

Translating Transnational Capital into Professional Development: A Study of China's Thousand Youth Talents Scholars

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Abstract

Over the past decade or so, Chinese government has been strategically luring back overseas Chinese high-fliers to strengthen her science, technology, education and universities. One of the major initiatives is the Thousand Youth Talents Scheme launched in 2011. By 2016, 2945 Thousand Youth Talent Scholars (TYTS) had been recruited into Chinese research universities and research institutes and enterprises. Enjoying favorable policies and possessing their unique capital, they are well positioned to transfer the knowledge, skills and experiences obtained overseas to their home institutions, while at the same time face challenges and difficulties in their professional development in their homeland. While China's overseas Chinese talent policies, at both governmental and institutional levels, have been well documented, the lived experiences of such scholars have been little understood. How do they (re)integrate into Chinese academic institutions? How do they construct their professional social, cultural and vocational spaces by mobilizing domestic and international resources and networks and navigate their careers in the Chinese academic environment? Employing a qualitative research method of semi-structure interviews, this article examines the "transitional capital" of TYTS and their experiences of transferring the knowledge, skills, social networks and resources obtained overseas to enhance their career development.

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Introduction

With globalization and enhanced internationalization of higher education, international mobility of high-skilled talents has been placed highly on the agendas of governments and universities around the globe. Scientific mobility and the effects of global movement of leading scientists have attracted increasing scholarly attention from researchers and government policies. With China's rise in science and technology and her fast shifts from the peripheral to more central stage on a global scale, the policy and the practice of China's scientist mobility assumes growing importance. Engaging closely with the literature on Chinese returned academics and the effects of their overseas education and experiences on their career development and on the internationalization of Chinese higher education (Cao & Suttmeier 2001; Chen 2017; Gu & Schweisfurth 2015; Jonkers & Tijssen 2008; Wang et.al 2015), this article focuses on the young scientific elites of Thousand Youth Talents scholars (TYTS) to analyze their professional development experiences upon their return to China.

The Thousand Talents scheme was launched by the Central Organization Department of the Chinese Communist Party in December 2008. It attempted to recruit 2000 world leading talents including academics, senior professionals and entrepreneurs in the coming 5-10 years. In late 2010, as part of the Thousand Talents plan, the government initiated its Recruitment Program for Young Professionals which is often called Thousand Youth Talents scheme targeting more specifically young elite Chinese scientists overseas. Until now, the scheme has been implemented for seven years. This article aims to unfold the early stage of academic career development of the Thousand Youth Talents plan awardees, including their achievements and the effects and challenges of the scheme. This study has its particular practical significance because the initiative is the highest level talent scheme of the Chinese governments. It also has implications for China's quest for world-class universities and an innovation-based knowledge economy. Its focus on the lived experiences of the awardees has been little documented in the literature. It attempts to understand how they fare in the Chinese academic institutions. Employing a qualitative research approach of semi-structure interviews, it how they translate their "transitional capital" and their experiences of transferring the knowledge, skills, social networks and resources into career development, and how their efforts would contribute to the internationalization of Chinese higher education.

Literature Review

Transnational Capital and Scientist Mobility

Scholars have employed different concepts to identify the unique capital possessed by returned academics. Rosen and Zweig (2005) coined the term of "transnational capital" to denote the experiences, knowledge and skills acquired by returnees during their

periods of stay, study and work abroad. Bozeman et al. (2001) defined the sum of a researcher's professional network ties and their technical skills and resources as scientific and technical human capital. Jonkers and Tijssen (2008) adopted the compound concept of scientific social and human capital to combine scientific social capital and scientific human capital. The latter means a researcher's stock of relevant professional ties, while the former refers to the stock of researcher's scientific and technological knowledge and skills. Kim (2010) used the concept of identity capital to analyze the uniqueness and advantage of academic returnees.

Scientific mobility through different institutions especially across national science and higher education systems is viewed as a process in which scientists can accumulate scientific capitals (Wolley et al. 2008). One can enhance not only individual capabilities but also social-capital networks through these transnational experiences (Bozeman et al. 2001). When high-quality personnel come back to their homelands, they may create positive externalities by providing readily accessible new knowledge, ideas, and skills. Thus, to a country, technology transfer and human-capital mobility of talents are indispensable to the process of capacity establishment that lead to economic and social development (Wolley et al. 2008). Some literature underlines the importance of scientific mobility for research degrees and postdoctoral positions to the formations of human capital and the building of social-capital networks (Melin 2004; Zubieta 2009).

Highly skilled returned scholars can be a powerful driving force to enhance knowledge exchange and global connectivity, leading to international cooperation and a larger research community (Solimano 2008). The returned scientists hold four basic superiorities - higher English proficiency, broader academic vision, stronger technical skill and ability to develop foreign relations (Lou et al. 2000). They play a crucial role in local academic community by disseminating new knowledge and becoming network nodes. As Burt's (1993) structural theory refers, the basic element in such account is the structural hole, that is, a gap between two individuals with complementary resources or information. When the two are connected through a third individual as entrepreneur, the gap is filled, creating important advantages for the entrepreneur. It becomes evident that the returnees are in the position as a structural hole. They are embedded in the dual international-domestic academic network, as a bridge, and effectively connecting this two academia (Yang, Gao & Liu 2015).

Impacts of Academic Returnees

The space for professional development of YTTS has its unique characteristics, including both the domestic and the transnational. Domestic space refers to the local and national institutionalized academic and organizational structures and systems, while transnational professional development space means the international academic networks and interactions which they accumulate during and after their stay abroad. It is worth mentioning that the returnees do not passively adapt to their host university rules and structures. Instead, they strategically take advantage of their transnational experiences to create a new space for their professional development. By so doing, their career development efforts could simultaneously lead to innovation that benefits

China's higher education (Chen 2017).

Returned academics also play an important role in disciplinary development. They come back to China with rich knowledge of their subject fields, together with progressive teaching approaches and research achievements, they could easily introduce new instruments and equipment for teaching and research, actively apply what they have learned abroad to their teaching practices in Chinese universities, and establish and develop emerging disciplines and cutting-edge research areas (Lou, Chen & Gao 2000). With their experience and background, it is relatively easier for them to be granted research and industrial development funds provided by the Chinese government for them to construct research laboratories (Zhao & Zhu 2011).

Their position at the structural holes offers them more opportunities to exchange and collaborate with colleagues all over the world. Compared with the 1900s, international collaboration is now less driven by the need to acquire funding but more by a desire to share resources and skills. Jonkers and Tijssen's (2008) empirical study provides quantitative support for this assumption about the relationship between academic mobility and scientific productivity. It is proved that there is a positive correlation between foreign experience in a particular host region and the number of international co-publications with scholars from this region. Close personal interactions and accumulative scientific social capital could be a prerequisite for successful international academic collaboration.

The study by Woolley (2008) suggests that foreign postdoctoral destinations are a more significant determinant of international collaborative research than foreign research-degree destinations. In other words, networks built at the postdoctoral period appear to have a positive impact on productive forms of international collaboration. The patterns of international collaboration differ much across disciplines and by the reputation of journals. In general, researchers specialized in experimental fields show higher propensity of co-authorship than in theoretical fields (Newman 2001). Among journals, the average number of authors per paper appears to increase with the prestige of the journal (Madlberger & Roztocky 2009). Such findings help to explain the implications of brain drain, brain gain and brain circulation. The return of Chinese scholars does not simply mean their former host's loss. A new kind of cooperation between these scientists around the globe creates another circulation of knowledge.

Impact Factors of Professional Development of Academic Returnees

Empirical studies have shown that policies do matters in terms of luring back overseas Chinese talents (Cao 2001; Chen 2017). The programs offer favorable measures and incentives to overseas Chinese talents such as start-up funding, competitive salary packages, high-level academic titles, housing subsidies, spouse employment, and children's education (Cao 2008; Zweig 2006). Those awarded the title of Thousand Talent Scholars have favorable chances for leading research institutes, state-owned banking institutions or government-funded key research programs (Zhao & Zhu 2011). These preferential policies and incentives might be compelling pull factors leading to their decision to return. Compared with earlier talent policies, China's Thousand Talent schemes are more attractive for overseas Chinese scientists with much more

generous packages and better research, business and social environment (Zhao & Zhu 2011).

Both the central and local governments show great ambition to attract global talents. Large cities join the competition for top-notch talents from abroad (Zhao & Zhu 2011). Guangdong, for example, ranks the fourth by the number of TYTS in China. With a strategy of “Constructing a Province with Powerful Higher Education”, the province not only strongly supports the construction of top-tier universities, but also introduces high quality educational resources and brands from other provinces and abroad. The past two decades have seen the establishment of Research Institute of Tsinghua University in Shenzhen (2001), Peking University Shenzhen Graduate School (2001), South University of Science and Technology (2011), and the Chinese University of Hong Kong at Shenzhen (2013). These new institutions have attracted numerous overseas scientists and scholars to their campuses. It can be safely expected that Guangdong will rise fast in China’s landscape of higher education (Huang 2016).

Integration into the Chinese academic system is not always smooth and direct for returned scholars (Chen 2017). In some cases, it could be very difficult for a returnee to strike a balance between internationalization and localization with limited time and resources. Xu (2009) illustrated the dilemmas from three aspects. Firstly, publishing in Chinese probably do not help them to maintain their scientific mobility, yet they might become rather lonely among their Chinese colleagues if they only publish in English journals. Secondly, the returnees have to abide by local academic rules if they want to apply for domestic research grants. Thirdly, the returnees feel awkward whether they should be more involved in non-academic affairs since administrative positions may bring significant personal benefits as well as career advantages within the Chinese academic hierarchy. Inevitably, the preferential policies for the returned scholars have stimulated resentment and controversy from domestic-educated scholars who feel that their degrees are devalued and their status threatened (Zweig et al. 2004).

It is clear that returnees face a series of challenges to reenter the Chinese system. Such difficulties could have great impact on their career development and job satisfaction. Xu’s (2009) questionnaire survey shows that returnees are relatively satisfied with their academic career and their colleagues’ capacity, yet they still look much forward to better research support services. She also finds the length of living and work abroad and the titles awarded to them influence their job satisfaction in a substantial manner. In addition, some inner factors could also have an effect. Male returnee teachers give a more positive evaluation about their job than their female counterparts do. Other studies show that there is a positive correlation between the extent to which returnees adapt to current environment and their job satisfaction, as well as their work performance (Yi, Zhao & Ou 2010).

The Scheme, Its Background, and Implementation

Launched in 2008, the Thousand Talent Scheme aimed at boosting China’s competitiveness in science and technology, by attracting leading overseas Chinese academics, professional personnel, senior managing staffs and entrepreneurs who

hold patents or own their business. Among the Chinese government's policies for luring back overseas Chinese talents, the Thousand Talent Scheme has been the highest level initiative. Based on its success, a follow-up strategy often called Thousand Youth Talent Scheme in the English literature was launched in late 2010. Every year, over 600 Youth Thousand Talent Scholars are awarded.

According to the general pattern of talent growth, young people at the age of 35 are an ideal group with the most creativity and passion. Focusing on such "rising stars," the program is mainly target natural and engineering scientists with a doctoral degree obtained from major Western universities and no less than three years of overseas research experience. A formal teaching or research title in foreign flagship universities or other organizations is a must for the candidates to apply for the scheme. They should be clearly outstanding among their professional peers and have demonstrated their potential to be a leader in their specialized fields. Exceptional admission could be given to those fresh doctoral graduates who have made some extraordinary research achievements. Once chosen, they are required to return to China as full-time staff (Chen 2017).

Compared with other returnees who are not part of the scheme, TYTS have enjoyed a higher professional development platform provided by a series of preferential policies by governments and host institutions. Such policies include generous salary packages, housing bonuses, research grants, research assistance personnel, financial support for lab construction, and special support for family settlement and children education. In addition to their regular salaries at host institutions, the central government has committed to 0.5 million RMB (US\$) living allowance and 1-3 million RMB (US\$) research fund over three years. Due to China's great regional and institutional disparities, the actual financial and policy support they receive varies much across regions and institutions. In general, the privilege is substantial. Therefore, competition for the scheme has been much fiercer than expected. For instance, 558 were selected among 2325 applicants for the 12th TYTS in 2015 [CITE source here].

Characteristics of TYTS

By 2016, there were 2945 TYTS had been selected [CITE source here]. The number increases year by year from 143 in 2011 to 601 in 2016. Most of them are between 31-40 years old. More specifically, 4.4% of them are between 25-30 years old, 92.6% are between 31-40 year old, and 3.0% are over 40 years old. The number of returnees under 30 is increasing. Before coming back to China, 66.7% of them had pursued research degrees or worked in the United States. Others mainly come back from Germany, the United Kingdom, and Singapore. Beijing, Shanghai and Jiangsu are the top three destinations where the returnees cluster and develop their academic career (Huang 2016).

We have set up a database of the samples (???) of 262 TYTS recipients in Shanghai by 2016. The characteristics of the samples deploy that they concentrate most in research universities of science and technology and then in comprehensive universities. Among the samples, 90.5% (237) are male and only 9.5% of them are female. With an average age of 35.79, 84% of them are between 30-40 years old

which denotes their strong potential to make considerable contributions to China's scientific progress. The 985 Project Universities have an absolute advantage in attracting high-quality scholars.¹ For example, Shanghai Jiaotong University have attracted 89 TYTS, accounting for 34% of the total TYTS in Shanghai, followed by Fudan University with 77 TYTS awardees (29.4%), Tongji University with 44 (16.8%) and Shanghai University of Science and Technology with 21 recipients (8%). Their disciplinary distribution is: life sciences 58 (22.5%), engineering and material sciences 50 (19.4%), mathematics and physics 48 (18.6%), information science 23 (8.9%), chemistry 19 (7.4%), environment and earth sciences 14 (5.4%) and medicine 2 (0.8%).

Undoubtedly, the returnees have contributed much to the vitality of teaching and research in Chinese universities. Indeed, they are a strong driving force behind higher education innovations in China. They are more likely to make remarkable research achievements. In addition to the progress they make on key technology and cutting-edge knowledge, they also play an important role in strengthening institutional mechanisms especially because some of them have been appointed as senior administrators. Furthermore, their role as a bridge to link domestic and international academia has helped Chinese scholars and students to integrate more into the international academic community. **[Need more literature/evidence to support]**

However, some problems have emerged across regions, institutions and disciplines, often caused by the high assemblage of these returnees. Firstly, it has aggravated China's serious imbalanced development in higher education with most returned scholars gathering in eastern and coastal cities and in 985 Project universities. Secondly, the fierce and even vicious competition for talents among regions and universities has led to some reversed effects on talent growth and their academic career development. Thirdly, the favorable measures for the returnees are sharpening contradictions with their domestic colleagues who feel marginalized and unfairly treated creating resentment towards the returnees. **[Need more literature/evidence to support]**

Research Questions and Methods

The awardees by the scheme are highly competitive, with clear comparative advantages compared with ordinary returnees from overseas. They have high expectations of themselves and thus place much hope on their career development. In reality, however, they face many difficulties and challenges in achieving their goals. This study aims at investigating their professional development to see whether or not and how they translate their transnational capital into career development. Therefore, our research questions are what kinds of transnational capital they possess and how they manage to use it to negotiate in their upward career development, and how they transfer their advantages after their departure from foreign institutional, disciplinary and academic environments into the Chinese context.

As for research methods, a database about TYTS recipients' basic information was collected during the initial stage of study. A small-scale questionnaire survey of the

¹ 985

samples as a pilot study was then conducted to explore their basic working situations and job satisfaction in the spring of 2016. This article, however, is mainly based on the data of a qualitative study of interviews conducted from September to December in 2016. It draws findings primarily from the data gathered through in-depth and semi-structured interviews with fifteen TYTS in four 985 Project universities in Shanghai, recruited in the previous six rounds of the scheme. Table 1 below shows their basic background. The interviews were conducted in Chinese Mandarin and audio-taped with their permission. They lasted between 1-2 hours. All the audio data were transcribed into texts and then sent to the interviewees for inspecting to ensure the accuracy and reliability. Pseudonyms are used here to protect the participants.

Table 1: Basic Information of the Interviewees

No.	Gender	Round	Year for Returning	Academic Title	Country of Overseas Study	Discipline
A	Male	6	2014	Research Scientist	Switzerland	Bioscience
B	Male	6	2015	Research Scientist	Netherlands	Environmental and Earth Sciences
C	Male	5	2014	Professor	Japan	Physics
D	Male	6	2015	Professor	USA	Environmental and Earth Sciences
E	Male	2	2011	Professor	USA	Environmental and Earth Sciences
F	Male	1	2011	Professor	USA and Japan	Chemistry
G	Male	2	2012	Professor	USA	Bioscience
H	Male	1	2011	Professor	USA	Materials Science and Engineering
I	Male	6	2016	Professor	Canada and Denmark	Environmental and Earth Sciences
J	Male	5	2014	Professor	USA and Japan	Environmental and Earth Sciences
K	Male	3	2012	Special Researcher	USA	Astrophysics
L	Male	3	2012	Research Scientist	USA and Singapore	Materials Science and Engineering
M	Male	3	2012	Special Researcher	USA	Mathematical Sciences
N	Male	3	2012	Professor	USA	Mathematical Sciences
O	Female	4	2012	Researcher	USA	Bioscience

Findings

Our pilot study of a questionnaire survey shows that TYTS are overall satisfied with their work ($M=3.58$, with 5 as the highest level of satisfaction). They are particularly satisfied with their teams and work achievement. In comparison, they are less satisfied with the academic support they have received and their living conditions. Most of them hold positions that include both teaching and research, with particular strong commitment to research. Only a few of them shoulder additional administrative responsibilities. Their upward professional development has been demonstrated in various domains including financial and personnel resources acquired for research, academic reputation and positions within and outside their institutions, and their construction of research teams, fields and platforms.

Upon their return to China, they face challenges of changes roles and work environment. Barnett and Phipps (2005, pp. 6-7) conceptualize academic mobility based on “travel” literature and analyze three forms of academic travels. The first is geographical where academics as bodies move in space. The second is epistemological where academics move into new knowledge homes. The third is ontological where the academic takes on a new or a widened sense of herself. They believe that these three forms intersect each other. The role transition from a super postdoctoral fellow to an independent scientist leading a research team is daunting and challenging. TYTS need to build up their working space in a Chinese institution. This transitional period usually takes several years. Whether or not they can transit successfully depends much on the institutional environments and personal factors such as their people skills and social relations. While mobilizing the resources, knowledges and social networks they have accumulated to enhance their research platform and performance, they take advantage of institutional, disciplinary and governmental supports to shorten their junior-to-senior transitional period in Chinese universities.

Apprenticeship: A Story of a Young Scientist

Interviewee-C is an interesting case for illustrating the growth trajectory of a TYTS. Having earned his Bachelor and Master’s degrees from one of China’s research intensive universities in 2002 and 2005 respectively, he pursued his Ph.D. in the University of Tsukuba in Japan during 2005-2009. He then became a postdoctoral fellow in the University of Tokyo for five years. Under the supervision of an academic returnee from Japan, he has published two SCI (Science Citation Index) papers during his Master’s studies and was awarded as an outstanding graduate of Shanghai. During his doctoral and postdoctoral research in Japan, he accumulated professional knowledge and networks in the international academic circle in his field. As he narrated.

During my PhD studies at Tsukuba University, my supervisor asked me to do a project about gallium nitride. Actually, several fellow students had tried this research but failed. My supervisor encouraged me to have

another try. I was very uncertain about if I could do it. But after all efforts, I succeeded. At that time, the research was influential. Because of this, I was awarded the Wanwen Research Exchange Prize in Japan. However, the period of doing postdoctoral research was my golden time. I did many very useful and valuable studies, for example, semi-conductor. I have built a lot social networks with top researchers in the field in Japan and internationally (Interviewee-C)

Having studied and worked in Japan for nine years, he returned to his alma mater university in China as a TYTS awardee in 2013 with three million RMB (US\$???) research funds from the central government and another three million RMB (US\$???) from his host university. Having been promoted as a full professor upon his arrival at the university, he was granted the title of “Eastern Scholars Program” scholar with another one million RMB (US\$???) research fund from the municipal government. With all these research funds from central and local governments and the university, he has set up his research lab and established his research team for continuing knowledge production and talent cultivation. During 2014-2016, he published 15 high quality papers in English journals with his former teachers and other colleagues at the university. In the October of 2016, he was appointed as the Dean of his school at the age of 37.

Apprenticeship: Education and Postdoctoral Training

The educational background and professional training during their apprenticeship can be categorized into three patterns as shown below in Table 2. All participants have a Bachelor degree from Chinese universities. Pattern A is domestic Master’s and doctoral degrees plus once or more international postdoctoral experiences. Pattern B is a domestic Master’s degree with an international doctorate plus postdoctoral experiences. Pattern C refers to those with international Master’s and doctoral degrees and international postdoctoral experience. Almost all our participants had over three years postdoctoral research experience in one or more prestigious research universities overseas.

Table 2 Educational background and postdoctoral experiences of interviewees

Interviewee	Master degree	Doctorate	Postdoctoral position	Postdoc or Research Fellow	Years of study and working abroad
A	China	Switzerland Eth Zurich university	Switzerland Eth Zurich university	-	7
B	China	Netherland	Netherland University of Amsterdam	-	7
C	985	Tsukuba	Tokyo	-	9

	University	University	University		
D	Chinese Academy of Sciences	Chinese Academy of Sciences	America Oklahoma	-	5
E	985	America Oklahoma	America Oklahoma	-	8
F	211	Chinese Academy of Sciences	HKUST	Tokyo、America	6
G	-	Iowa State University	Stanford University	-	11
H	985	UC Riverside	UC Riverside	Texas A & M University	8
I	Academy of Sciences	Canada University of Alberta	Denmark Aarhus University	University of Alberta	7
J	China	Academy of Sciences	America Purdue University	Tokyo	6
K	Bachelor at 985	Columbia University	UC Berkeley	University of Texas at Austin	12
L	America	Singapore National University and MIT joint	America California Institute of Technology	-	7
M	Bachelor at 985	America UC Berkeley	America Vanderbilt University	UC Berkeley Stanford	15
N	Academy of Sciences	Academy of Sciences and ETH Zurich	America University of Michigan	-	14
O	Hong Kong	America Brown University	America Yale University	-	8

As noted above, all TYTS had postdoctoral research experiences and some even had two or more periods as postdoctoral research fellow. Postdoctoral research positions in prestigious institutes, laboratories, and universities can provide access to cutting-edge theories and technologies, relatively abundant resources, and elite research networks (Woolley et al. 2008). With more work experiences as postdoctoral researchers and longer period of apprenticeship, TYTS accumulate more transnational capital in various forms such as knowledge, skills and social networks, and strengthen

their identity and ambition.

Compared with most other overseas returnees, TYTS take advantage of their doctoral training in global elite research universities and postdoctoral experience with distinguished scientists in first-class laboratories and research institutes so as to stand out in academic performance and productivity. With the social and professional networks they built during their postdoctoral research, they are granted opportunities of embeddedness in transnational academic community, something they mobilize as great resources to enhance their human capital, shape their research directions and inspire them to become excellent scientists after they return to China. Our interviewees usually have 5-15 years of study and work experiences abroad. It was evident that the longer period of they stayed abroad, the more transnational capital they accumulated.

Constructing Professional Development Spaces

For scientific and technological research, infrastructure and labs are particularly basic requirements. They are expensive too in terms of time, resources and personnel. It takes years for TYTS to set up their labs. Although, they could build basic conditions for the lab to function regularly, sometimes they find it is hard for them to get sustained financial support from governments and universities to maintain and upgrade their labs and facilities. Lack of enough funding to run their lab is a constant worry of TYTS. This is because their funding from governments usually only covers the first three years of their labs.

In addition to sustainable financial investments for maintaining research labs, their infrastructural construction also includes physical space, facilities and materials to conduct their research. TYTS recipients face different situations. Some complain about their insufficient physical space for research, while others grumble about the distance between their labs and offices (for example, Interviewee-D). This is indeed an issue as some of them have their labs outside campus (Interviewee-K). Some interviewees reported their current research labs are only temporary places and would need to move into other buildings due to construction needs. One participant complained that their Dean did not keep his promise of buying facilities for his research (Interviewee-M). However, based on our on-site observations, most of the TYTS recipients are fortunate to have large spaces and well-facilitated research labs such as the case of Interviewee-A.

Research teams are the human resource base needed for conducting research and scientific activities. For returned young scientists, one of the most important challenges and urgent tasks is to recruit high quality research students and build their own research teams. There are four main features of their research teams. First, most of the teams are small-to-medium in size, with fewer than ten members. As shown in Table 3 below, eleven teams have members fewer than ten. Among them, five teams have no more than five members. Only four teams have more than ten members. Second, the main body of the research teams are junior researchers of doctoral and master's students, with few senior members or postdoctoral fellows. Of the fifteen research teams, in addition to the leader of the teams, only one team has members of

a full professor and an associate professor. Due to the difficulty in recruiting postdoctoral researchers, doctoral students become the backbone of the research teams.

Table 3: Research Teams of Interviewees' Labs

Code	Year of Return to China	Round	Research team members					No. of Team Members
			No. of Full and Associate Professors	No. of Research Assistants	No. of Postdoctoral Researchers	No. of Doctoral Students	No. of Master's Students	
A	2014	6	0	0	0	2	3	5
B	2015	6	0	0	1	2	2	5
C	2014	5	0	2	0	2	2	6
D	2015	6	0	0	1	4	2	7
E	2011	2	0	1	0	5	3	9
F	2011	1	0	1	1	6	9	17
G	2012	2	2	1	0	7	2	12
H	2011	1	0	1	0	3	3	7
I	2016	6	0	1	1	1	1	4
J	2014	5	0	0	0	1	2	3
K	2012	3	0	0	1	1	2	4
L	2012	3	0	0	0	4	3	7
M	2012	3	0	0	0	4	1	5
N	2012	3	6	0	8	4	1	19
O	2012	4	0	1	1	5	4	11

Third, those TYTS who returned to China earlier with opportunities to have larger research teams tend to be more satisfied with the size and quality of their research teams. For example, Interviewee-F returned to a university as one of the first round TYTSs in 2011. His research team now has 17 members, including one research assistant, one postdoctoral fellow, six doctoral students and 9 master's students. He pointed out that the quality of doctoral students was critically important for his team's performance, and that it had been improving due to their new admission policy that recruited top level graduates from the university and other leading research universities nationwide by recommendation without examination. The location and status of his university as a 985 Project institution has advantages to attract high quality research students nationally.

Therefore, the fourth feature of their research team is that their most daunting challenge is to admit qualified graduate students and researchers. Chinese research universities face tough competitions for talents with peers both at home and abroad as well as with the industry. Most highly qualified students prefer to study abroad to pursue doctoral degree and conduct postdoctoral research. The policies of luring overseas scientists and scholars are a double-edged sword which triggers the inflow of

overseas academics with postdoctoral experience while pushes junior yet promising students and doctorate holders to go abroad. The positive effects are the growing rate of returnees and brain gain that strengthen China's position in global competition for top talents. The negative effect has been that the incentive has pushed many highly promising research students and those already with a doctorate to seek doctoral and postdoctoral experiences abroad.

It is really difficult for me to recruit outstanding postdoctoral fellows. Those who are brilliant and ambitious have all gone abroad. They do not want to do PhD at home. This is a major problem. The policy that values foreign degrees and undervalues domestic degree has led many to overseas. Even you are top-tier and terribly excellent at home, it does not count. You have to go abroad for overseas experience. Under such policy, if a student wants to pursue academic career, he or she has to get some overseas postdoctoral experience first, and then come back. If a student does not want to do research, he or she does not need to have postdoctoral experience with me either. I have no choice but do research by myself and rely on my own students. I could not make big breakthroughs. In this situation, when I have a good idea and foreign scientists in MIT have the same idea, they would do the experiments and get the results, but I cannot. (Interview with **A and M ???**)

To overcome such difficulties, some YTTSs take advantage of getting their fellow students or graduates back from their former host institutions. In this sense, the transnational professional networks play an important role in the formation of returnees' research teams. Several participants including Interviewee-C shared their experiences of recruitment.

I've recruited two talents from my former lab at the University of Tokyo. One is my younger fellow student. He is now a Chenhui Scholar of our university. The other is a visiting student from Shanghai University. I supervised him when I was at Japan. (Interviewee-C)

Exploring New Research Directions and Fields

In line with forming research teams, TYTSs face the task of framing their research fields and further strengthening the research fields that were formed overseas previously. Their strategies for professional development differ considerably. The most popular pattern is to join existing large teams and research labs within their work unit, collaborating with colleagues in their host institutions. The second is to build their independent research teams and area from scratch. The third is to have their own teams and labs and try to attract others to join including younger TYTSs. The last approach is least seem as it only works well for established scientists with influence and resources.

Most TYTSs are at cutting-edge level in their research fields as a result from

their doctoral and postdoctoral experience in best research labs overseas. Their research focuses and interests might be relatively new in China, with few labs in Chinese research institutes and universities. Thus, they often need to build their research teams and fields from scratch. At the same time, their research interests and fields are often inter/cross-disciplinary with both possible innovations of knowledge and risks and uncertainties in exploring new fields and directions.

Acquiring Research Grants

Some TYTS are satisfied with research grants application and express that they have substantial research funding from both governments and their universities. Indeed, their CVs almost always look impressive in terms of research grants. Most TYTS have successfully acquired research grants from a variety of sources such as the National Natural Science Foundation of China (NSFC) and the Ministry of Science and Technology. It seems normal for them to have won a few million RMB research grants especially from by the governments.

It is interesting that the situation in China is opposite to what I anticipated when I was in the US. I thought it would be difficult for me to secure enough research grants while (it is) relatively easy to recruit high quality research students. However, after coming back, it turns out that I face challenges in recruiting high quality students but have no difficulty in getting research funds. The top-tier undergraduates from this university (a 985 institution) choose to study abroad. We could only get middle-level graduates. I am not satisfied with their quality. As for research fund, in addition to the financial support from TYTS, I've got a general project from NSFC. I've also been invited by senior colleagues to join several big research projects, including one from the Ministry of Science and Technology and one 973 Project. Thus, money is by no means a problem. Instead, recruiting qualified research students is an issue. (Interviewee-M)

Yet, the opportunities of winning large research grants from governments vary greatly by research fields. One TYTS complained that it was difficult for him to get research grants from NSFC and the governments due to his research field was “absolutely new” in China. Having submitted application and failed twice, he turned to get generous investment and financial support from the industry and have built a joint-research lab with enterprises (Interviewee-C). Obviously, the past decades witnessed some gradual improvement of China's science funding and assessment system (Cao & Suttmeier 2001). Most TYTS, however, appraise NSFC's review process of research proposals as “fair” and “relatively genuinely based on peer-review.”

Interpersonal Spaces and Collaboration with Colleagues in China

In general, most TYTS awardees have built good interpersonal relationship with colleagues at home institutions. The interpersonal conflicts and tensions with domestic colleagues and senior scientists emphasized by Cao and Suttmeier (2001)

and Chen (2017) have not been found in our study. This could be explained by a few reasons. Firstly, our interviewees are from 985 universities of which their work units are only small parts. In comparison with China's many regional institutions, these universities are national and provincial bases for key disciplines with better resources and healthier academic culture, with a mindset that is more open. Secondly, TYTS recipients are relatively independent, enjoying autonomy with their own research space and labs. They do not need to rely much on their senior colleagues. Most of the members of their teams have some foreign experiences sharing the same norms and standards with the international community.

The participants share their successful experience of international collaboration with colleagues at home institutions in China in research, organizing conferences and co-authorship. They have built conducive social and professional networks, are well acknowledged by colleagues, and know well about which labs are the best and who are the best scientists in their fields in China. Some young scientists have good and effective collaborations with other colleagues, as shown by the case of Interviewee-M:

I have done about 60% research with my own research team, and 40% research by collaborating with other colleagues. I have a lot of collaborations with others. (Interviewee-M)

With their international background, TYTS play an active role in the global engagement of the academic community. Their bridge role becomes especially evident in organizing academic activities at national and international levels. Interviewee-E has been organizing a national conference of young leading scientists in his field, a circle of young minds with close relationship and good communications. He said:

The synthetic biology has its circle. We have a forum specifically for young scholars of synthetic biology with regular conferences. Young scholars nationwide in the field share their research. We have had such forums for two years. The first one was organized by Tsinghua, and the second by Peking University. Next year, the third one will be held in Shanghai. I will be responsible for organizing it. (Interviewee-E) [**Note, in the draft here is interview with A**]

Transnational Knowledge Production Networks and Transnational Capital Transfer

In the process of knowledge production and dissemination, TYTS more or less rely on their former host labs and institutions abroad. Interviewee-C is a good example of mobilizing his former host institution's resources and social networks. Even after returning to China, he continues to collaborate effectively with his former postdoctoral supervisor and the supervisor's lab in many ways. Firstly, they work together to make experiments, exchange research ideas and produce joint publications. As his own research lab in China is still under construction, he conducts some

complex experiments in Japan during winter and summer vacations. Secondly, he constructs his research team by having his fellow students and researchers from his Japanese alma mater. Thirdly, through his former supervisor's lab and research platform, he not only manages to stay at the cutting-edge level in his research area in China, but also works with a distinguished top scientist from Princeton University. He explained:

Regarding collaboration with Princeton University, it is because Professor Y, a top scientist in my research field, has close collaboration with my supervisor in Tokyo University. The year before last year, Professor Y's wife died. Feeling that he is too old to conduct research all by himself, he transfers some basic research to Tokyo University. In such way, the main research is conducted in Tokyo University. Professor Y supports us to do the research. (Interviewee-C)

In this case, the participant has built a transnational collaboration pattern of knowledge production and distribution. The transnational collaboration network includes his home research lab, former supervisor's lab and an American top university's lab. Having building such favorable transnational professional networks, the participant has published fifteen papers in international peer-reviewed journals during a sequence of three years during 2014-2016. He owns his success to what he has accumulated in Japan, shown by his following remarks:

Semiconductor and laser is a research field that has been well developed. If you want to make some contributions to basic theoretic principals, you need to be much focused and work extremely hard. I did not publish any major papers during my first two years at Tokyo University. I was fully absorbed in reading, thinking and research. In this way, after I came back to China, I now feel that my publications all come out intensively. (Interviewee-C)

Productivity and Coauthored Publications

According to Jonkers and Tijssen (2008), there are positive correlations for the Chinese researchers who worked abroad and their output and international publications. Some TYTSs are selected because of their publications when studying and working abroad. Their most distinguished works are often coauthored with their doctoral and/or postdoctoral supervisors abroad. Their productivity relies much on collaboration with colleagues in their former host institutions as well as in their home institutions.

As for productivity after coming back to China, it is crucial for TYTSs to keep publishing. The policy-makers and their university leaders pay much attention to the sustainability of their productivity after returning to China. In general, most TYTS recipients are productive. They are at their golden age to produce. They also work very hard. They have shown three possibilities. The first group members have similar

productivity before and after returning to China. The second group has encountered fluctuations and frustrations in keeping publishing after their return. For example, Interviewee-M explained that he had not published high quality papers as his university leaders expected partially because his research interest and directions had shifted after returning to China. It took time for him to accumulate in his new fields. Another reason was his lack of research facilities as his university failed to provide the facilities it promised. The third group members have better productivity after returning to China.

Taking Interviewees A, B and C as examples, during 2010-2016 they published more than ten papers in peer-reviewed journals with an average of two papers per year per person. All publications were coauthored, particularly with their previous doctoral and postdoctoral supervisors. Most publications appeared in core journals in their disciplines. Interviewee-A had a paper in *Science* in 2011 and returned to China in 2014 as a TYTS awardee.

Table 4 Publications of Three Thousand Youth Talent Scholars during 2010-2016

Cod e	Ag e	Discipline	Year of Return	No. of Publicati ons before Return	No. of Publicatio ns after Return	No. of First- author ed Public ations	No. of Non -first -aut hore d Publ icati ons	No. of Total Publicat ions
A	35	Life Sciences	2014	6	4	4	6	10
B	33	Environm ent and Earth Sciences	2015	9	1	6	4	10
C	37	Informatio n Sciences	2014	5	7	5	7	12

Discussions and Conclusion

TYTS' career trajectory from postdoctoral fellow to full professor

For ordinary overseas returnees and domestic trained doctorate holders, it usually takes at least three year to be promoted to associate professor, and another 5-10 years to become a full professor. For TYTS scholars, they are granted full professorship upon their return, under the condition of an overseas doctoral degree plus at least three years of work experiences at top research institutes and universities. Given the harsh competition and long struggle of professional promotion faced by domestically

trained scholars and ordinary returnees, TYTS scholars have huge privilege and advantages in a number of areas including promotion, research teams, funding, and lab facilities. It seems that they are more productive and make more contributions to disciplinary development of their work units and home institutions. Compared with ordinary overseas returnees (Chen & Li 2013; Chen 2017), they have higher satisfaction with the process of integrating into the Chinese academic community.

Transnational capital plays a crucial role in TYTS's professional development

TYTS's professional career relies on various factors of both national and international environments. This study shows that they maintain intensive collaborations with their previous host institutions and mobilize their transnational resources for professional growth after returning to China. The title of TYTS has crucial and positive influence on their professional development. This identity capital benefits them greatly with academic status, promotion, and resources. The identity capital provides them with privilege and functions as a fast channel to their swift professional development. They earn the membership of elite scientists and are expected to outperform their counterparts in research. The officially-granted identity also enables them to have continuous access to further prestigious programs.

Transnational knowledge production networks and knowledge transfer

With increasing scientific mobility, transnational knowledge production and transfer is in great demand. This empirical study shows that TYTS make good use of their transnational professional networks. In the case of Interviewee-C, three labs across China, Japan and the United States become a linkage of knowledge production. His home lab in Shanghai, his previous lab in Tokyo and the lab of his supervisor's major collaborator in Princeton form a knowledge streamline and network linking scientists across national borders. This confirms Gao's (2014) four types of relations developed by returnee academics including the pre-relation with their previous research direction, post-relation with their current research directions after returning home, vertical relation with their supervisors and horizontal relation with their research teams and close collaborators at home.

Different patterns of professional development

It should be noted that the professional development paths of TYTS differ from discipline to discipline. They are resulted from various factors. Most TYTS have established themselves in a couple of years, and transformed successfully from super postdoctoral fellows to full professors who lead active research teams. There are also cases of TYTS who are struggling with challenges and difficulties including lack of facilities and lab space, changing research directions, problems with recruiting qualified team members, shortage of research funds, and financial unsustainability. They have adopted different strategies. Some choose to join and integrate into senior scientists' teams and then become backbone there. Others build their own research space while collaborating with colleagues at home and foreign institutions. Most TYTS have extended their work units' disciplinary fields and directions by

conducting interdisciplinary and innovative research.

The TYTS face both opportunities and challenges

The daunting challenges facing TYTS include how to build high quality research teams and how to improve their research labs without sustainable research support after their first three years funding from the government. They are also confronted with high pressures from evaluation and accountability requirements from both the government and their institutions especially during the initial stage of the scheme. They have heavy working loads and work for long hours. Sometimes high expectation and pressure make them feel unendurable. Indeed, there have been a few extreme cases of TYTS who died on job at young ages due mainly to work pressure. Their most valuable assets include transnational capital, policy privilege from governments and institutions, and positions they own as TYTS. Well positioned to lead Chinese national innovation and link Chinese and international scientific communities more closely, they have a bright future, and are expected to play an important role in China's scientific and higher education development in the long run.

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