Title:

Embarking on the Postdoc journey: Unveiling Chinese doctoral graduates' expectations and experiences

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Abstract

Whilst China has become home to the second largest doctoral education system in the world, with over 20% of its doctoral graduates taking up postdoctoral researcher positions inside and outside of China, a lack of information regarding the expectations of these doctoral graduates in pursuing postdocs has resulted in a failure to meet their expectations, leading to insufficient institutional support for their career development. In order to improve this situation and provide more tailored institutional support for Chinese postdocs, we conducted interviews with 30 doctoral graduates from elite Chinese universities from February 2020 to December 2021 to understand their expectations for and experiences of postdocs. The data identified four expected-to-accumulated capitals during postdoc experiences: personal scientific capital, discipline-related social capital, institution-related social capital, and family-related social capital. Among these, the primary consideration for engaging in postdocs is to enhance personal scientific capital in both qualitative and quantitative aspects. Chinese doctoral graduates who choose domestic postdocs have higher expectations for increasing institution-based social capital, while those who go abroad expect to develop discipline-related social capital within the international academic community. Understanding these expectations will be instrumental in developing optimal approaches to providing institutional support for the career development of Chinese postdocs.

Keywords: Doctoral employment, postdocs, expectations, experiences, China

Introduction

Whilst doctoral candidates and graduates have become a major work force for knowledge production and transfer globally (Zheng et al., 2023) and China is home to one of the largest doctoral education systems in the world, studying the employment of Chinese doctoral graduates is crucial for understanding their role in advancing scientific knowledge and contributing to global scholarship. From 2015 to 2020, this system produced approximately 290,000 doctorates, with an average employment rate of 94.01% (Luo et al., 2022). However, this also means that over 18,000 Ph.D. graduates were unemployed in China during that period. One significant reason behind this is that academic careers have remained the preferred choice for Chinese doctorate holders, but the availability of teaching positions in Chinese universities has gradually declined. As a result, postdoctoral researcher positions, commonly referred to as ‘postdocs’, have become the second choice for Chinese doctoral graduates (Luo et al., 2022). A national survey conducted in 2017 revealed that over 20% of doctoral graduates held temporary contracts in postdoctoral researcher positions in China (Qing & Liang, 2019). The number of new postdocs in China has increased almost tenfold, from 2,651 in 2000 to 25,514 in 2019 (Shen & Xu, 2021). As of 2023, the latest statistics indicate that the number of postdoctoral researchers has reached 340,000 (Shen, 2023). Outside mainland China, the number of Chinese doctoral graduates pursuing postdoctoral research experiences abroad has also been on the rise. This trend can be attributed to financial incentives provided by the Chinese Scholarship Council, China's talent policies, and the expanding international cooperation network within Chinese academia (Li & Shen, 2019).

While postdocs are increasingly becoming an important employment option for Chinese doctoral graduates, there has been continuous discussion about the declining work satisfaction among Chinese postdocs. In China's context, postdoctoral researchers are primarily recruited by the state and managed by the National Postdoctoral Researchers System since 1985. Only a small portion of postdoctoral researchers are employed directly by the principal investigators (PI) of research projects in universities. In most cases, universities act as 'the host' rather than 'the employer'. This has led to a loosely coupled relationship between postdocs and universities, resulting in unrecognized professional roles of postdocs within host universities and uncertainties in career development due to temporary contracts. These issues have become major concerns for Chinese postdocs and have affected their work experiences and satisfaction with academic life (Y. Liu et al., 2023). Guo and Ren (2023) found that a significant number of Chinese postdocs left academia to 'stop the losses because of unsatisfactory postdoctoral experiences. It is not limited to China's context; previous studies have indicated that postdocs worldwide face precarity and uncertainty in career development (Herschberg et al., 2018; Skakni et al., 2019), and over 50% of postdocs experienced career burnout during their postdoctoral research period (Cai et al., 2022). Guo and Ren (2023) further highlighted that postdoctoral researchers' job satisfaction is closely related to their fulfilment of career expectations, which should be closely examined.

In contrast to the expanding number of Chinese postdocs, research on Chinese postdoctoral researchers is limited. Stith et al. (2011) described for the first time the overall system of postdocs in China. The state is the main funding provider and holds the approval right for universities to set workstations to employ postdocs (Stith et al., 2011). He and Wang (2021) found that individuals who received more satisfactory doctoral supervision are more willing to become postdoctoral researchers after

graduation. Previous analysis of the career trajectories of over 300 postdocs unveiled that many of them got their academic positions in the universities where they received their doctoral education, indicating an implicit inbreeding in Chinese academia (Shen & Xu, 2021). More recently, a handful of quantitative studies (Cai et al., 2022; Guo & Ren, 2023) investigated on the job satisfaction of Chinese postdocs and discussed possible external influential factors, such as means of funding, base cities, institutional support, personal relations with colleagues and so on, among which institutional support of universities was recognized as a key factor (Gao, 2018). The internal factors, such as the postdoctoral researchers' expectation and motivations, have not yet revealed.

Another stream of research has focused on examining the issues concerning Chinese postdocs from an international comparative perspective. Ahmed et al. (2015) conducted a comparison between the development of the Chinese postdoctoral training system and that of the United States. They recognized that the U.S. and China ranked first and second, respectively, in research output, which is closely tied to their investment in research and development (R&D) and their postdoctoral researcher systems. Despite China's tenfold increase in R&D investment over the past decade, the salary for postdoctoral researchers remains very low compared to that in the U.S., lacking international competitiveness (Ahmed et al., 2015). Similarly, X. Liu et al. (2023) compared the postdoctoral researcher systems in 25 countries worldwide and manifested the low payment and low international attractiveness for doing postdocs in China. They further found that the working hours for postdoctoral researchers in China were the longest, with an average of 61 hours per week, while the average work hours for the 25 countries in their study were 48.1 hours per week (X. Liu et al., 2023).

Not limited to Chinese postdocs, previous studies on postdoctoral researchers in general have explored the gendered career aspiration of postdoctoral researchers

(Bataille et al., 2017), enabling factors for their transition to non-academic career, the negative impacts of precarity on postdoctoral research work (Guidetti et al., 2022), turning them away from academic career (Dorenkamp & Weiß, 2018). Most studies recognized that preparing for an academic career was a major motivation for doctoral candidates to become postdocs (Chen et al., 2015; Miller, 2012). Miller (2012) pointed out that behind the same desire to prepare for an academic career, individuals' considerations for choosing postdocs can be diverse. For instance, some postdocs want a research career rather than an academic position in a university and do not mind the short-term contractual nature of postdocs (Miller, 2012). Her research further called for a closer examination of the expectations for postdocs.

As seen, previous studies have outlined the system governance, work status, career path of Chinese postdocs to some extent; however, a close examination of the expectations behind their career-path choice of becoming a postdoc remain undone. The scarcity of this information is regrettable because it is the sort of evidence the universities and the Chinese government appear to be requiring if they are to attract and support Chinese postdoctoral researchers, as the original goal of developing Chinese national postdoctoral researchers' system (X. Liu et al., 2023). The limited understanding of Chinese postdocs' expectations hinders the realization of comprehensive and tailored institutional support for Chinese postdocs' career development and research productivity during the postdoctoral career stage. Without sufficient institutional support, they may end up trapped between their desire and the lack of available opportunities for its realisation, leading to more dis-satisfactory postdoctoral experiences (van der Weijden et al., 2016). In the worst situation, these talented postdoctoral researchers may leave academia for good. Hence, to enhance the quality of postdoctoral experiences and better support their career development, we

should deepen our understanding of the expectations from Chinese doctoral graduates pursuing postdocs.

This qualitative study attempts to contribute to the knowledge base by exploring the expectations and experiences of Chinese doctoral graduates from elite universities becoming postdocs. We chose Chinese doctoral graduates from elite universities as the analysis unit of the study because they are currently the major source of Chinese postdocs. The study examines the Chinese doctoral graduates' expectations for postdocs both in China and overseas as both are important career choices for Chinese doctoral graduates from elite universities. The study tries to answer the following research question: What are the expectations for doctoral graduates from Chinese elite universities to pursue postdoctoral researcher positions?

After this section, we will introduce the analytical lens for understanding the career decisions of doctoral graduates. Then, we will briefly introduce the research methods and materials used in the study. The analysis results of our interview data based on the analytical lens will be presented. Finally, we will discuss the main findings from the study, the possible implications for practice improvements and the avenues for future studies.

Conceptual framework

In previous studies, several frameworks have been proposed for understanding the career development of doctoral graduates after graduation, for instance, the academic identity trajectory theory (McAlpine & Amundsen, 2018) and the scientific and technical human capital theory (Bozeman & Corley, 2004; Bozeman et al., 2001) used in Kim et al. (2020)'s study and Berger and Milem (2000)'s model for researching organisational impacts on student outcomes. These frameworks are valuable for

outlining some possible factors that contribute to their career-path choices and professional identity development. They may also fall short in presenting a holistic framework for understanding the elements contributing to doctoral candidates' career-path choices and realisation. This is because although doctoral candidates may make the final decisions on their careers at the end of their doctoral studies, the decision is, in fact, attributed to their years of experience and development during their doctoral studies. Particularly, for doctoral graduates aiming for academic profession, they view the postdoctoral research period as a prolonged process of academic socialization aimed at accumulating capitals for academic career development.

Therefore, we propose to integrate the insights from the socialisation theory of postgraduate students (including doctoral students/candidates) (Weidman & DeAngelo, 2020; Weidman et al., 2001) to understand doctoral students' expectations behind their career-path choices. According to Weidman and DeAngelo (2020), the components contributing to doctoral candidates/graduates' career development and life cycle come from the resources for doctoral socialisation, consisting of capitals from both the individual doctoral candidates (i.e. personal capitals) and the situated environment (i.e. social capitals). These personal and social capitals are accumulated, developed and converted into the constellation of capitals that accompany their career and personal orientations and even possibly their lifetime (Weidman & DeAngelo, 2020). Similarly, Chen et al. (2015) argued that the career trajectories of doctoral graduates should be considered within their individual/personal, institutional and intellectual (e.g. disciplinary) contexts. The agencies by doctoral graduates in the personal, institutional, and intellectual spheres to accumulate human capitals contribute to their career decisions and trajectories.

Following Weidman and DeAngelo (2020)'s socialisation perspective, the first element is personal capital, referring to the resources brought in by doctoral candidates individually for their career development (Weidman & DeAngelo, 2020). It includes both personal cultural capital and personal scientific capital. Cultural capital is a broad term indicating the resources that students carry with them into their doctoral education, such as accumulated capitals via family and educational preparations/credentials (Weidman & DeAngelo, 2020). It refers to the resources of doctoral students in relation to their individual characteristics (e.g. student background, preparation, predisposition, aptitude, agency, socioeconomic status (SES), race/ethnicity, gender identity) (Weidman & DeAngelo, 2020). Moreover, the scientific (or professional) capital brought in and developed through doctoral professional experiences is also an important resource for doctoral candidates' and graduates' development (Kim et al., 2020). The concept of scientific (and technical) capital originally includes both individual/personal and collective/social aspects, as scientific and technical human capital refers to the sum of researchers' professional networks, technical skills and resources (Bozeman et al., 2001). In this study, to avoid overlapping, we use the term 'personal scientific capital' to refer to the sum of individuals' scientific technical skills and resources. The scientific capital related to professional ties refers to the social capital of profession, as explained next. The personal scientific capital of doctoral candidates can be reflected in the record of their research productivity, for instance, publications, grant-funded projects, conference presentations and technology transfer activities (Kim et al., 2020).

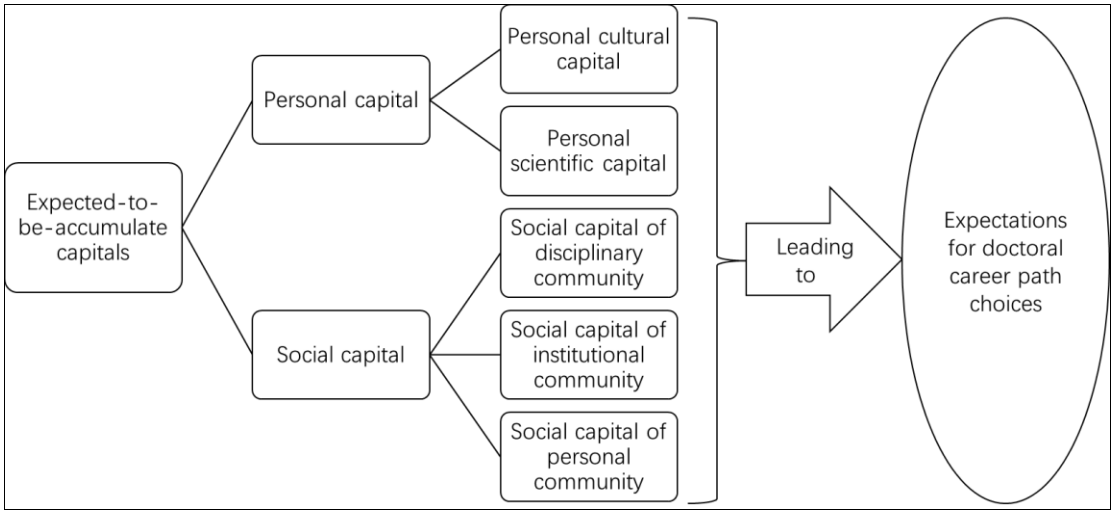
The inputs from the environment constitute the second most important element contributing to doctoral career-path choices, namely, social capital for doctoral candidates' development. This is 'generated through interpersonal interaction with other individuals, both within (institutional history and culture) and external to

(disciplinary/professional communities and personal communities) the higher education' (Weidman & DeAngelo, 2020, p. 14). Considering that the possible situated contexts for doctoral candidates can include, but are not limited to, universities, family, disciplines and professional associations (Weidman & DeAngelo, 2020), in this study, the social capital for doctoral graduates is interpreted as the network ties or relations they develop with their base institutions, personal community (including family, friends, employers, colleagues) and disciplinary/professional communities.

Thus, in this study, we propose to use the following conceptual framework to understand the potential capitals expected for the career decision-making of doctoral graduates.

Figure 1

Conceptual framework for understanding the expectations for doctoral career-path choices



Research methods

Since this study aims to investigate an uncharted field, qualitative research approach was employed to answer the research question. As to gain in-depth analysis of Chinese doctoral graduates' expectations for doing postdocs, a case study strategy was

employed and the group of doctoral graduates from elite universities in China was chosen as the case because they were the main source of postdocs from China. Semi-structured interviews were used as the main data collection method in this study, complemented with documentary data of academic literature. From February 2020 to December 2021, we conducted interview with 30 doctoral graduates from Chinese elite universities in 8 different cities in China, who have assumed postdoctoral researcher positions after graduation, consisting of 23 based in China and seven abroad. Appendix 1 shows the brief background information of the interviewees.

All interviews were designed as semi-structured around the goal of the study and were carried out in Chinese, the mother tongue of the participants. We sent out the interview invitation openly in social media (e.g. Wechat), and through our academic network and the network of our situated universities, and recruited the participants with snowballing strategy. In the end, the 30 participants were recruited based on their voluntary response.

As all co-authors are from research universities in metropolitan regions (i.e., Beijing, Shanghai) in China, the snowballing strategy at the end has limited the scope of the study participants. Firstly, two-thirds of our recruited domestic postdoctoral researchers conducted their postdoctoral research in Beijing. Additionally, H21 was based in Hangzhou, while H22 and H23 were based in Jilin. Among the overseas postdoctoral researchers (A1 to A7), apart from A6 in Germany, the others were based in the United States. Secondly, out of the 30 participants, 22 received their doctoral degrees from research universities and institutes in Beijing, except for H5 from a university in Shanghai, H8 from Xi'an, H9 from Lanzhou, H10 from Wuhan, H17 from Xiangtan, H20 from Tianjin, H22, and H23 from Jilin. Thirdly, the study ended up recruiting more male participants (26) than female participants (4). Lastly, there were

more participants from sciences and engineering (21) compared to other disciplines (9). Based on the analysis of the participants' profiles, we acknowledge the metropolitan background of most participants, as well as the gender and discipline imbalance in our collected data. Therefore, the findings of this study may be more applicable to postdoctoral researchers from Chinese elite universities, based in metropolitan cities in China and overseas, or those who completed their doctoral degrees in metropolitan cities in China, primarily in the fields of science and engineering, and mostly male. It is important to note that the findings of this study cannot be simply applied to all postdoctoral researchers in or from China.

The interviews were conducted online and on-site based on the interviewees' preference, and later transcribed into text. We designed and used a semi-structured interview protocol (see Appendix 2). When conducting interviews, we adjusted the interview questions in the protocol to fit the specifications of the participants, aiming to delve deeper into the interview and encourage more interactive sharing from them. Each interview lasted from 40 to 90 minutes. The interviews were recorded after obtaining research permission from the participants. To protect the participants from being identified, they were made anonymous in our study.

Later, in the data analysis, the postdoctoral researchers based in China were renamed H1 to H23 ('H' is short for 'Home'), while the postdoctoral researchers based abroad were renamed A1 to A7 ('A' is short for 'Abroad'). Some direct quotations from the participants were translated into English when needed for reporting the research findings. Relevant academic literature on China's doctorates and postdoctoral researchers were also included in the study to supplement the interview data analysis. After collecting and organising the interview data, using Atlas.ti 9, we coded the data according to the categories in our constructed analytical framework. The results of the

data analysis will be presented in the next section.

Analysis

Table 1 *Expectations of Chinese doctoral graduates from elite universities for postdocs*

Expected-to-accumulate capitals		**Reflections of expectations**
Personal capital	Personal scientific capital	- To increase the quantitative change of research productivity, including, but not limited to, publications, getting state-funded research projects and patents - Qualitative change in research capacity: increase research independence and sharpen research skills - Qualitative change in research: complete follow-up research of doctoral research or strengthen the depth or breadth of research
	Personal cultural capital	*Not noticeable in data analysis*
Social capital	Social capital of disciplinary community	- To develop academic networks in the discipline at home and internationally - To develop a network with top researchers - To fulfill the requirements of the Chinese government's talent policies
	Social capital of institutional community	- To diversify their institutional profile - To strengthen their connections with supervisors and future employers
	Social capital of personal community	- To increase a family's opportunities in education, healthcare, and welfare benefits in big cities

As Table 1 shows, the analysis of research data following the proposal conceptual framework (Figure 1) suggests that Chinese doctoral graduates from elite universities pursued postdoctoral researcher positions expected to increase the personal scientific capital, discipline-related social capital, institution-related social capital, and family-based social capital. The expectation of personal cultural capital was hardly noticeable in the data. These expectations were influenced by their career development goals, the academic labour market in China, China's talent policies, and cultural values such as collectivism and strong family ties in China. Next, we will illustrate on the analysis results.

Expectation 1: Accumulation of personal scientific capital

All interviewees mentioned that one of the reasons they considered a postdoctoral researcher position was to increase their personal scientific capital, so they can be more competitive in getting academic positions in the elite universities in China. Here, by increasing their personal scientific capital, in quantitative perspective, the participants referred to increasing the number of academic publications and research projects, enriching their international research experiences, and expanding their participation in academic networks, such as international conferences. This is closely related to the recruitment criteria employed by Chinese elite universities, where factors such as the number of academic publications and patents, the applicants' ability to secure research funding, and their international mobility experiences during their doctoral and postdoctoral periods are taken into consideration. Taking an elite research university in Shanghai as an example, the recruitment of an assistant professor typically requires a minimum of three academic publications and experience in funding applications.

International research experience and postdoctoral research experience are considered advantageous for applicants. As mentioned by H15 (Biology, male),

> ‘I think, graduating from our university, it is not difficult to obtain an academic position in universities. It depends on which level of university you want to join. Most people choose postdocs in the elite universities or top research institutes because they hope that afterward, they can join the Project 985 universities.’

Not solely the quantitative indicators, the interviewees highlighted the qualitative changes in their research capacity. Qualitative change refers to the enhancement of their research expertise, changes in their research agenda and their professional identity of becoming independent researchers. First, regarding the change in research expertise, ‘to sharpen my research skills’ and ‘to delve deeper into the research topic’ were frequently mentioned by the interviewees as the main reason to become postdocs. For instance, H23 (Agriculture, male) already received offers of academic positions in several local universities, but he chose to do a postdoc in a top research university because ‘It is not just a job but a chance to improve my research capacity’.

Second, the capacity to conduct research independently was highlighted as another important qualitative change by several interviewees (e.g. H2, H3, H12, H13, H15, H18). In this study, we understand the independence of doing research as ‘the extent to which actors in science are free from influences that alter their choices’ (Gläser et al., 2022, p. p. 107). According to our interviewees, research independence was the key difference in the professional identity between doctoral researchers and postdoctoral researchers. As explained by H3 (history, female):

> ‘We call the supervisor for postdoctoral researchers ‘cooperative supervisor’, which means that as a postdoctoral researcher, one can have more freedom in research. It also means the relationship between postdoc researchers and their supervisors is cooperative, not a hierarchical supervisor–supervisee relationship… This is the biggest role change from doctoral researcher to postdoctoral researcher. Because I have become more autonomous, I am more motivated to conduct research.’

Making a breakthrough or qualitative change in research is the third expected qualitative change. Interviewee H18 (Marxism, male) shared that he was not satisfied with the research outputs of his doctoral research, and he intends to continue with the same research project in the postdoctoral period to attain more profound findings. With the same dissatisfaction regarding doctoral research, H23 (Agriculture, male) chose to become a postdoc because he switched to another research topic that he found more interesting.

Expectation 2: Accumulation of discipline-related social capital

Increasing social capital in the discipline was found to be another expectation for pursuing postdoctoral researcher experiences, according to the interviewees. For instance, H4 (History, male) believed the development and maintenance of an academic network were more helpful than publications. From his experience, he found that this was the advantageous aspect of undertaking a postdoc position.

> ‘I got more chances to present myself and my research in academia… This is very important. As an academic, you need to find the academic circle that recognises your research.’

Meanwhile, for the interviewees who went abroad, their aim in becoming internationally mobile was to increase their social capital in relation to the international academic community. As A5 (Chemistry, male) pointed out, 'Pursuing postdoctoral research (for me) is not about getting a better salary but about receiving recognition among your international academic peers'. A4 (Chemistry, male) mentioned during the interview that he was worried that if he continued with his postdoctoral researcher position in China, although he may accumulate more publications, it may not be easily recognised or accepted by the international academic network. A5 shared similar thoughts with A4,

> 'First, you must admit, they (academics) are still more advanced here (America) in terms of research exploration. Second, the academic world is still led by them (here means: American academia)… For your future research in the field, you need to gain their (international academic community's) recognition.'

The accumulation of social capital in the international academic community is supported by Chinese talent development policies, such as the Thousands of Youth Talents Program and the Excellent Young Scientists Fund. The underlying logic of these talent policies from the Chinese government is to attract Chinese talents to return to China and bring back advanced knowledge and technologies, as well as the related international academic networks. The interview data found Chinese talent policies as the catalyst pushing talented Chinese doctoral graduates to go abroad (e.g. A3, A5, A7). Some interviewees overseas mentioned that it was normal to plan their career paths in compliance with the Chinese talent policies. Like A7 (Mechanical Engineering, male) shared.

> ‘I think the reason I began to consider a postdoc position abroad is to join the Thousands of Youth Talents Program. Now, it has evolved into the Excellent Young Scientists Fund. My plan is to work as an international postdoc for three years. After that, I will apply for the Excellent Young Scientists Fund. That’s what I am aiming for after I obtain three years’ worth of international postdoc experiences. With the funding granted, I will return to China and work as an academic staff in universities.’

Influenced by these considerations, this group of Chinese doctoral graduates (e.g. A4, A6, A7) usually prioritise leading scholars when choosing the base for postdoctoral research, and their doctoral supervisors are usually outstanding in the field and enjoy an esteemed reputation. A4 shared in the interview that many of his doctoral peers found another top researcher in their field as their host supervisor for postdoctoral research, and it was not difficult for doctoral researchers from elite universities in China to do that because of their doctoral supervisor’s strong and extensive academic network. In so doing, they increased their social capitals in relation to two or more top research groups in the field and strengthened the cooperation among these research groups.

Expectation 3: Accumulation of institution-related social capital

The interviewees’ expectations for increasing their institution-related social capital can be divided into two folds: to diversify their institutional profile and to strengthen their connection with future employer institutions.

Driven by the first expectation, some interviewees tended to choose a host institution that they believed was better or in a higher reputation status compared with the institution they graduated from (e.g. H1, H3, H4, H9, H10, H14). They believed that an academic network based on a more well-known institution could contribute to their

establishment in the research field. For instance, H6 (Religion, male) described his experience in an academic conference:

> 'I was flattered! I once went to participate in an academic conference in the south, and my presentation was assigned to be the first one! I saw more senior researchers there, but I was prioritised because I am from Peking University. Later, I went to another conference. I was invited to join a panel discussion together with other professors from other universities, not like other junior researchers in parallel presentation sections…These can also be traced to the '*Beida*' (Peking University) brand. From this perspective, I owe a lot to the *Beida* brand.'

The interviewees also mentioned that they could receive more research resources and enjoy more intellectual freedom in a more famous university. Interviewee H4 (History, male) stated that he intended to stay in elite universities because he believes that the academics in these universities can enjoy more academic autonomy:

> 'From my observation, universities with lower rankings in China wish to improve their ranking by increasing their research productivity. Therefore, they would put more pressure and requirements on junior researchers. Elite universities have already established their status or dominant academic power, so they would be more tolerant of slow-paced researchers. If you look at their young researchers, you will find that they have more freedom to work at their own pace.'

For another group of interviewees who stayed in the same institutions or institutions at the same level in the hierarchy of higher education system in China, after graduation (e.g. H2, H6, H18), they believe that their strengthened ties with the host

institution would lead to future job opportunities for themselves in their graduation institutions. For instance, doctoral graduates from Tsinghua University may prefer to stay in their home university, or to Peking University, which is considered in the same rank as Tsinghua (Liu et al., 2021). In this sense, they were accumulating the social capitals of future employers. Some interviewees in the study changed their base research group within the same institution to comply with the university policy of avoiding inbreeding, but their postdoc research groups have strong ties with their original research groups. Usually, the research activities during their postdocs are closely aligned with the research profile of their original research group. Some even remain as affiliated members of their original research group. After they completed their postdocs, they would return to the original research group and get promoted to academic positions. To some extent, they realised the institutional mobility and complied with the 'avoid inbreeding' policy through negotiation/cooperation between research groups, while maintaining their supervisor-related capital. Such implicit cooperation of research groups is more obvious in the top universities or between top universities as a reciprocal strategy to retain their talents. As H6 (Religion, male) shared:

> 'We have a postdoc in our research group. He was originally from X University, and his doctoral supervisor is among the top researchers in the field in China. We all know that he only came here for a two-year postdoc, and after that, he will return to X University. His supervisor sent him here to strengthen the ties between two research groups, broaden his views and comply with the no-inbreeding policy, so he could get an academic position at X University.'

Expectation 4: Accumulation of family-related social capital

Interestingly, the analysis of interview data found a small group of interviewees in Beijing (e.g. H2, H12, H16, H17) who decided to pursue postdoctoral research because they wanted to settle down in Beijing and get a Beijing residency (in Chinese: *hukou).* Aside from residency, Chinese people have imbued this term with more meanings. Now, it reflects a family's opportunities in school education, healthcare and welfare benefits in a city in China. These opportunities are usually more relevant for families with children who have the needs of good education. Thus, for these interviewees, pursuing postdoctoral researcher positions in their graduate city was a way to accumulate social capital in the city for their (future) families.

For interviewees based in Beijing or originally graduated from Beijing, the Beijing *hukou* was a topic repeatedly mentioned during our conversations. H16 (Biology, male) considered that for doctoral graduates from universities in Beijing, if they intended to continue with postdoctoral research in Beijing, there were usually two reasons: first, they hope that by getting a job as a postdoctoral researcher, they can get the *hukou* in Beijing, and second, they would like to complete their research, which has not yet been fully addressed within the doctoral research period.

His point was supported by other interviewees, including A2. A2 mentioned that her first priory was to secure the Beijing *hukou* immediately after graduation. She shared that she was already at the last stage of a job interview for a state-owned company, but then she heard that the job might not be able to help her get the Beijing *hukou.*

> ‘If they (the company) could help guarantee that I would get the Beijing *hukou*, I would have probably struggled with the decision. Because they could not, I left and went abroad for a postdoc in the end.’

From the interview data, the career decision for a postdoctoral research position is not solely a personal choice of professional development but rather, a collective decision of a family or future family between family members/partners. As H20 (Mechanical engineering, male) shared:

> ‘We (my girlfriend and I) made this decision through rational analysis. We discussed where our future will be, how to develop our future family, how to talk with our parents… After a rational analysis and open discussions, we made this decision (he chose a postdoc position in Beijing and moved to Beijing). It is alright for a boyfriend to follow his girlfriend to find a job in her city or the other way around.’

While making this family decision, the interview data showed that early career researchers in China has a more equal relationship between men and women. Both female and male participants mentioned that they would secure residency/*hukou* in a metropolitan city for their families.

Discussion

The analysis results contributed to deepening our understanding of expectations of doctoral graduates from Chinese elite universities for doing postdocs with three striking findings.

First, different from people’s impression of focusing only on quantitative change of personal scientific capital, such as the number of publications and funded projects, Chinese doctoral graduates from the elite universities highlighted their expectation for

the qualitative changes in their research capacity, such as the breadth and depth of their research, the ability to conduct research independently, and the enhancement of certain research skills. The analysis showed participants in the study were all aware that postdoctoral research a critical period for doctoral graduates to become independent and established researchers (Krull et al., 2022; Singer, 2004), and were eager to establish their academic autonomy. We assume this may also be related to the more hierarchical patriarchal research structure in Chinese supervisor–supervisee groups (Zheng et al., 2018). From there, Chinese doctoral graduates may become more eager for proving their capacity to be independent, autonomous researchers. Previous studies have found that postdocs in western and less-developed regions of China, despite receiving lower salaries, are not less satisfied with their work compared to their counterparts in eastern China (Gao, 2018). The finding regarding expectations on qualitative change of personal scientific capital could provide explanation to this phenomenon. Firstly, postdocs in western China are less common compared to those in eastern China, and as a result, the universities in these regions value and appreciate the added value brought by postdocs. This may lead to more institutional support and access to additional resources in their host universities, enabling them to establish their research groups and maintain academic independence. Consequently, they can fulfil their expectations for qualitative changes in their personal scientific capital. This also explains why institutional support from host universities, rather than salary alone, has been identified as an important influential factor on the work experiences of Chinese postdocs in previous studies (Gao, 2018; Guo & Ren, 2023). Second, there were different opinions on ‘what social capitals are more important’ between Chinese doctoral graduates who chose to stay in China for postdocs and those chose to go abroad. Of course, when it comes to an individual’s choice, one may aim for the accumulation of all capitals, only

varying in the priority of the considerations. The study found those who chose to do a postdoc in China valued more the institution-related capitals, and they usually already had a clear career path ahead when they chose their base institutions for the postdocs. By comparison, their peers who chose to go abroad have a clear aim of strengthening their ties with the international academic community. In both situations, supervisor-related capital was expected in pursuing postdocs. Such a finding also reminds us of Lu and McInerney (2016)'s discoveries about the different strategies of networking in academic career development by Chinese domestic doctorates ("Land-turtle, *tubie*") and overseas returnee doctorates ("Sea-turtle, *haigui")*. While the former utilise their advantages of being closely connected and trusted within the Chinese domestic network, the latter largely rely on international networks and collaboration (Lu & McInerney, 2016). This finding not only supports Lu and McInerney (2016)'s findings with new evidence of similar strategies by Chinese postdocs in China and overseas respectively, but also provides further explanation for the reasons behind: For academic career development in China, institution- and supervisor- related social capitals play a bigger role that that of discipline- and supervisor- related social capital, while for academic career in internal academic community, the situation may be the opposite.

The findings of Chinese domestic postdocs' consideration add new evidence with explanation for the new form of academic inbreeding in China (Shen & Xu, 2021): elite doctoral graduates in China chose to do postdocs in another elite universities and then returning to the graduation institution for academic positions. Due to the importance of social capital in the Chinese academic labour market (Lu, 2013), the institution- and supervisor- related social capital (in Chinese: *xueshu guanxi)* can be used to gain access to job assignments and, later, to academic promotions, in the Chinese academic labour market (DiTomaso & Bian, 2018; Lu & McInerney, 2016).When Chinese postdocs go

mobile within China, they expected to accumulate more supervisor- and institution-related social capitals in Chinese academia, so that they can returned to their graduation institutions or similar counterparts for their future employers. This study further indicates such a phenomenon may be more visible in the disciplines of science and engineering and among the top research groups in certain fields or among top universities.

A third striking finding Is that expectation of family related social capital plays a more significant role in career-path choice for doctoral graduates in metropolitan regions in China, rather than that of personal cultural capital. This can be seen in the absence of interview data explicitly suggesting the accumulation of personal culture capital as an expectation for choosing postdocs in the study. It also can be seen in the fact that while mentioning enhancing social economic status, opportunities and benefits, participants referred it to families, particularly for their children or future children. The study shows a strong impact of collectivism and strong family culture of Chinese society on Chinese metropolitan doctoral graduates' career choice, under which while considering the enhancement of social and economic class, they may be thinking about it from the perspective of a family, particularly for future children or future children, rather than for individuals. This finding implies rather than marital status (e.g., married or unmarried), the family status with children or without children might affect the career-choice of Chinese doctoral graduates and changed their expectations of pursuing postdocs.

Conclusion

This study contributes to the conceptual understanding of the career-path choices of doctoral graduates by proposing an analytical framework for understanding

doctoral graduates' expectations of career choice from academic socialization perspective (Weidman and DeAngelo 2020). It further makes empirical discoveries as to the expectations of 30 doctoral graduates from Chinese elite universities when they decided to pursue postdoctoral researcher positions. The study found that Chinese doctoral graduates from elite universities chose postdocs with the expectation of increasing their personal scientific capital, institution-related social capital, discipline-related social capital and family related social capital. Among these considerations, rather than the quantitative change, a qualitative change of personal scientific capital was a common and the most important expectation by Chinese elite doctoral graduates. While social capitals matter for academic career development, domestic postdoc participants with higher expectation on increasing institution-related social capital and oversees postdoc participants valued the increase of discipline-related social capital more. Metropolitan postdocs expected for more social capitals for their family and children.

Based on our analysis results and discussion, we drew some implications supporting postdoctoral researchers in meeting their expectations and improving their postdoctoral experiences:

In order to support domestic postdocs in China, host universities and the government should recognize the importance of personal scientific capital for postdocs who have graduated from Chinese elite universities and provide increased institutional support for their research independence and output. Chinese universities should first acknowledge the professional identity of postdocs as staff members, on equal footing with other early career researchers such as assistant professors and lecturers within their respective institutions. To achieve this, the Chinese government should decentralize its governance of postdoctoral researchers and grant universities greater autonomy to

include postdocs in their staff management systems, offering more comprehensive institutional support. For elite doctoral graduates who have high expectations of developing into independent principal investigators leading their own research groups, they should be given ample opportunity to pursue their own research projects rather than being compelled to join larger research teams or projects.

To support Chinese postdocs overseas, international host institutions can provide assistance in integrating postdocs into the international academic network and engaging them in international research activities. This collaborative effort may contribute to enhancing the overall quality of work experiences for Chinese postdoctoral researchers.

It should be mentioned that this is a very preliminary study of the expectations of Chinese postdoctoral researchers, which is a large population. The sample in this study includes only 30 postdoctoral researchers who graduated from China's elite universities. A first future research avenue is to examine the situation of doctoral graduates from other regional universities in China and beyond. All the interviewees in this study worked in universities and were determined to pursue academic careers, which creates space to explore the reasons behind doctoral graduates in industrial postdoc positions. Another research avenue is to unveil why, despite these expectations, some doctoral graduates can successfully get postdoctoral researcher positions while others cannot. Lastly, further longitudinal research can also be done to follow the career development of the participants choosing postdoctoral positions at home and overseas and compare their career paths.

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Appendix 1 *Brief Information Regarding the Interviewees*

Interviewee	Discipline	Gender	Means of interview	Based city of Ph.D.	Base city of postdocs
H1	Information science	Male	face-to-face	Beijing	Beijing, China
H2	Information science	Female	face-to-face	Beijing	Beijing, China
H3	History	Female	face-to-face	Beijing	Beijing, China
H4	History	Male	face-to-face	Beijing	Beijing, China
H5	Philosophy	Male	face-to-face	Shanghai	Beijing, China
H6	Religion	Male	face-to-face	Beijing	Beijing, China
H7	Energy	Male	face-to-face	Beijing	Beijing, China
H8	Education	Male	face-to-face	Xi’an	Beijing, China
H9	Mathematics	Male	face-to-face	Lanzhou	Beijing, China
H10	Mathematics	Male	face-to-face	Wuhan	Beijing, China
H11	Mathematics	Male	face-to-face	Beijing	Beijing, China

H12	Law	Male	face-to-face	Beijing	Beijing, China
H13	Physics	Male	face-to-face	Beijing	Beijing, China
H 14	Material science	Male	Online	Beijing	Beijing, China
H15	Biology	Male	face-to-face	Beijing	Beijing, China
H16	Biology	Male	face-to-face	Beijing	Beijing, China
H17	Economics	Male	face-to-face	Xiangtan	Beijing, China
H18	Marxism	Male	face-to-face	Beijing	Beijing, China
H19	Marxism	Male	Online	Beijing	Beijing, China
H20	Material sciences	Male	Online	Tianjin	Beijing, China
H21	Mechanical Engineering	Female	Online	Beijing	Hangzhou, China
H22	Agriculture	Male	Online	Jilin	Jilin, China
H23	Agriculture	Male	Online	Jilin	Jilin, China
A1	Chemistry	Male	Online	Beijing	California, US.
A2	Chemistry	Female	Online	Beijing	Hanover, US.
A3	Chemistry	Male	Online	Beijing	San Francesco,

					US
A4	Chemistry	Male	Online	Beijing	California, US
A5	Chemistry	Male	Online	Beijing	Boston, US.
A6	Mechanical Engineering	Male	Online	Beijing	Essen, Germany
A7	Mechanical Engineering	Male	Online	Beijing	Boston, US.

Appendix 2 Interview protocol

I. Beginning of postdoc career path choice

Could you describe your experiences that how did you begin your postdoctoral postitons?

II. Experiences and responsibilities

Could you describe your work experiences as a postdoctoral researcher by far? What are your main responsibilities and activities?

III. Considerations for career path choice

(1) Could you share your consideration for choosing the postdoct postitions after doctoral graduation? Why to choose this city? this institution? this research topic?

(2) What did you expect from doing postdocts? e.g. in related to your personal/family development? your institutions? Your field?

(3) have you considered doing postdocs abroad? Why or why not?

IV. Achievement during postdocs

(1) how did you self-evaluate the achievement of your postdoctoral work?

(2) what were the most satisifed parts in your work?

(3) what were the most unsatified part?

(4) what are the most important achievement that you aim for, or already achieved, for you for postdoctoral period?

V. Future plan

(1) What are your career plan after the postdocs?

(2) To what extent you considered the postdoctoral experiences have prepared you for the future job market? What did you gain during postdocs? For instance, in related to future employers? future academic positions/job opportunities? your establishment in the field? etc.