications in Chinese language are still important — so much so that the is now a "Chinese Science Citation Database" is published by the Chinese Academy of Science and has been integrated into the well-known Web of Science platform (see Clarivate Analytics website for details).

Objectives set by the National Medium- and Long-Term Programme for Science and Technology Development (2006–2020)[4] are ambitious: (a) R&D expenditure as a percentage of gross domestic product (GDP) should increase to 2.5% or higher; (b) the rate of S&T contribution to the economy should reach 60% or higher; and (c) the annual number of patents granted to Chinese inventors and the cited scientific publications of Chinese authors should rise to the top 5 worldwide (Wang, 2016). These policy objectives are still not matched but have had effective results in research. Nanotechnology has been the domain with the earliest definition of a national policy, based on strong financial support; it produces a very notable number of patents, although very few seem to be licensed and—as publications, rather than economic

[3] Fields with the lowest comparative advantage scores are psychology; arts and humanities; nursing; health professions; social sciences; economics, econometrics, and finance; dentistry; and veterinary.
[4] The State Council of the People's Republic of China (2006). The National Medium- and Long-Term Programme for Science and Technology Development (2006–2020). http://www.gov.cn/jrzg/2006-02/09/content_183787.htm (in Chinese)

instruments (Cao et alii, 2013) —tend to concentrate in a small number of academic publications (Kahane, 2012; Oulion & Arvanitis, 2017). Moreover, the plan is rather less indicative concerning scientific research and publications. It just mentions that some priority scientific areas that correspond to specific technologies are to be favored, producing the very specific profile for research publications that we mention above (Wang 2016).

Over the past two decades, China's scientific community has begun to embrace open science, increasing its number of data repositories and open-access journals. But strong policies and changes to academic culture are needed before science in the country can become fully open and transparent (Phillips, 2017). As one of us (Arvanitis) can attest, the pressure to publish in "internationally recognized" journals is as strong in Chinese universities as it is in the larger Arab universities and is tightly linked to funding. That explains not only the growth of scientific publications but also the share of English-language publications that is calculated to be around 72% of Chinese scientific publications indexed in Scopus (Wang 2016: 448).

International Collaboration

Until 2014, fewer than one fifth of China's papers in the Web of Science were co-authored with an international peer. The percentage of international papers increased to 24% in 2016 and in journals included in the Web of Science , international collaborations make-up just over 50% of its papers (Phillips, 2017, see Figure 1) which is a very high percentage by any standard, usually found in the scientific production of developing economies (Gaillard 2010).

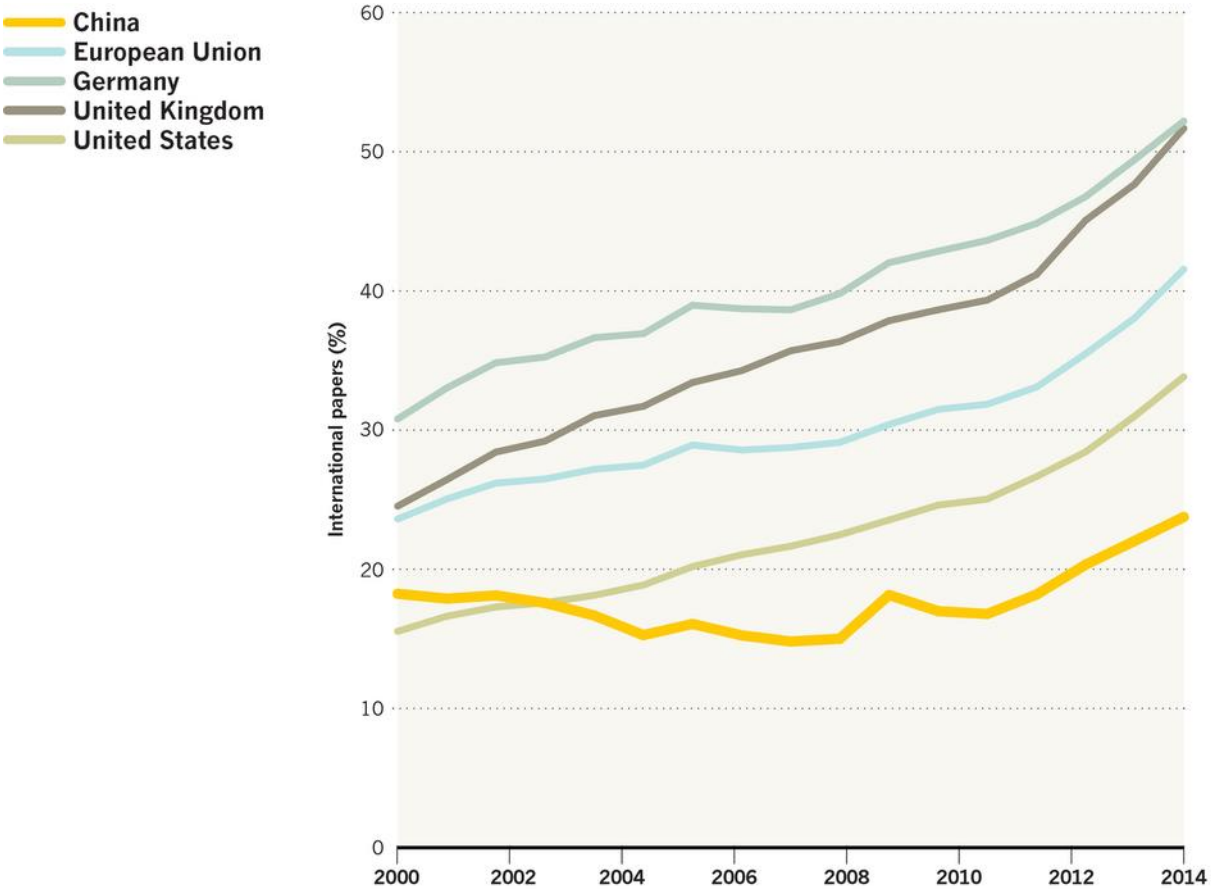

Figure 1. The development of Chinese papers with international co-authors in Web of Science compared to some countries (2000–2014)
Source: *Nature*, 2017

Arab-Chinese Research Collaboration

As seen in Figure 2, China collaborates with almost all countries over the globe, including the Arab world. The Web of Science data suggests that in 2014, Chinese authors were strong contributors to co-authored articles with Saudi Arabia, and this country stands among the 10 top collaborating countries with China.

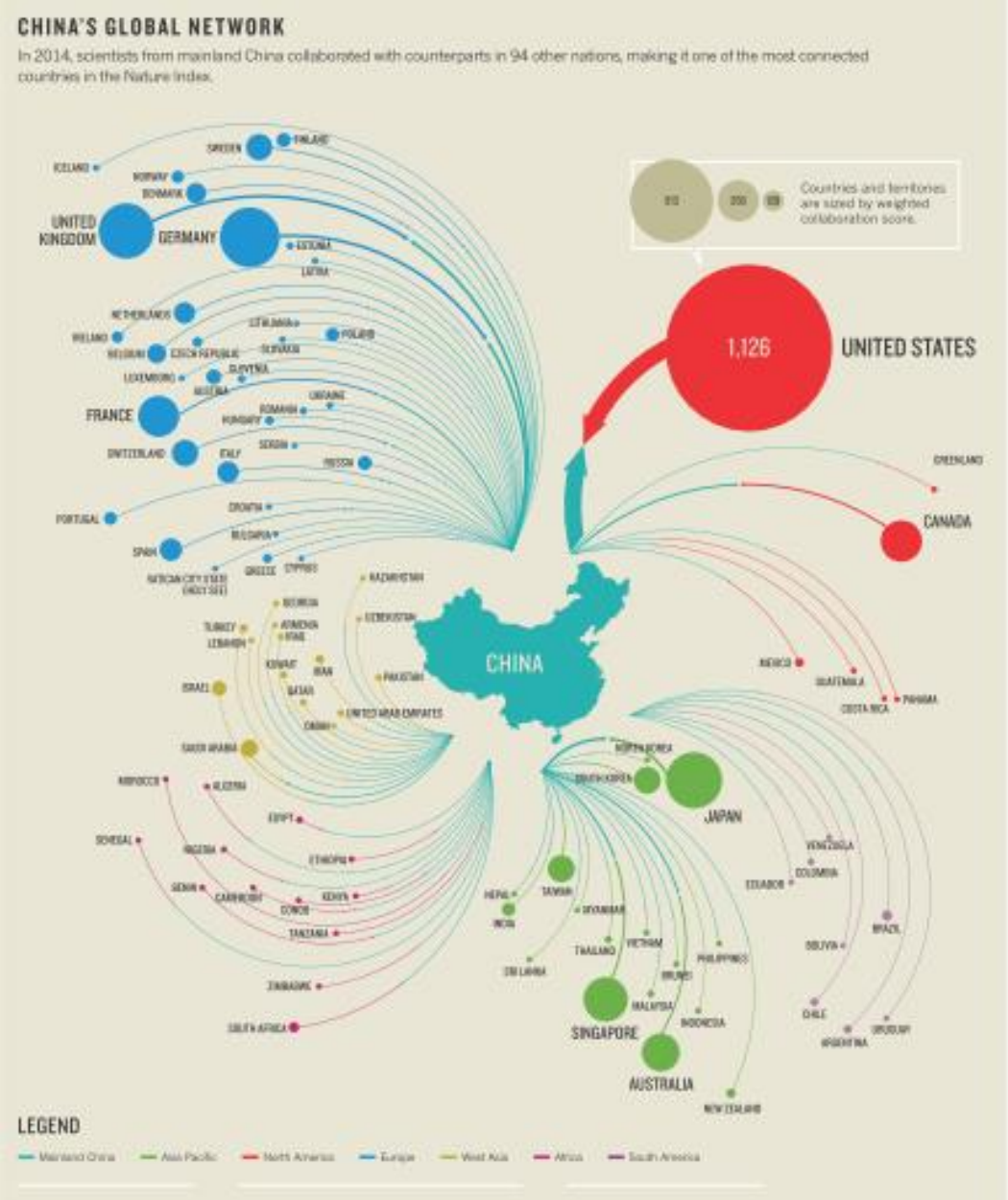

Figure 2. China's international collaborations in publication (2014)

Source: *Nature*, 2017

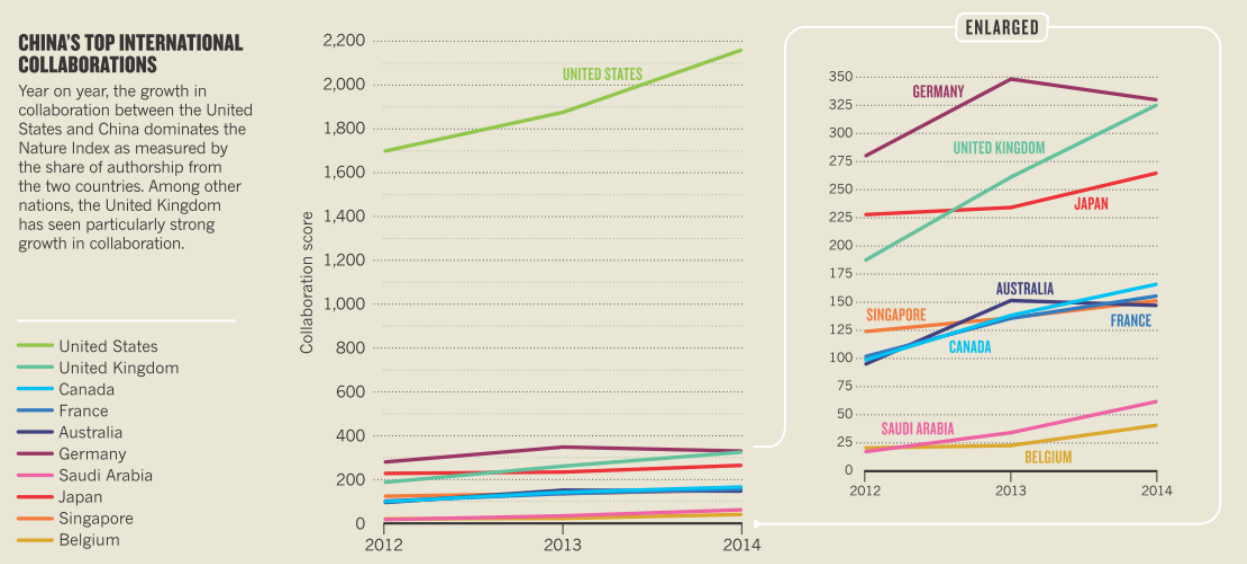

Figure 3. China's top international collaborations in publication (2014)

Source: *Nature*, 2017

We examined the scientific production from all Arab countries (21 countries) in the Web of Science (WoS) and Scopus, which seems to be more inclusive. According to WoS, the average share of co-authorship is 1.9% of total publications in the Arab world in the last decade (2007–2017), while it is 2.8% in Scopus. Not only is there a wider collection of articles in Scopus, but this database indicates nearly double the number of co-authored publications with China: 15,123 in Scopus and 8,197 in WoS, which is 84% more co-authored papers. Four Arab countries in WoS have more than 800 co-authored articles with China: Saudi Arabia, United Arab Emirates, Algeria, and Egypt; see Table 1. In Scopus, five countries mention more than 790 co-authored papers: Saudi Arabia, Egypt, Qatar, Morocco, and the Emirates; see Table 2. If we consider that WoS is more restrictive in defining what composes the scientific "mainstream," we can then make the hypothesis that WoS figures, although much smaller, concentrate on those fields that correspond to China's priorities, in terms of scientific fields. They depict the rather

older and stronger integration of co-authored publications in the more traditional mainstream fields in international journals, whereas Scopus provides figures that translate newer developments in the scientific fields both for China and the Arab countries. Nonetheless, one would have to enter into more detail to assess this aspect.[5]

When looking at the share of co-authored articles in the production of each country, one gets a rather different image. If we exempt the countries that have very small figures, which coincide with difficult political situations (Palestine, Sudan, Yemen, Syria, Bahrein) and produce strong outliers, a quite coherent image appears; see Table 3.

It is remarkable to show that the most active scientific country in the Arab world, namely Tunisia, has very low co-publications with China, either in absolute figures or in relative terms. The same goes for Kuwait, which has been among the oldest countries regularly producing scientific publications since the late 1970s and early 1980s (El Alami et al., 1992). Kuwait has a publication profile that is very close to that of Tunisia and, to a lesser extent, Lebanon. As Hanafi and Arvanitis (2016) show, most Arab countries have a very technical and physicochemical profile of publications (chemistry and agricultural sciences mainly), whereas Lebanon and Tunisia have a more life-sciences specialization.

Very strong linkages appear among Saudi Arabia, Qatar (not well represented in WoS), and the United Arab Emirates. Gulf countries have very actively promoted scientific publications and have had a policy to attract foreigners or expatriate nationals by paying high wages and giving good living standards. Since 2013, the number of co-authored papers between Saudi Arabia and China has leaped forward at a very high proportion. In general, in these three

[5] To our knowledge, Lili Wang (2016) has been assessing this distribution by areas by using the concept of revealed comparative advantages (RCA) from the field of international trade economics, rather than impact factor or citation analysis (Jin & Rousseau, 2004).

countries, the number of co-authored articles increases much more quickly than their overall production.

Morocco and Egypt, both large producers, also have strong linkages with China, although in a lesser degree than Gulf countries. Algeria has a very different presence in the two databases. We suspect there is a statistical anomaly there. In any case, Algeria has a very engineering-oriented specialization that is very congruent with China's profile.

Table 1

Publication in the Arab World in Web of Science and Co-Authorship with China (2007–2017)

Country	Documents	Co-authorship with China	% of co-authorships on country's total publication
Saudi Arabia	99,579	2,494	2.5
U.A. Emirates	24,745	1,432	5.8
Algeria	33,993	864	2.5
Egypt	101,150	831	0.8
Morocco	26,939	389	1.4
Lebanon	16,231	355	2.2
Jordan	16,779	347	2.1
Yemen	2,073	319	15.4
Tunisia	48,102	303	0.6
Iraq	9,515	243	2.6
Oman	8,116	196	2.4
Qatar	14,672	181	1.2
Kuwait	10,318	77	0.7
Palestine	264	56	21.2
Bahrain	2,645	48	1.8
Syria	3,637	30	0.8
Sudan	4,417	25	0.6
Comoros	63	6	9.5
Libya	2,889	1	0.0
Djibouti	102	0	0.0
Somalia	83	0	0.0
Total	426,312	8,197	1.9

Source: WoS (our computation)

Table 2

Publication in the Arab World in Scopus and Co-Authorship with China (2007–2017)

Country	Documents	Co-authorship with China	% of total publication
Saudi Arabia	118,860	6,734	5.7
Egypt	126,060	2,545	2.0
Qatar	17,349	1,311	7.6
Morocco	36,131	911	2.5
Emirates	32,112	790	2.5
Sudan	5,901	483	8.2
Iraq	14,553	433	3.0
Algeria	43,886	331	0.8
Lebanon	19,054	325	1.7
Tunisia	57,650	301	0.5
Oman	11,785	251	2.1
Jordan	24,357	226	0.9
Kuwait	13,172	192	1.5
Syrian Arab Republic	4,711	95	2.0
Palestine	4,418	71	1.6
Bahrain	3,787	51	1.3
Yemen	2,732	39	1.4
Libyan Arab Jamahiriya	3,853	25	0.6
Comoros	98	5	5.1
Somalia	118	4	3.4
Djibouti	176	0	0.0
Total	540,763	15,123	2.8

Source: Scopus (our computation)

Table 3

Share of Co-Authored Articles with China in the Total of Production

Scopus		WoS	
Qatar, Saudi Arabia	$p > 5\%$	UAE	$p = 5.8\%$
Iraq, Morocco, UAE, Oman, Egypt	$2\% > p > 3\%$	Iraq, Algeria, Saudi Arabia, Oman, Lebanon, Jordan	$2.1\% > p > 2.6\%$
Lebanon, Kuwait	$1.5\% > p > 1.7\%$	Morocco, Qatar, Egypt	$0.8 > p > 1.4$
Jordan, Algeria, Tunisia	$0.5 > p > 0.9\%$	Kuwait, Tunisia	$0.6 > p > 0.7$

Below we will analyze in detail the data from Scopus for the countries Saudi Arabia, UAE, Algeria, Egypt, Morocco, and Lebanon.

Many of the articles are co-authored by a large number of authors and funded by institutions other than Chinese or from each of the concerned Arab countries. The average number of authors per article for Morocco, Lebanon, Egypt, Algeria, and Saudi Arabia (SA) are 31.5, 15.8, 13.3, 7.7, and 5.2, respectively. Within the field of science, this variation is related more to medicine and biology and less to engineering and chemistry. These articles are often the product of research funded by large international consortia, either private or international, on topics that include multi-country and comparative methodologies. Most of these are funded from an institution from the United States or the European Union. Most of these articles are written in English, but some articles (21) are written in Chinese, but not Arabic.

The subjects of co-authorship are often similar. For the co-authorship between SA and China in the last decade, the top 10 subject areas are engineering (1,477 documents), chemistry (1,403), physics and astronomy (1,283), computer science (1,264), mathematics (1,188), materials science (1,172), biochemistry, genetics, and molecular biology (836), medicine (784),

chemical engineering (698), and agricultural and biological sciences (656). For the United Arab Emirates (UAE), these subject areas are to a large extent similar: engineering (225), medicine (155), computer science (126), physics and astronomy (122), chemistry (112), materials science (106), chemical engineering (77), mathematics (77), energy (74), and Earth and planetary sciences (72). It is interesting to note that in all of these countries except the UAE, the field of agricultural engineering is among the top 10 fields. Specialization in these areas is congruent both for China and those countries that have long been promoting agricultural engineering as a national priority.

From these data, we suggest that there are four patterns of co-authoring:

First, there are articles that have multiple authors driven by funding agencies or big laboratories in the United States or Europe, involving large research projects, usually needing comparison work, and/or involving a large number of countries that "participate" even very little, with some data. An example is the article "Global, Regional, and National Comparative Risk Assessment of 79 Behavioural, Environmental and Occupational, and Metabolic Risks or Clusters of Risks in 188 Countries, 1990-2013: A Systematic Analysis for the Global Burden of Disease Study 2013" (Forouzanfar et al., 2015). The team leader was Christopher Murray of the University of Washington, with 711 co-authors. This team leader also published another article (St. Raetz et al., 2016) with 34 co-authors: two authors from Syria, one affiliated with the Syrian Ministry of Health and the other independent, and seven from China. This article was funded by the Bill & Melinda Gates Foundation. Another medical article was co-funded by the British Heart Foundation and other donors.[6] Another example from the field of psychology is the article

[6] "Global, Regional, and National Age-Sex Specific All-Cause and Cause-Specific Mortality for 240 Causes of Death, 1990-2013: A Systematic Analysis for the Global Burden of Disease Study 2013" co-authored by multiple authors including 20 Chinese and two Syrians: independent and from Ministry of Health.

"Global Variation in Cultural Models of Selfhood" (Vignoles et al., 2016), co-authored by 72 authors. Some fundamental research, usually located in universities, receives funding from a variety of funders (not only Arab or Chinese). An example is an article in the field of work done under at CERN in astrophysics (St. Raetz et al., 2016) with 34 authors, one of them from Syria: M. Moualla, from Tishreen University, Department of Physics, Latakia, Syria.[7] Another article, "Searches for Electroweak Production of Charginos, Neutralinos, and Sleptons Decaying to Leptons and W, Z, and Higgs Bosons in pp Collisions at 8 TeV" (Khachatryan et al., 2014), was co-authored by 130 authors, the last one from Qatar. The acknowledgment shows more than 30 funding agencies for this project, one from China but no Qatari funding.[8]

[7] Here is the acknowledgement: "SR is currently a Research Fellow at ESA/ESTEC. SR, CA, RE, MK and RN would like to thank DFG for support in the Priority Programme SPP 1385 on the 'First Ten Million Years of the Solar system' in projects NE 515/34-1 and -2, NE 515/33-1 and -2, and NE 515/35-1 and -2. TK acknowledges support by the DFG program CZ 222/1-1 and RTG 1351 (extrasolar planets and their host stars). MK would like to thank Ronald Redmer and DFG in project RE 882/12-2 for financial support. MF acknowledges financial support from grants AYA2014-54348-C3-1-R and AYA2011-30147-C03-01 of the Spanish Ministry of Economy and Competivity (MINECO), co-funded with EU FEDER funds. DK and VR acknowledge support by project RD 08-81 of Shumen University. Z-YW was supported by the Chinese National Natural Science Foundation grant no. 11373033. This work was also supported by the joint fund of Astronomy of the National Nature Science Foundation of China and the Chinese Academy of Science, under Grant U1231113. XZ was supported by the Chinese National Natural Science Foundation grands no. 11073032, and by the National Basic Research Program of China (973 Program), No. 2014CB845704 and 2013CB834902. MM and CG acknowledge DFG for support in program MU2695/13-1. JS, RN and MMH would like to thank the DFG for support from the SFB-TR 7. CG, and TOBS would like to thank DFG for support in project NE 515/30-1. CM acknowledges support from the DFG through grant SCHR665/7-1. RN would like to thank the German National Science Foundation (Deutsche Forschungsgemeinschaft, DFG) for general support in various projects. We would like to acknowledge financial support from the Thuringian government (B 515-07010) for the STK CCD camera used in this project. This work has been supported by a VEGA Grant 2/0143/13 of the Slovak Academy of Sciences. The observations obtained with the MPG 2.2 m telescope were supported by the Ministry of Education, Youth and Sports project - LG14013 (Tycho Brahe: Supporting Ground-based Astronomical Observations). We would like to thank the observers S. Ehlerova and A. Kawka for obtaining the data."

[8] The acknowledgment is :"We congratulate our colleagues in the CERN accelerator departments for the excellent performance of the LHC and thank the technical and administrative staffs at CERN and at other CMS institutes for their contributions to the success of the CMS effort. In addition, we gratefully acknowledge the computing centres and personnel of the Worldwide LHC Computing Grid for delivering so effectively the computing infrastructure essential to our analyses.

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M. Kahn (2018) has been arguing these kind of papers, rather frequent among developing countries and emerging economies, are the product of mega-science projects that impose 'rules of use' to protect the intellectual property of the project staff. These rules enhance co-publication counts and citations and distort the use of co-publication data as a proxy for collaboration. It seems to be particularly true in the cases of China, India, Brasil, and South Africa.

Second, there are articles related to development and funded by China. An example is the article "Priming Effect of C-13-Labelled Wheat Straw in No-Tillage Soil under Drying and Wetting Cycles in the Loess Plateau of China" (Liu et al., 2015). This article has five Chinese

Foundation, Cyprus; the Ministry of Education and Research, Estonian Research Council via IUT23-4 and IUT23-6 and European Regional Development Fund, Estonia; the Academy of Finland, Finnish Ministry of Education and Culture, and Helsinki Institute of Physics; the Institut National de Physique Nucleaire et de Physique des Particules/CNRS, and Commissariat a l'Energie Atomique et aux Energies Alternatives/CEA, France; the Bundesministerium fur Bildung und Forschung, Deutsche Forschungsgemeinschaft, and Helmholtz-Gemeinschaft Deutscher Forschungszentren, Germany; the General Secretariat for Research and Technology, Greece; the National Scientific Research Foundation, and National Innovation Office, Hungary; the Department of Atomic Energy and the Department of Science and Technology, India; the Institute for Studies in Theoretical Physics and Mathematics, Iran; the Science Foundation, Ireland; the Istituto Nazionale di Fisica Nucleare, Italy; the Korean Ministry of Education, Science and Technology and the World Class University program of NRF, Republic of Korea; the Lithuanian Academy of Sciences; the Ministry of Education, and University of Malaya (Malaysia); the Mexican Funding Agencies (CINVESTAV, CONACYT, SEP, and UASLP-FAI); the Ministry of Business, Innovation and Employment, NewZealand; the Pakistan Atomic Energy Commission; the Ministry of Science and Higher Education and the National Science Centre, Poland; the Fundacao para a Ciencia e a Tecnologia, Portugal; JINR, Dubna; the Ministry of Education and Science of the Russian Federation, the Federal Agency of Atomic Energy of the Russian Federation, Russian Academy of Sciences, and the Russian Foundation for Basic Research; the Ministry of Education, Science and Technological Development of Serbia; the Secretaria de Estado de Investigacion, Desarrollo e Innovacion and Programa Consolider-Ingenio 2010, Spain; the Swiss Funding Agencies (ETH Board, ETH Zurich, PSI, SNF, UniZH, Canton Zurich, and SER); the Ministry of Science and Technology, Taipei; the Thailand Center of Excellence in Physics, the Institute for the Promotion of Teaching Science and Technology of Thailand, Special Task Force for Activating Research and the National Science and Technology Development Agency of Thailand; the Scientific and Technical Research Council of Turkey, and Turkish Atomic Energy Authority; the National Academy of Sciences of Ukraine, and State Fund for Fundamental Researches, Ukraine; the Science and Technology Facilities Council, UK; the U.S. Department of Energy, and the US National Science Foundation. Individuals have received support from the Marie-Curie programme and the European Research Council and EPLANET (European Union); the Leventis Foundation; the A. P. Sloan Foundation; the Alexander von Humboldt Foundation; the Belgian Federal Science Policy Office; the Fonds pour la Formation a la Recherche dans l'Industrie et dans l'Agriculture (FRIA-Belgium); the Agentschap voor Innovatie door Wetenschap en Technologie (IWT-Belgium); the Ministry of Education, Youth and Sports (MEYS) of the Czech Republic; the Council of Science and Industrial Research, India; the HOMING PLUS programme of Foundation for Polish Science, cofinanced from European Union, Regional Development Fund; the Compagnia di San Paolo (Torino); and the Thalis and Aristeia programmes cofinanced by EU-ESF and the Greek NSRF."

authors and one Syrian (Theib Oweis) from the International Center Agricultural Research Dry Areas (ICARDA), Damascus. The research work was supported by the Chinese National Scientific Foundation, the Special Fund for Agro-Scientific Research in the Public Interest, and the 12th Five-Year Plan of the National Key Technologies R&D Program. It should be noted that ICARDA is an international research center belonging to the Consultative Group of International Agricultural research centers (now based in Montpellier) and China is very much promoting agricultural research through these centers. ICARDA, before the war, was based in Syria.

Third, there is research funded exclusively by China. The article "Fabrication of CeO2/ZnCo2O4 n-p Heterostructured Porous Nanotubes via Electrospinning Technology for Enhanced Ethanol Gas Sensing Performance" (Alali et al., 2016) has eight authors: six are Chinese and two from Syria (University of Aleppo, Syria). This research was supported by National Natural Science Foundation of China, Fundamental Research Funds of the Central University of Helongjiang (HEUCFZ), Natural Science Foundation of Heilongjiang Province, International Science & Technology Cooperation Program of China, and the Major Project of Science and Technology of Heilongjiang Province.

Finally, there is research conducted by Arab researchers who have a double affiliation and are funded by Chinese agencies. One example could be the article in the domain of chemistry, food science and technology, nutrition and dietetics, "Enhancing the Antimicrobial Activity of D-limonene Nanoemulsion with the Inclusion of Epsilon-Polylysine" (Zahi et al., 2017). The first author is Algerian, who has two university affiliations: in Beijing and Blida (Algeria). This project was supported by the Beijing Natural Science Foundation, the National High Technology Research and Development Program of China, and the Fundamental Research Funds for the Central Universities.

Out of these four patterns of co-authorship, few co-authored articles can be mentioned to be the product of a complete common research project between Arab researchers and their Chinese counterparts. In most cases, Arab researchers are part of a larger research programme.

The China's Arab Policy Paper (Chinese Government 2016, January 13) announced an interest for China to carry out scientific collaborations with the Arab world but the initiatives are not numerous. There is a project of Sino-Jordanian university and another one in design now called "Outstanding Young Scientist Coming to China Project," which encourage exchanges between young scientific talents of China and Arab states. It is very striking from a country such as Sudan, which has a very longstanding relationship with China starting in 1956 when China helped Sudan in all domains of development but very little in scientific cooperation. Jaafar Karrar Ahmad (2016) lists almost 200 projects of Chinese aid, soft loan, and investment in the framework of trade and investment agreement against the oil that China buys from Sudan. However, the only project that was not implemented was an integrated information system of higher education. It is clear that there is no evidence of supply from China or demand from Sudan to foster scientific collaboration. The same observation can be made about Algeria. In 2015 the Gross Annual Revenues of Chinese companies' construction projects in Algeria amounted to more than US $8 billion without any substantial research component to this economic cooperation.[9]

Generally speaking, the Arabs have historically not really developed a cultural relationship with China that would be aligned with the level of economic cooperation. For instance, the Lebanese historian Masoud Daher (2017) argued that not much Chinese literature has been translated into Arabic. Recently, more linguistic connections have been established,

[9] See China Africa Research Initiative (CARI), http://www.sais-cari.org/s/Uploaded_ContractData-nnc5.xlsx.

thanks to the Confucius Institute, which one may find in many Arab countries. The Confucius Institute at the University of Dubai has taught people of all ages from a wide range of backgrounds (Rakhmat, 2015). The China–UAE cooperation in education and research is more likely to witness more positive developments in the coming years, especially in terms of the enrollment of Chinese students in UAE universities (Hamdan, 2013).

We consider here some reasons why thus far the research collaborations are not (yet) significant.

First, although China mentions an overall interest with Arab countries, it still is rather lower in priority than the interest China has with other regions, and particularly the European Union. China and the European Union launched a new co-funding mechanism to support joint research and innovation activities. Each year, more than €100 million from the EU's Horizon 2020 program will be matched by at least €28 million from Chinese programs, for projects that involve European and Chinese participants. Before Horizon 2020, the EU ran the 7th Framework Programme from 2007 to 2013, in which China was the third largest international partner country, with 383 Chinese organizations participating in 274 collaborative research projects that garnered €35 million of funding from the EU. It has been shown that the first agreements led to rather a small number of publications, but the newer H2020 EU programs seem to be rather more productive (L. Wang, personal communication, September 2016).

Second, diasporas may play some role in scientific collaborations, although Gaillard et al. (2013a and 2013b) have shown that among drivers of international collaborations in science, diasporas are the lowest of all; this holds true for Europe, Arab countries, Turkey, Israel, and Latin America. Nonetheless, when initiating a new collaboration, it might appear that expatriates play some role. There are many Chinese communities in Europe and the United States that are

not found in the Arab world. The Chinese scientific diaspora is very important indeed: only about one-third of the 380,000 who went abroad over the past 20 years have gone back to China (Cao & Suttmeier, 2001). The Chinese government has tried repeatedly to tap this huge human resource and has designed many efforts to incentivize a return to China by Chinese-born scientists.

> The Thousand Talent Program, operated by the Central Origination Department of the Communist Party, is a prominent example of its efforts. Many Chinese scholars have studied in the United States, and this contributes to international connections that continue after returning to China. (*Nature*, 2015, para. 3)

Since they were set-up 20 years ago, these programmes have not been the object of any assessment apart from anecdotes and one unique study (Lu & Zhang, 2015.

Third, the Arab world and China have very different economic structures but are closely linked by trade. The Arab interest in science and innovation is less important than that of China for the market in Arab countries. Nonetheless, in the social sciences, alongside articles co-authored by both Chinese and Arab scholars we only find articles in pragmatic domains such as business (corporate social responsibility, organizational studies, etc.), psychology (cross-cultural interpretation of personality, individualism, collectivism, autism, etc.), or international relations. We do not yet find any critical study, either in sociology or in anthropology, that might be considered as threatening to the social or political order in the Arab world or China. .

Conclusion

As we argued in this chapter, there is promising scientific publications co-authored by Arabs and Chinese, but this does not translate automatically into high-level collaborations. As mentioned above, part of the co-authorship relates to large scientific projects, as was underlined

by Michael Kahn (2017: 117). Collaboration is thus limited to integrating these large research projects, not because of a choice, but because of the need these projects have into feeding with comparative data or large international networks. We explore some reasons for this lack of collaborations. Maybe should we underline that research is still not very high in the political agenda of Arab countries and that "science diplomacy" appears as very strange to Arab countries (not so for China). Moreover, there is little previous grounds of collaborations through training or stays abroad involving both regions. Australia, for example, has set-up a policy with China for geo-strategical reasons being a neighbor country (Australian Government, 2011). The EU is also trying to figure out a policy with China. None of this appears in the agendas of Arab countries.

In order to foster collaborations, China and the Arab world should have clear programs providing institutional funding and facilitating collaborations between scholars from both sides. Nonetheless, we believe the linkages will still be pragmatic ones, mainly in technical and engineering fields. In the post-Arab uprisings era, the Arab world is divided into two groups. The first group is made up of those who are open to the wings of change: more freedom, more justice, and more democracy. China will disappoint them concerning freedom and democracy. For the second group, made-up by those supporting the authoritarian governments, China is a perfect partner who can provide safe scientific collaboration without cultural interference. Gulf countries do seek this kind of collaboration. (see the contribution of Habibul Haque Khondker in this volume) China's government will preach neither human rights, nor women's rights or democracy, so it appears as the best possible partner, bringing science without critical thinking, exactly as these Arab authoritarian countries have taken the Western technology and the natural and exact science but not the social science. Arab countries are thus dissociating the economic from the political: a sort of win-win strategy, as Mohamad Hamshi (2017) puts it. But the scientific prospect is still not one that appears as interesting enough either to the Chinese partner

or the Arab countries, at least in the official relations. It does indicate thus, that the authoritarian mode of government, a shared feature of most Arab countries and China, is not enough to guarantee collaborations.

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