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A study on current situation and influence factors of transnational migration of scientific researchers in China

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Main Content

- Background and summary of research
- Methodology and data
- Characteristic analysis of recruited oversea talents
- Analysis of the influence factors of transnational migration of scientific researchers
- Conclusions and some discussion

Some definitions

The meaning of transnational migration of scientific researchers:

- **Brain Drain：** Chinese researchers flow to other countries through various forms, such as studying for a doctoral degree,carrying out postdoctoral work,visiting scholar,carrying out project abroad, etc.
- **Brain Gain：** International researchers come to China to work, exchange,visit and cooperate in projects, etc.
- **Time range：** Generally the transnational migration of researcher should be more than 3 months.

The transnational migration of scientific researchers is a complex social phenomenon and its emergence and development is result from the combination of external and internal factors.

- **External perspective：** It reflects the changes in diplomatic relations between the researchers out flowing countries and the recipient countries；
- **Internal perspective：** It exposes the gaps in economy, technology, and other aspects of the country's accumulated social conflicts between the researchers out flow countries and the recipient countries.
- **Individual level：** The migration of researchers is actually a social phenomenon formed by individual choices which involves many social reasons and complicated psychological reasons.

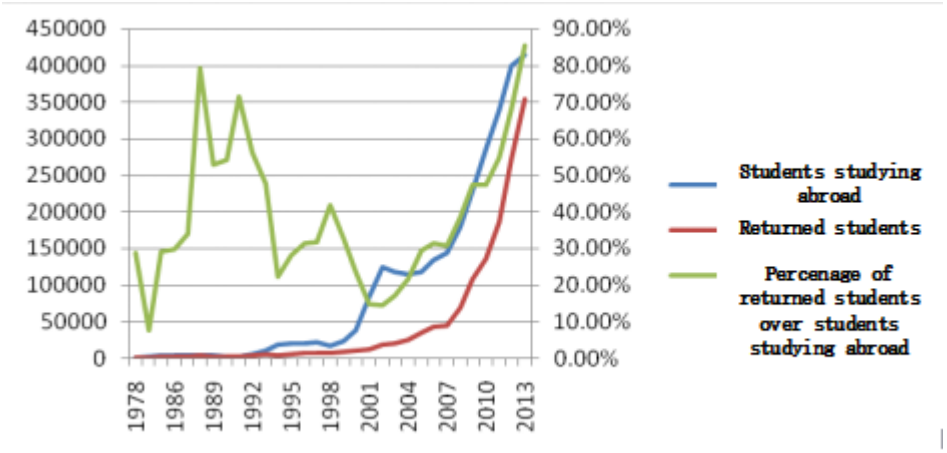
Relevant research reviews

- **Chen Changgui（1996）** analyzes the cause of the talent drain in China and he puts forward some policy suggestions to attract students from abroad to work in china.
- **Gao Zijian（2010）** claims that we need to explore new paradigms of international talent flow based on the new economic and social background.
- **Ludmila Ivancheva and Elissaveta Gourova（2011）** found that the top 3 influence factors affecting the transnational migration of scientific researchers are future career development, interesting research topics and collaborative research projects.
- **Wei Hao（2012）** found that the commodity trade between countries will significantly promote the transnational flow of students.
- **Laudeline Auriol（2013）** finds three main influence factors affecting the transnational migration of scientific researchers, which are academic reasons, work or economic factor and family or personal reasons.

- **Sonia Conchi（2014）** found that in the same research field, German scientists with experiences in transnational migration have higher rates of publication citations than those without. In terms of attractive migration countries for German scientist, the most popular country is America followed by UK and Switzerland in 2000-2010.
- **Xiao Lu and Wenxia Zhang（2015）** think that as a channel connecting international and local Chinese scientists, the returned talents play an important roll in the spread of knowledge through the international network.
- **Silvia Appelt（2015）** founds that the mobility of scientists is positively correlated to the economic conditions and resources, research and development investment, and the reduction of visa related restrictions.

Background

- **The number of students studying abroad and returned students all have a rapid increase.**



Year	Students studying abroad	Returned students	Percenage of returned students over students studying abroad
1978	860	248	28.8%
1980	2124	162	7.6%
1985	4888	1424	29.1%
1986	4676	1388	29.7%
1987	4703	1605	34.1%
1988	3786	3000	79.2%
1989	3329	1753	52.7%
1990	2950	1593	54.0%
1991	2900	2069	71.3%
1992	6450	3611	56.0%
1993	10742	5128	47.7%
1994	19071	4230	22.2%
1995	20381	5750	28.2%
1996	20905	6570	31.4%
1997	22410	7130	31.8%
1998	17622	7379	41.9%
1999	23749	7748	32.6%
2000	38989	9121	23.4%
2001	83973	12243	14.6%
2002	125179	17945	14.3%
2003	117307	20152	17.2%
2004	114682	24726	21.6%
2005	118515	34987	29.5%
2006	134000	42000	31.3%
2007	144000	44000	30.6%
2008	179800	69300	38.5%
2009	229300	108300	47.2%
2010	284700	134800	47.3%
2011	339700	186200	54.8%
2012	399600	272900	68.3%
2013	413900	353500	85.4%
2014	459800	364800	79.3%

Source：《China Statistical Yearbook》（2015）

Since the beginning of the reform and the opening-up in China, not only the number of oversea students and returned students are all on the rise. the number of oversea student is always higher than the return students. Since 2000, in most of the year the number of returned students maintained a high growth rate. Since 2004, more significant increase are shown in the number of return students. In 2013, the return students accounts for 85.4% in students studying abroad. It is a pick in history. Although the percentage which is 79.3% have dropped in 2014, but it is still remain at a relatively high level.

Research questions

1、What are the essential Characteristics of recruited oversea talents?

In resent years, several thousands of oversea high-level talents have been recruited through various talent recruitment program in China. Most of them are Chinese students who finish their study oversea and came back to work in China.The analysis of characteristics of this group is helpful in providing consulting advice for talent recruitment programs in China.

2、What are the influence factors of transnational migration of scientific researchers?

Why do researchers choose to study abroad? Why do they choose to come back to work in China? Is there any changes in the influence factors comparing with before? The analysis of these influence factors can help understanding the internal causes of transnational migration of researchers. It also can provide better reference for relevant personnel policy.

Methodology and data

1、Curriculum Vitae （CV） analysis

- **Sample selection：** We select the high level technical personnel who are recruited from abroad through ' Chang Jiang Scholars Program',' Hundred-Talent Program' and 'Thousand-Talent Program' (Thousand Youth Talent Plan) in China.
- **Analysis process：** First we collect the name of all batches of the selected scholars in the talent programs mentioned above through internet and then input them into excel; then we find the CV of the selected scholars through related sites in order to get the information such as gender, year of selection, current employment organization and position, research field, date and place of birth, Final graduated university、university or institutions for their postdoctoral、oversea study experiences, beneficial policies, publication, patents and awards, etc. These information forms the CV database; We then coded the information and reorganized the information based on our research purpose.

	Thousand Youth Talent Plan	Hundred-Talent Program	Chang Jiang Scholars Program	Total
Number	1797	2037	1264	5098

2、Survey questionnaire

- **Sample selection：** We focus on researchers with oversea experiences who work in universities, research institutions and research and development department in companies in China. This research adopts the stratified sampling method. We sent out 2000 questionnaires and 721 of valid questionnaires are collected.

- **Data collection：** In the collected questionnaires, the majority of the respondents which accounts for 78.3%have doctoral degree; the majority of the respondents which accounts for 70.6% are male; the respondents are mainly from universities which accounts for 63.3%. Most of the respondents which accounts for 66% age between 31-45.

Sources of regruited oversea high-level talents

Thousand Youth Talent Plan		Hundred-Talent Program		Chang Jiang Scholars Program	
Source	Percentage	Source	Percentage	Source	Percentage
America	63.80%	America	48.1%	America	52.4%
Gemany	6.23%	Japan	15.8%	UK	10.3%
UK	5.47%	Gemany	8.1%	**Japan**	8.8%
Singapore	4.90%	UK	7.3%	Gemany	7.8%
Japan	2.74%	Canada	3.8%	Canada	4.8%
Canada	3.49%	Singapore	2.3%	France	3.3%
Hong Kong	3.97%	Australia	2.2%	Australia	3.3%
Australia	1.55%	France	1.6%	Hong Kong	1.3%
France	1.90%	Korea	0.8%	Swenden	1.2%
Switzerland	1.81%	Netherland	0.9%	Singapore	1.2%
Other	4.15%	Other	9%	Other	5.5%

The analysis of the sources of recruited oversea high-level talents shows:

- The recruited oversea high-level talents mainly come from America, Germany, UK and Japan.
- For example in the thousand youth talent plan, the top three sources are America (63.8%), Germany and UK; In handred-talent program, the top three sources are America (48.1%), Germany and Japan;
- In the Chang-jiang scholars program, the top three sources are America (52.4%), UK and Japan (See table 4-6).

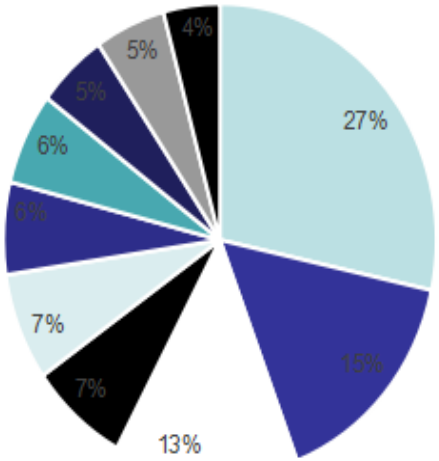
The distribution of recruited oversea high-level talents in China

- The recruited oversea high-level talents are centrally located in the first-tier cities such as Beijing, Shanghai Guangzhou etc. For example, in the thousand youth talents program, the province or city that attracts the most of recruited oversea high-level talents is Beijing followed by Shanghai and Jiangsu.
- The total number of talents in these three provinces accounts for 54% of the total recruited talents. In terms of the geographical distribution, provinces in eastern China attracts the majority of the scholars(76%). The number of talents in central and western China is relatively few, which are15% and 9%.

Distribution of thousand youth talents

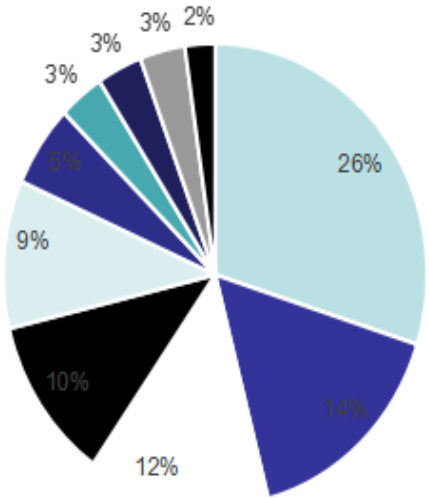
	Province	Number of people	Percentage
Eastern China/ coast line	Beijing	502	28%
	Shanghai	294	16%
	Jiangsu	184	10%
	Guangdong	123	7%
	Zhejiang	106	6%
	Liaoning	37	2%
	Fujian	44	2%
	Tianjin	39	2%
	Other	45	3%
Total in eastern China/ coast line		1374	76%
Western China	Sichuan	66	4%
	Shanxi	47	3%
	Chongqing	21	1%
	Other	23	1%
Total in western China		157	9%
Central China	Anhui	127	7%
	Hubei	107	6%
	Hunan	24	1%
	Other	8	1%
Total in central China		266	15%
Total		1797	100%

Subject areas of the recruited oversea high-level talents



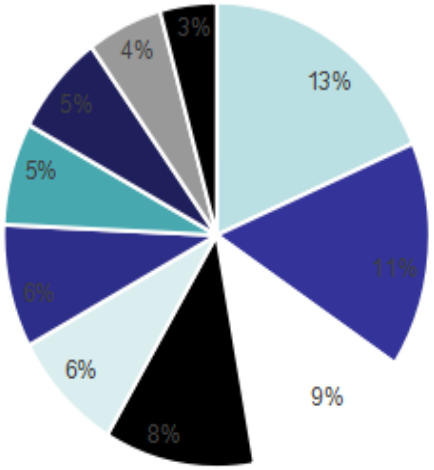
- Biology
- Chemistry
- Engineering and Materials Science
- Phisics
- Mathematics
- Materials Science
- Information Science
- Electronic communication technology
- Others
- Geoscience

Subject areas of thousand youth talent plan



- Biology
- Phisics
- Chemistry
- Geoscience
- Materials Science
- Electronic communication technology
- Environment and resource Science and technology
- Preclinical medicine
- chemical engineering
- Astronomy

Subject areas of hundred-talent program



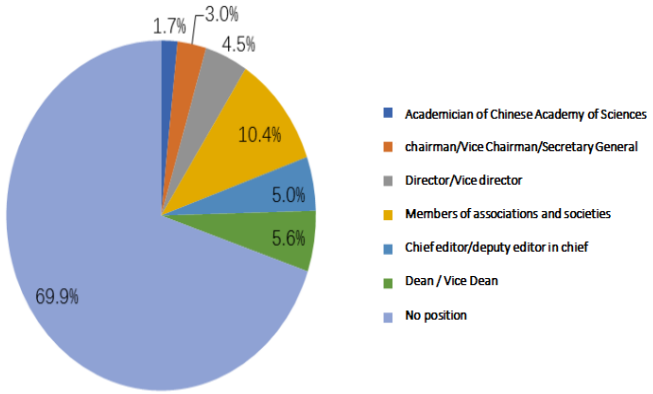
- Biology
- Others
- Chemistry
- Phisics
- Mathematics
- Materials Science
- Geoscience
- Clinical medicine
- Natural science related engineering and technology
- Power and electrical engineering

Subject areas of Chang Jiang Scholars Program

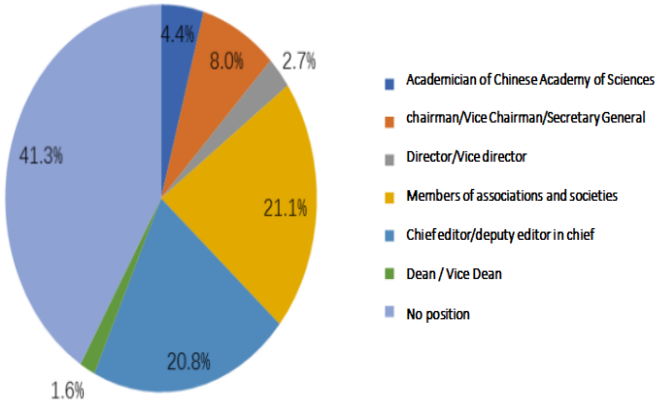
- Since the purposes of various talent programs are similar, they all focus on recruiting high-level talents who devote to basic science research.We can see that the majority of the recruited oversea high-level talents are from biology, physics and etc.
- Based on our research，in the thousand youth talent plan, the recruited talents from biology, chemistry and physics fields account for larger proportion, which are 26%, 14% and 11% respectively; In the hundred-talent program, the top 3 research fields are biology (26%), physics (14%) and chemistry (12%); In Chang Jiang scholar program, the proportion of biology reaches 13%.
- Currently in all three of the most influential talent programs, the number of recruited talents in biology field is the most, which is far higher than that in other subject field.

The international status of the recuited oversea high-level talents

- Some researchers hold the important positions in various international organizations. It reflects their status in the related field and the recognition among peers.
- Our research shows that there are not many of the recruited oversea high-level talents who hold the positions such as chairman, Vice Chairman, the Secretary General, deputy secretary general, the chief editor and deputy editor in chief, etc in international organizations. For example in thousand youth talent plan, the percentage of researchers holding a position in international organizations is 30.1% whereas in Changjiang scholar program the percentage is 58.7%。
- Since the thousand youth talent plan and the hundred-talent program are targeting young researchers with potential, most of them are recently graduated doctors. Few of them hold positions in international organizations. It shows that there is still a gap between the recruited oversea high-level talents and the world class scientists.

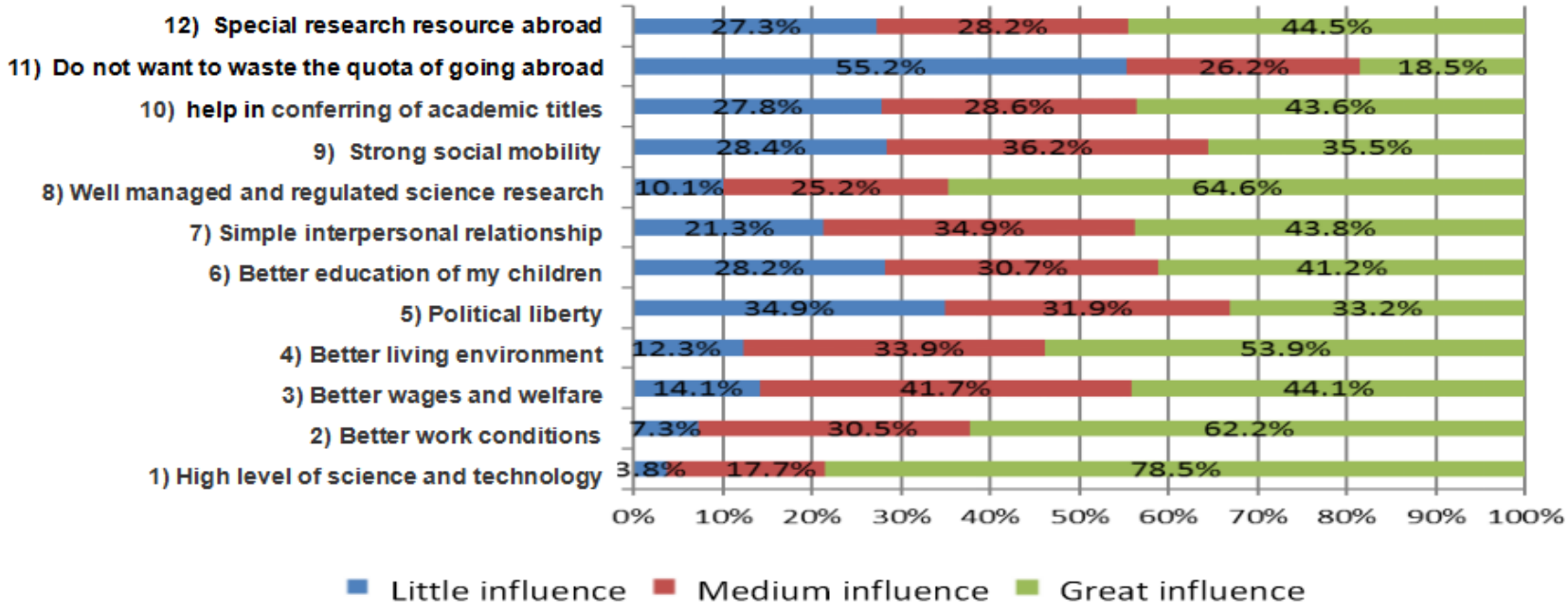


percentage of researchers in thousand youth talent plan have positions in inernational organizations



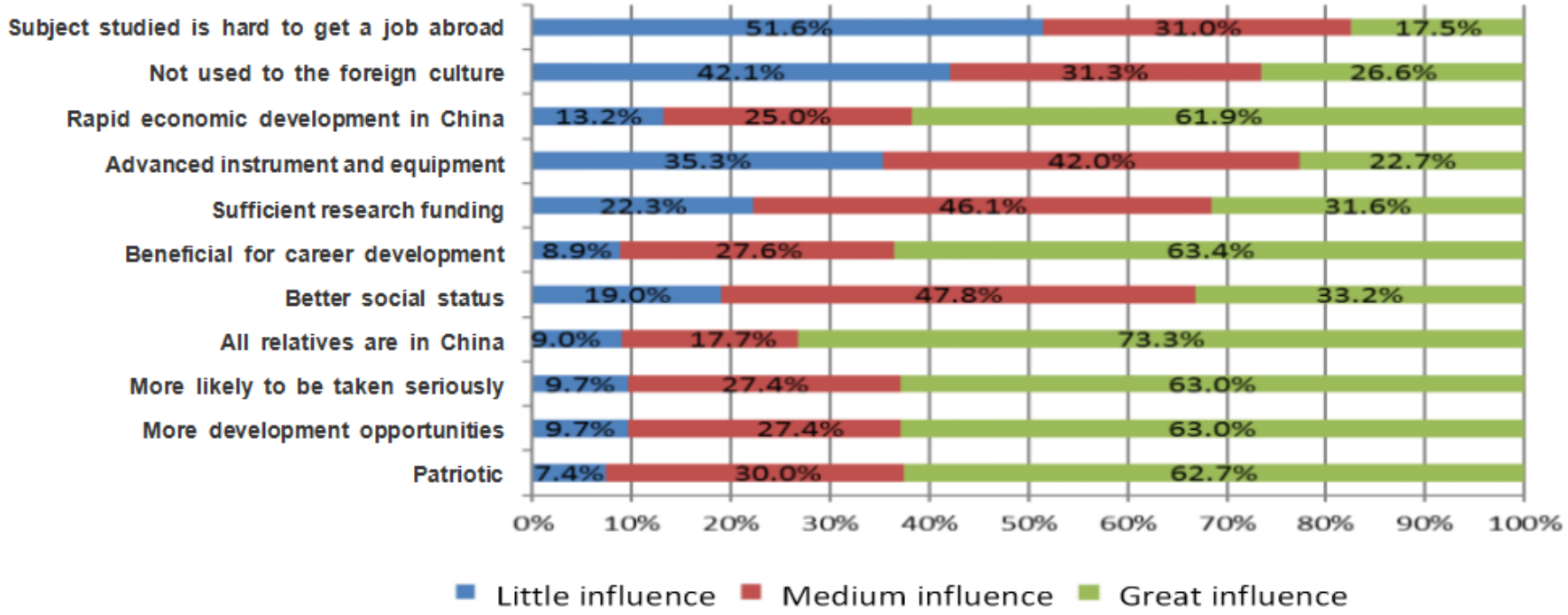
percentage of researchers in Changjiang scholar program have positions in inernational organizations

Influence factors analysis of researchers drain



- The influence factor that listed in the first place is the level of science and technology. 78.5% of the respondents think the high level of science and technology greatly affected their decision to go abroad.
- This also reflect that there is still a gap in science and technology level between the science and technology well developed countries and China.
- The influence factor that listed in the second place is well managed and regulated science research. 64.6% of the respondents regard this as an important influence factor.

Influence factors analysis of researchers gain



- The flow back of oversea talents is mainly result from two factors. On one hand there is a better prospect and space for development when returning to China.
- On the other hand, the family ties and family culture plays an important role in their decision of returning to China.
- From our research, we can see that the influence factor that their relatives being in China is in the first place. 73.3% of the respondents regard it as an important influence factor.
- The influence factor that return to China being beneficial to their career development is at the second place, followed by the factors of more opportunities in China and being more likely to be taken seriously.

Comparison of the influence factors in resent 20 years

Influence factors of talent drain		Influence factors of talent gain	
Chen Changgui（1996）	Our resesarch（2016）	**Chen Changgui（1996）**	Our research（2016）
1、Political liberty	1、High level of science and technology	**1、Affects of familyl ties**	1、Relatives all in China
2、More oppotunities and choices of work	2、Better managed and regulated research	**2、Higher social status in China**	2、Benefitial to career development
3、High living standard	3、Better working conditions	**3、Benefitial to career development**	3、More oppotunities for development
4、Better working conditions	4、Better living conditions	**4、Patriotism**	4、More likely to be taken serious

Conclusions and some discussion

- There are historical reasons behind the unbalance of recruiting oversea high-level talents and it is difficult to change in a short term of time. From the perspective of national economic and social development，there is relatively few talents recruited in the manufacturing and telecommunication field. There is a serious deficiency of Industry leading personnel, high-level technical experts and highly skilled talents in some key areas, which have cause seriously restrictions in further development of related fields in China.
- We should carry out the investigation of the demand of high-level talents in China focusing on fields that closely related to economic growth, such as electronic information industry, equipment manufacturing industry, etc.This will provide the basic data support for the next step of targeted recruitment of overseas talents in order to fulfill the innovation driven development strategy.
- There are many influence factors that affect the transnational migration of scientific researchers, such as better research environment, loyalty to organizations, better welfare and benefit, etc. On the individual level any influence factor may have a decisive effect on the transnational migration. However on the national level, the existing system design should be reconsidered when Chinese researchers are flowing to other countries and researchers in other countries are not attracted by China.

Thank you for you attention!

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