Benefits and Challenges of International Mobility of Researchers: The Chinese Experience

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Abstract

Globalization and the shift into knowledge economy have made researchers amongst the most sought-after resources. International research mobility has been encouraged at policy levels, and increased remarkably in the past decade. Meanwhile, concerns of policy-makers about possible loss of such human capital is also fast growing. This article first reports major findings in the literature on international mobility of researchers. It then examines China's loss of researchers, and how China attempts to reverse the brain drain. Citing a major policy initiative as an example, it assesses China's efforts to deploy its large and highly-skilled diaspora in the service of Chinese scientific and technological development. It maintains that in the fierce competition for global talent, China has been taking proactive stance with only limited success. It argues that China needs to reform its academic culture in order to be able to lure its best minds back from overseas and retain them.

Introduction

Research mobility has increased remarkably in the past few years. When moving, researchers can spread and increase their human and social capital. Via mobility, researchers can access to best scientific equipment and teams and improve their career prospects both abroad and in their home countries. International mobility is an important advantage for excelling in the academic profession in many fields and higher institutions. There is an "expectation of mobility" in research careers, depending on country and discipline. In many fields it is standard practice to pursue a postdoctoral stay abroad after finishing the doctorate. Young researchers are often lured away during their higher education years and remain in the host country upon graduation.

International mobility is far from a recent phenomenon in the academic world. Scholars have been internationally mobile for centuries, and this has generally been considered positively both for researchers and their environment. With globalization, however, international mobility is a particularly growing phenomenon. International research mobility is encouraged at the policy levels locally, nationally and globally. The European Union (EU), for example, has proposed a significant number of measures to increase the mobility of researchers across the European Research Area to help researchers develop their research career. Scholars and policy makers are increasingly interested in quantifying it. There is a growing interest in mapping their mobility patterns and understanding what drives them.

There have been concerns about international mobility of researchers. Firstly, mobility creates difficulties for individual. For example, reintegration into the national research system is not always smooth in certain European countries. Around 10-20% of Swedish postdocs are reported to find it difficult to transfer the knowledge they have gathered abroad to their department back home (Melin 2005). The issue becomes more serious in non-Western societies such as Korea, Japan and China. Secondly, there has been substantial disciplinary differentiation in international mobility of researchers. Natural and medical researchers have generally a higher propensity to be mobile. Thirdly, many countries are worried about their loss of highly skilled human capital. In a context of global competition for talent, it is important to ensure an adequate supply of researchers and to create conditions for their mobility between national borders.

China has been an active player in the global mobility of researchers. On the one hand, China has contributed hugely to the movement. By 2012, there had been 2.64 million Chinese students overseas, but only 1.09 million had returned. Although more students are returning as the Chinese economy develops recently, the return rate has been modest (Tharenou and Seet 2014). Many, especially the best, have remained overseas (Zweig 2013). On the other hand, China is the top country seeking human resources worldwide. Since the 1990s, the Chinese government has made great efforts and invested substantially to reverse the brain drain (Cao 2004, 2008; Li 2004; Zweig 2006a). There have been various policies at different levels from the central and local governments to higher learning institutions. Such a move becomes even more significant as China adopts building an innovation-based society as its national strategy.

The issue of highly skilled migration, with a special reference to academic mobility, has aroused worldwide attention especially in the political arena. Yet, there has been little on international mobility of researchers in the literature. Studies are also lacking to assess whether or not China's efforts to attract world's best researchers have been successful. Based partially on the findings from an Australian Research Council Discovery Project during 2007-2009[1] and its related studies,[2] as well as on the author's longstanding academic enquiry and professional observation, this article locates China's current endeavors into a global context. It assesses both the social costs and benefits and the challenges they face, citing the "Thousand Talents Plan" as an example. It tests the effect and efficiency of such an extraordinary policy.

The Global Mobility of Researchers

Most published work has focused on highly skilled talents. Few studies look at researchers. The definition of researchers has been offered differently and gathering data on the population of researchers has been difficult. Some studies look at the population of doctoral holders. However, not all doctoral holders move on to become researchers and not all researchers are doctoral holders. Another strand of the literature studies the elite researchers within a certain discipline. Yet, definition of 'elite' also varies, usually entails winning a certain award (e.g. the Nobel Prize), publishing in certain prestigious journals (e.g. *Science* and *Nature*), receiving an exceptional number of citations to one's work (e.g. International Science Index's list of highly cited authors) or working at a prestigious institution. In general, researchers are seen as a small subgroup of the highly skilled. They are economically important as they produce the research that precedes the R&D developments that drive economic growth in the knowledge economy.

The global movement of researchers represents contemporary dynamic international flow of human talent and reflects the reality of the global labor market. Top researchers move from poorer to wealthy countries as part of the global movement (Khoo et al. 2007). Critical to economic development, such people are among the most sought-after resources (Wadhwa et al. 2009). They are precisely what developing countries need most in their nation-building in a context of a widening gap between rich and poor societies. However, developing countries are losing their most talented researchers to developed countries. This has severely affected their economic and social progress. The global competition for talents has further disadvantaged developing countries (OECD 2008). Bulgaria, for example, lost one small town of 55,000 to

[1] The Australian Research Council Discovery-Project Grant was entitled The Chinese Knowledge Diaspora and the International Knowledge Network: Australian and Canadian Universities Compared, undertaken by Professor Anthony Welch (University of Sydney) together with the author.

[2] Its related projects included three doctoral studies conducted by Hongxing Cai (2011), Jie Hao (2012) and Zhen Zhang (2014) at the University of Sydney under the supervision of Professor Welch.

60,000 of its highest educated and skilled population each year during the 1990s (Chompalov 2000). During the same period, around 500,000 and 800,000 Russian scientists left for Western industrialized countries (Saravia and Miranda 2004).

The mobility of researchers is part of the global issue of brain drain, a phenomenon well recognized since the 1960s. Brain drain involves a net loss of skilled persons from less developed nations and a net gain in the more developed countries (Adams 1968). For poor countries, it is their "brightest and the best" who most tend to move out. Recent migration policies of OECD countries place great emphasis on skill in their selection of immigrants (Hugo 2005), together with the competition for talent and skilled workers (Abella 2005). Although there have been discussions from brain drain to brain gain and further to brain circulation claiming that the brain drain's effects on development are not necessarily only negative (Saxenian 2002, 2005), the loss of their scarce human resources continues to have a severely negative impact on developing countries.[3] The issue of brain drain remains relevant. For many countries, the outflow of their best researchers is something their policy-makers cannot ignore.

Within the developed world,[4] some countries suffer from brain drain on the one hand and attract researchers on the other. For example, there has been an outflow of talents from Australia and Canada to the USA and European countries while both are "magnets' for skilled immigration from developing countries (OECD 2007). The USA appears to be a pure beneficiary of the global movement of researchers. Historically about half of foreign science and engineering doctoral recipients in the USA stay after completing their studies. The percentage increased from 63% in 1990-1993 to 76% in 1998-2001. Although some have estimated the trans-Atlantic drain was only between 0.5-1% (Saint-Paul 2004), these are top performers within their fields. The USA also seems to be best prepared for a global competitive market for talents. Its labor markets are flexible to welcome these global citizens looking for the most promising places to pursue their career (Straubhaar 2000).

The USA attracts best researchers from both developing countries and relatively skill-abundant Europe. Such people have been important contributors to the US technological edge. According to Stephan and Levin (2001), individuals making exceptional contributions to US scientific and economic development are disproportionately drawn from the foreign born. *The Economist* (2006) reported that half the Americans who won Nobel prizes in physics in the past seven years were born abroad. Such success stories as Intel, Sun Microsystems, Yahoo, E-bay or Google were all founded or co-founded by immigrants. The total number of Europeans in the USA outweighs by a very large margin that of Americans in Europe. In 2000 there were five times more French and fifteen times more Germans in the USA than Americans in France and Germany. Even if all US expatriates and only half of French and Germans expatriates were highly skilled, these countries would still be net exporter of skills to the USA (Dumont and Lemaître 2005).

Evidences show an asymmetrical flow of scientists between Europe and the USA: far more EU scientists move to the USA than US scientists move to the EU. A large part of this migration toward the USA occurs in workers' higher education years, and a large fraction of

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[3] While the movement of talented researchers from developing to developed countries remains serious, brain outflow also occurs among developing countries. South Africa, for instance, bemoans its loss of researchers to other countries while its neighbors complain about their loss of talents to South Africa (Teferra and Altbach 2004).

[4] China shares a loss of its best researchers with other developing countries. However, considering a major aim of this article is to assess China's achievements and challenges in the implementation of its schemes to draw best researchers to China, the focus here is on the developed world. This is because developed countries are firstly China's rivals, and secondly China can learn much from their experiences.

students stay to work in the USA later on. An OECD study of doctoral holders from seven OECD countries finds that although Switzerland and Canada have higher shares of foreign doctorates, the USA remains the main destination in absolute terms (Auriol 2007). There is very little international mobility among US doctoral holders. Stay rates of foreign doctorate recipients in the USA are high (Finn 2005). In the case of the UK, while it loses brain to the USA, it is a net importer of young academic staff and manages to attract back highly productive academics who spent some time abroad to establish their research reputations (Bekhradnia and Sastry 2005).

According to Oswald and Ralsmark (2008), there is "a funneling of talent into the United States" at the bachelor-degree level. They analyzed 112 assistant professors at ten top US departments of economics in Harvard University, Chicago University, Massachusetts Institute of Technology, University of California at Berkeley, Princeton University, Stanford University, Yale University and New York University. The typical assistant professor had a BSc from outside the USA and a Ph.D. from inside the USA. Only 25% of the sample obtained their first degree in the USA while 87% got their Ph.D. there. Assuming that the region where the bachelor degree was obtained is the same as the country where the person was born, 62% of the subjects migrated to USA after their bachelor education and got their Ph.D. and that a further 13% moved there after their Ph.D. Oswald and Ralsmark thus found evidence of a severe brain drain. Unlike most brain drain research that focuses on academics in science and engineering, they looked at economists.

Analyzing the international mobility of the ISI[5] highly cited over various disciplines, Maier, Kurka and Trippl (2007) found a high concentration of scholars in Western countries, especially in the USA. Spatially mobile knowledge spill over agents may generate a number of side effects that lead to a more complex picture than the simple brain drain-brain gain dichotomy. The term brain circulation seems to be more adequate for describing the effects of the mobility of knowledge spill over agents. As for the spatial distribution of highly cited "star scientists" as identified by *ISI HighlyCited.com*, there is a strong concentration of star scientists in the highly industrialized countries and in the USA in particular, with significant differences between subject categories regarding mobility and spatial concentration. Mobility patterns are strongly oriented toward the USA, and contribute to an increase in the spatial concentration of star scientists in all subject categories.

Using a broad definition of elite scientists including winning the Nobel Prize and publishing in *Science* and *Nature*, Laudel (2005) pointed out that it was not the established elite scientists that moved, but the young, potential elite. According to her, migration is field-specific, occurs more among potential, rather than among established elites, and policies aiming at eminent scientists may prove inadequate to the task of sustaining national scientific communities. The 'elite brain drain' works to the advantage of the USA. Migration to the USA occurs less often when scientists are already elite members. It is the potential elite rather than the actual elite that move and recruitment into the elite appears to turn mobility into migration at the same time. Similarly, Hunter, Oswald and Charlton (2009) find that the movement and productivity of elite scientists is remarkable: nearly half of the world's most-cited physicists work outside their country of birth; they migrate systematically toward nations with large R&D spending; movers and stayers have identical h-index citations scores. They also point out that elite researchers are especially mobile, and tend to concentrate in a few places, notably in the USA.

Based on 1980-2006 census data, Tritah (2008) showed that a brain drain of researchers from Europe to the USA had increased especially since the 1990s. The emigrants were from the

[5] ISI stands for the International Science Index.

upper tail quality distribution of their source country workforce in terms of education, scientific knowledge and unobservable skill, while returnees are fewer, older and less educated. Grip, Fouarge and Sauermann (2008) analyzed migration of graduates from science and engineering studies from nine European countries. They found that not only wage gains were driving the migration decision. Differences in labor market opportunities related to R&D spending were a strong predictor of future migration. They found strong evidence of selective migration: the best graduates were most likely to migrate. Qualitative aspects of the job match such as the utilization of skills in the job and involvement in innovation hardly matter in the decision whether or not to migrate. Wage level affects migration toward countries in continental Europe, whereas Anglo-Saxon countries seem to attract migrants due to their larger R&D intensity.

Therefore, many countries seek to increase their stock of "brainpower" by reducing mobility barriers for the highly skilled workers. In today's high-tech knowledge economy, given the importance of science and technology for growth and welfare, EU policy-makers, for example, are increasingly worried about their perceived outflow of scientists from the EU to other parts of the world, mainly to the Anglo-Saxon countries, and especially to the USA. The European Commission proposed a "blue card" scheme in 2007, officially to rival the American Green Card, to significantly reduce immigration barriers for the highly skilled workers. Besides attracting worldwide brains, policymakers in Europe are also steadily concerned with retaining their human capital. In its examination of the brain drain to the USA, the Third European Report on Science and Technology noticed that 73% of the 15,000 Europeans who studied for their Ph.D. in the USA during 1991-2000 planned to remain there (European Commission 2003).

China's Loss of Researchers and Coping Strategies

By 2013, 3.05 million Chinese had gone overseas to study and 1.44 million of them had returned, while the numbers were respectively 2.64 and 1.09 million by 2012 (Xinhua News Agency 2013, 2014). There was a "deficit" of 1.5 million based on 2012 numbers. China is "losing blood" especially when it comes to high-end talent. Studying abroad remains a prevailing trend for Chinese students (Waghann 2013). According to the *Report on Studying Abroad 2014* released in March 2014 by China Education Online (2014), over 413,900 Chinese went to study abroad in 2013. Among them, 103,427 and 93,768 were respectively at postgraduate and undergraduate levels. Many of those studying abroad over the past three decades have grown to be world's leading researchers, and over 70% of them have opted to stay in their host countries after graduation (Cheung 2014).

The overwhelming majority of Chinese students have studied in affluent Western societies, particularly the USA. The higher their academic credentials abroad are, the less likely they return to China. They seem to follow a pattern: studying in the USA, looking for employment opportunities, applying for green card after securing visas, and obtaining American citizenship. This is why Science Magazine referred to Tsinghua and Peking Universities as "the richest base for cultivating American Ph.D.'s" in July 2008 (Wang 2012). This is confirmed by Bijwaard's (2010) finding that Chinese students show the highest permanent probability of stay, in marked contrast to the students from other countries who travel to the Netherlands to study and return to their home countries after graduation. According to the head of office of the Central Coordination Group for Talents' Work, 87% of Chinese students and academics in science and engineering chose to stay overseas (Li 2013).

In the fields of science and engineering, the retention rate of Chinese doctoral graduates in the USA during 1990-1999 was 87%, higher than India's 82%, Taiwan's 57% and South

Korea's 39% (OECD 2002). The return rate among Chinese who received Ph.D.'s in the USA is shockingly low. Approximately 92% of all Chinese who received a science or technology Ph.D. in the USA in 2002 were still in there in 2007 (Wessel 2010). Furthermore, the best of the domestically trained also travel overseas. In 2006, for example, respectively 571 and 507 Ph.D. graduates from Tsinghua University and Peking University settled in the USA (Wang 2012). China is now a major source of immigrants to the USA, but only about 40% of Chinese immigrants with high-tech skills acquired Bachelor degrees in the USA (Taylor 2006).

The return rate of overseas Chinese students increased from 14% to 23% during 2000-2004 to around 30% during 2005-2007 and to 40-47% during 2008-2010 (National Bureau of Statistics 2011). However, those drawn back by China's universities and scientific research institutes are not the "crème de la crème" of its overseas talent. China's best and brightest student still prefer to stay overseas (Zweig 2013). Even those who returned, many of them left again (Tung 2007). China thus suffers from serious brain drain. The outflow of talent, especially the loss of high-end group, affects China's sustainability of fast economic growth due to the nation's lack of innovation. China ranks 29th in Global Innovation Index 2014 compared poorly with top performers such as Switzerland, the UK, Sweden, Finland, the Netherlands, the USA, and Singapore. As China moves to center-stage in the global economy, a war for scarce talent and competitive advantage has been unleashed (Cornell University, INSEAD and WIPO 2014).

Starting from top politicians, China has consistent policy initiatives to bring its best minds from overseas. Since the 1990s, China has been among the most assertive in the world in introducing policies to reverse the brain drain of scientific and entrepreneurial talent, as part of its aim of becoming a global economic and science powerhouse (Sharma 2013). At present, overseas recruitment has mainly focused on luring top talent back to China. The Chinese government has implemented various initiatives to reward those who choose to return. Earlier programs included the "100 Talents Program" by the Chinese Academy of Sciences in 1994, and the "Yangtze River Scholar Program" by the Ministry of Education in 1998.

With three decades of rapid economic growth and social development, China has improved its position to attract global talent as pull factors, including globally competitive salaries, better career opportunities, continuous increase of spending on science and technology and, much improved research and social environment, and a larger pool of talent formed over years. China's efforts are also contextualized by international push factors including the global financial crisis and cuts and low morale in some Western systems. China's recent schemes set the bar higher and cast the net wider (Qiu 2009). The "1000 Talents Program" launched in 2008 plans to attract 2,000 leading researchers under age 55 with professorship or equivalent positions in renowned foreign universities or research institutes over a period of 5-10 years. The "1000 Youth Talents Program" for Distinguished Young Scholars initiated in 2011 aims to attract 2,000 excellent young overseas scholars under age 40 by 2015.

What China has been doing is not necessarily extraordinary, yet how and to what extent China has been doing so is. Based on my observation, the Chinese experience has been featured particularly by the following:

Strong Government Role

China's global talent policies are part of its national talent plan that has been high on the agenda for years. The emphasis on *rencai* (talented personnel) received great attention at the 2001 Asia-Pacific Economic Cooperation conference on human capacity building in Beijing. The government announced its 2002-2005 National Talent Building Plan in 2002, followed by the

first national conference on human resources development in 2003. The government then established the Central Group for the Coordination of Talented Personnel, an above-Ministry unit led directly by Li Yuanchao, a Politburo member and Head of the Central Organization Department. A special section on talent development was included in the 10th Five-Year Plan (2006-2010), and talent development was adopted as a strategy to revitalize the country at the 17th Party Congress in 2007. In 2010, the *National Medium- and Long-term Talent Development Plan 2010-2020* was jointly issued by the Central Committee of the Chinese Communist Party and the State Council.

Deploying the Chinese Knowledge Diaspora

Accomplished Chinese citizens represent a significant potential talent source for China's high-level innovation talent pool (Welch and Zhang 2007). In an era when the knowledge economy is increasingly global in form, such knowledge diaspora are a target of national migration and innovation policies (Kuptsch and Pang 2006). They can play a unique role in integrating China more closely with the international scholarly community and in China's R&D development. For China, deploying such diaspora option becomes a priority, representing a more nuanced response to issues of brain drain (Zweig 2006b). China's focus on its knowledge diaspora is also due to realistic considerations. Although China's human resource in aggregate terms is substantial, it lacks human capital, especially at internationally cutting-edge level. China has not yet become an attractive destination for international researchers. It can only focus on bringing back its own people who have studied and stayed overseas before it can attract world's best researchers of non-Chinese origin. The government is mobilizing the vast knowledge diaspora in the service of the homeland. Various programs have been launched to draw back top-flight overseas researchers of Chinese origin.[6]

Incentives at Various Levels

China's local governments, higher education institutions and national laboratories are taking the initiative to recruit global talent. Unlike the central government's interest in top scientists and engineers, local governments are keen on entrepreneurs. They have been effective in promoting returnee entrepreneurship in high-tech industries such as internet, IT, communication, media and new energy. By February 2009, local governments had established more than 110 overseas returnee entrepreneurship incubation centers, with over 8,000 enterprises and 20,000 returnees. Those in Beijing, Shenzhen, Wuhan, Dalian, Suzhou and Wuxi have established their special talent zones. Beijing's Zhongguancun, for example, has explored new policies to set up a special talent zone that has made it China's Silicon Valley (Wang 2012). There are intergovernmental efforts to create trans-local networks for overseas returnees, such as the Association of China Returnee Entrepreneurship Parks comprises 41 high-tech parks from Beijing, Nanjing, Shanghai, Shenzhen and some other cities. Initiated by governments in different cities, such networks have an explicit purpose of fostering closer relationship among high-tech parks in different regions. Chinese universities are also actively recruiting global researchers. Many senior academics working at top universities in the West and in Japan, Singapore and Hong Kong are approached

[6] However, whenever possible, China is keen on all kinds of top researchers, irrespective of their racial and cultural backgrounds. So far talents recruited into China are overwhelmingly ethnic Chinese, but those of non-Chinese origins have begun to show interest in working in Chinese universities, research institutions and state-owned enterprises. By 2009, there were 223,000 foreigners working in China with permits, although, only a small percentage of them are top researchers (Wang 2012).

by Chinese universities to take posts. Between 1999 and 2005, the number of academic returnees to China increased from 7,000 to 30,000 (Zweig 2006b).

The "1000 Talents Program:" An Example

Launched in late 2008, the "1000 Talents Program" targets top talent from overseas, especially aiming to entice high-flyers back home. The scheme is supposed to run to 2018 to attract 2000 internationally leading researchers to careers in Chinese universities, institutes and corporations. Four types of organizations are eligible to apply to recruit global talent through the scheme: national innovation projects, key scientific subjects and laboratories, central government-owned enterprises and state-owned banking institutions and high-tech parks. Municipalities and provincial governments propose the talent needed by their localities to the central government. They set out across North America, Europe, the Oceania and parts of Asia such as Japan and Singapore on recruitment drives. Many city governments volunteer their commitments as to the number of talented returnees they would recruit. In addition to competitive payment package, they also promise to resolve all housing, education and healthcare problems.

The Office for Attracting High Level Overseas Talent established by the Central Organization Department coordinates the evaluation and selection process. The Ministry of Science and Technology evaluates candidates for national innovation projects and works with the Ministry of Education to evaluate candidates for key subjects and laboratories. The State-owned Assets Supervision and Administration Commission of the State Council and the People's Bank of China evaluate applicants for state-owned enterprises and banking institutions. The Ministry of Science and Technology and the Ministry of Human Resources and Social Security evaluate talents with entrepreneurial skills.

The Chinese government and relevant accepting organizations deliver full support to the recruited awardees, based on their strong technical backgrounds, to help them establish their careers in China, in science, technology innovation, and business development. Through a wide variety of terrific incentives including huge monetary, assistance with housing, and tax-free education allowances for their children, China's central and municipal governments encourage academic and research institutes to "bring back the best." Non-Chinese professionals and their families can apply for Permanent Residence or multiple-entry visa valid for 2-5 years; for all professionals selected by the scheme, the central government will provide each with one million *RMB* as a one-time subsidy in addition to their salaries, which should be comparable to the remuneration of their previous post; professionals and their families will be able to enjoy social security benefits.

Awardees must have foreign doctorates, be under 55, and willing to work in China for no less than six months each year. The program targets those with titles on a par with professors in prestigious foreign universities and scientific research institutes, senior technical and management professionals working in well-known international companies and financial institutions, entrepreneurs owning proprietary intellectual property rights or with "core technologies" and overseas experience as an entrepreneur, and those who are familiar with related industries and international practice. It is required that the technologies brought by awardees must be "internationally advanced" and can fill the domestic gap with market potential.

The plan has met with some success. As of summer 2011, 2,100 people had returned under this program. Some 3,500 returnees have been recruited in less than five years under the initiative (Sharma 2013). A national survey in late 2011 showed that there had been 1,510 recruitments within the first two years. Among the recruited, 1,161 (77%) focused entirely on

research while 349 (23%) worked in companies; 991 (65.6%) were foreign citizens while 519 (34.4%) were holding Chinese passports. As for their racial backgrounds, most of them were overseas Chinese with foreign passports with only 50 (3.3%) were non-Chinese.[7] In terms of their professional ranks, 850 (56.3%) had held full professorship or equivalent. The program was perceived well by Chinese elite researchers: 54% of the 500 surveyed academicians of the Chinese Academy of Sciences and the Chinese Academy of Engineering thought positively of the scheme.

However, the plan may look like a major success only on paper. The purpose is to get people to come back full-time. In terms of this, the scheme is not fulfilling its policy goal. Many awardees are unwilling to leave tenured positions at major universities in the West, and prefer part-time or visiting research posts in China rather than full-time positions (Zweig 2013). They lack strong commitment to the long-term development of China's science and technology sector. As Sharma (2013) writes, "The problem was that the Thousand Talents was really targeting the very best and the very best aren't the ones coming back." There have also been some problems with the implementation of the scheme. The most frequently reported ones by the returnees included: (1) much governmental attention to the introduction process while neglecting services; (2) too broad requirements and scope for talent selection, and loose connection with social economic development needs; (3) quality of introduced talents yet to be improved; (4) lack of top-level design and coordination, with cooperation between various governmental branches especially needed; (5) effective work mechanism to be improved; and (6) financial support, tax preferences and education of children remain major headaches for returnees.

Administratively, there are some institutional and organizational problems including the lack of transparency in recruitment procedure and retrospective recognition of already-returned talents rather than actively seeking new personnel from abroad; shortage of a healthy workplace culture in which the recruited talents can have a supportive working environment with their local colleagues who receive much less pay and are treated with much less respect. It is also administratively important for the Chinese government to question whether or not to continue the focus mainly on ethnic Chinese talents. Lastly, to fully tap into the pool of global talent, largest cities in the Chinese mainland need to become more culturally friendly toward non-Chinese people in many dimensions of life from languages to food and social services. In this aspect, they still have a long way to go to catch up with more internationalized cities in the region such as Hong Kong and Singapore.

Issues and Challenges

China's global talent policy has had some positive effects. By 2011, the Recruitment Program of Global Experts had sponsored more than 2,263 overseas innovation talents, including 1,902 Thousand Talents and 361 Thousand Youth Talents. The number of overseas talents was equivalent to the number of those introduced through the Cheung Kong Scholars Program and the Hundred Talents Program over the past fifteen years, and the number of those who were full professors in foreign institutes was nearly twenty times the total number of those introduced over the past thirty years. Overseas talents have gradually become an important research force in

[7] One example is Robert Glenn Parker who received his Ph.D. from the University of California at Berkeley and was a professor at the University of Michigan. He is now based at Shanghai's Jiao Tong University. Other examples include Ross Macallister, who became Chief Information Officer of Sinopec, a Fortune 500 company in China, and previously worked as a partner at Atos Consulting in the UK; and Mikhail Eremets, a German expert in high-voltage super conductors and now serves as a professor of Physics at the South China University of Technology.

China. Of the 296 national major scientific research projects approved by the Ministry of Science and Technology during 2006-2011, 22% were chaired by high-level experts recruited overseas after 2006 and 32% belonged to the 1000 Talents Program. Yu and Sun (2012) report that the talents strategically recruited from overseas have helped to raise China's research level and improved the cultivation of innovation talents.

However, many of the top-flight overseas Chinese researchers are still not willing to give up their posts in developed countries to move back to China. Some returnees, after working and living in China for a while, decide to re-expatriate. China therefore faces a number of issues and challenges in attracting and retaining global talent. Considering the importance and urgency, the following observations are made:

First, short-termism has permeated China's research. Unwilling to take risks, Chinese researchers now look for instant benefit only. They are pressured to produce results within a short period of time. This culture explains why the proportion of research funding goes on basic or "blue skies" research in China is shockingly low compared with those in the UK and USA. It not only hampers high-quality researcher returning to China, but also affects how much returnees achieve in China. In order to be able to draw back the "crème de la crème" of its overseas talent, China needs to understand that instant gains are not sufficient to attract and retain those who truly love research. A fundamental change to research climate as proposed by Yigong Shi and Yi Rao in *Science* is needed. At the moment, however, too much research money passes through the hands of those who are in positions, rather than being distributed through open, competitive, peer-review procedures (Zweig 2013).

Second, Guanxi has been repeatedly and consistently confirmed by studies as the most significant reason for Chinese talent to stay overseas and for some returnees to repatriate. Studies of Chinese brain drain and gain overwhelmingly point to it as a major problem (Cai 2011; Chen et al. 2003; Gill 2010; Hao and Welch 2012; Wadhwa 2009a, 2009b; Yang and Welch 2010; Tharenou and Seet 2014; Zhang 2014). It not only scares away China's best researchers overseas from coming back to China, it also stops them from working effectively even after they are drawn back to Chinese universities and research institutes. Cai's (2011) reports that researchers of Western origin work better with local Chinese colleagues. Returnees complain of time wasted on cultivating personal relations, rather on research, to gain research funding, and petty jealousies complicate their work. Similarly, Zhang (2014) finds that although China offers attractive packages, the cream of Chinese talent prefer to stay in Western countries because "the Chinese research environment makes them uncomfortable", and "Guangxi is on top of their most headaches" (p. 267).

Third, the implementation of the global talent policy involves some considerable amount of money, which leads to misconducts under certain circumstances. Misconducts could happy on both the recruiter and the recruited sides, but often both sides work together to abuse the policy. Due to the nature of such behaviors, hard evidences are difficult to find. Yet the media have frequently reported various cases, involving some high-flyer researchers. According to Zweig (2013), for example, many mainland professors working overseas are trying to hold two positions and draw two salaries. Professor Wang Xiaodong at Ohio State University (OSU) negotiated a 1000 Talent's Award at Nankai University and became target of complaint by colleague at OSU about amount of time spent as "dean" of a new college of Pharmacy he set up at Nankai.

Fourth, what matters is whether or not imported overseas researchers can make a real difference. This depends much on how they work collaboratively with people around them.

There have been reported problems about their collaboration with local colleagues and those who returned earlier. Early returnees, now in positions of authority in scientific establishment, resist reforms that would put more funds in the hands of the current crop of "star". Fresh returnees are unhappy with the facts that they need to kowtow to those who returned earlier. While they feel frustrated and disappointed with their workplace relations, others complain much about them. Such a culture damages their research which is more often collaborative work. Cai (2011) quotes the following remarks to show how overseas Chinese scholars are poorly perceived at a Chinese university: "Many of them are cheats who are only keen to seek personal gain from us," "Overseas Chinese felt we didn't think highly of them or treat them well. Honestly, we don't need such people at all" (p. 123).

End Remarks

The Chinese leadership has placed great emphasis on high-end group of talent, and has invested substantially to compete for them globally. Both the intensity and the scale of the policy have been remarkably impressive. While there have been some successes, a number of inconvenient truths have tarnished such initiatives. The unfortunate reality for China remains that despite needing talent, it is instead cultivating talent for developed Western countries. China's small number of immigrants and huge number of emigrants has caused a severe "migration deficit" for the country. Intellectual elites represent a significant part of the new generation of China's emigrants overseas (Wang 2014). Both the push and pull factors of China's global talent policy touch on some fundamental issues about China's research system particularly and about the wider society generally (Altbach 2010). It is indeed a continuity of China's century-long struggling between its traditions and Western values (Yang 2013). Despite China's extraordinary political ambitions, there are no signs of possible integration between the Chinese and the Western any time soon.

While it is prudent for China to continue to implement policies that offer substantial incentives to encourage return, it is equally important to note that over time China may continue to lose its best talent trained overseas best talent trained overseas that return from abroad. In order to attract, retain and fully utilize them, policy-makers at all levels must get serious about the deeply entrenched work ethics and academic culture that has permeated Chinese research institutes and universities (Qu 2003; Ip 2006; Gill 2010; Hao and Welch 2012; Chen et al. 2003). Without achieving this, China would continue to lag behind its East Asian peers, let alone catch up with the global powerhouses (Yang 2014). Chinese leaders need to understand that despite active intervention of the administration, what could not be accomplished for 30 years - attracting large numbers of the very best and very brightest to return and live in China - is still not going to happen soon (Zweig 2013). Simply relying on economic initiatives is far from sufficient. They will not return unless the system changes.

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