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Analysis of the lack of scientific and technological talents of high-level women in China

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Abstract. The growth and development of high-level female scientific and technological talents has become a global problem, facing severe challenges. The lack of high-level women in science and technology has become a global problem. How to recruit and help female scientists and technological talents grow raises awareness from the industry. To find out the main reasons for the lack of high-level female scientific and technological talent. This paper analyses the impact of gender discrimination on the lack of high-level female scientific and technological talents, the impact of disciplinary differences on female roles. The main reasons are: women's natural disadvantage of mathematical thinking; female birth, the traditional culture on the role of women and the impact of values.

1. Introduction

Nowadays, the lack of high-level female scientific and technological talents has become a global problem. by the end of 2016, only 21 females in the field of bio-medical, physical and chemical, which accounting for 3.61% in all 581 Nobel Prize winners. China's high-level women's scientific and technological personnel is very scarce, women's "high-level absence" phenomenon is very prominent. By the end of 2016 Chinese Academy of Engineering and the Chinese Academy of Sciences there are a total of 1577 person, 78 of which are women academicians which only account for 4.95%. Women accounted for 4.6% in 973 chief scientists, 3.9% for "Cheung Kong scholars" , while the national 863 program expert group members has no woman. In 2016, China Social Science Fund female project host accounted for 28.73% of the total number of projects, Natural Science Foundation female project host only 26.28%. High-level female scientific and technological talent is rare, there has been a "glass ceiling" phenomenon. What causes high-level women in the field of scientific research missing? The problem has become a hot spot for many scholars. The reason for the lack of high-level female scientific and technological talent is extremely complex, involving social, economic, historical and cultural aspects, the study on the issue has never stopped.

Talents in the field of science and technology in china especially high-level talent growth and development is facing severe challenge, if there is no timely study and effective measures, it will not only lead to a serious imbalance in the proportion of gender, but also affects the structure of China's entire talent optimization. This paper analyzes the main reasons of the lack of high-level female talent in China from the aspects of the characteristics of female talent distribution, gender discrimination and traditional concept (family reason) through data statistical analysis and investigation. These studies have an important reference value on the development of female talents and colleges and scientific research units for women's talent training.



2. High-level female scientific and technological personnel missing factors

2.1. *The Influence of Sex Discrimination on the Lack of Scientific and Technological Talents of High-level Women*

Why High-level women's lack of scientific and technological talent? international researchers believe that the mainly reason is sex discrimination, and Chinese scholars also believe that gender discrimination does exist in the research institutes and colleges and universities in the recruitment is particularly prominent. However, our study found that the development of female talent in China compared with the development of Western female talent, which not like Western women are still subject to varying degrees of discrimination, while Western scholars have different conclusions, in recent years, China's female talent in the development process has been paid more attention, even more likely to be recognized than men.

According to the data of the National Natural Science Foundation of China (Table 2), we analyzed the data of the funding of the National Natural Science Foundation of China from 2014 to 2016. It found that with the level of talent, in the field of natural science, the proportion of female scientific and technological personnel decreased significantly. However, the proportion of women who were funded in 2015-2016 was higher than that at the same year, and the total approved ratio for the three years was 11.99%, which was 11.65% higher than the total declared. The proportion of women subsidized in the Jieqing project was higher than the declared ratio.

Table1 2012-2016 Women's National Outstanding Young Funds Proportion of Approved interdisciplinary programs

Year	2014			2015			2016		
Content	Outstanding youth	Excellent youth	Youth Fund	Outstanding youth	Excellent youth	Youth Fun	Outstanding youth	Excellent youth	Youth Fun
Female declaration ratio (%)	12.55	18.73	47.31	11.37	17.16	47.87	11.04	16.35	48.32
women funded Percentage (%)	10.61	17.75	40.87	12.75	16.63	43.32	12.01	16.11	42.52

From the above data shows that under the same conditions, women are more likely to obtain funding than men. Therefore, gender discrimination is not the main reason for the lack of scientific and technological talents of high-level women in China. In the National Natural Science Outstanding Youth Fund project women's scientific and technological talent not only did not subject to significant gender discrimination, but women are more likely to be recognized. It can be seen that in the field of natural sciences, the development of women on the road to scientific research is far less than that of men, but once women reach a certain height, they are more likely to be recognized (the proportion of female funding in outstanding youth fund projects is greater than the declared ratio). Therefore, gender discrimination is not the main reason for the lack of high-level female scientific and technological talent in China.

Further analysis found that in the young women of science and technology talent, the overall proportion of the declaration from the youth fund 47.83% to the outstanding youth fund (excellent green) declaration of the overall proportion of 17.41% change from the youth fund approved the overall proportion of 42.24% to the outstanding youth. The change in the overall percentage of the approved fund (excellent green) 16.83% shows that the career development of female young scientists at the age of 32 to 40 years (the age requirement for women to declare youth and the age requirements for reporting youth funds are under 40). the golden time of career development has been affected by some important factors leading to the lack of high-level female scientific and technological personnel. According to the sixth national census data show that the average age of female fertility in China is

29.13 years old, while the female scientific and technological personnel in the doctor's graduation time after birth significantly later than the average female, plus the average 2-3 years of feeding time, That is to say, female science and technology talent in the 30-year-old age of 35 years of age the main energy in the birth and care for children's and family affairs. Women in the career development of the important period and creativity of the golden age of the main energy is not in scientific research work, which is a high level of female science and technology talent missing an important reason. And women's scientific and technological talent career return and how to deal with career development and care of the family's contradictions for the development of women's science and technology talent is also essential.

2.2. *The Influence of Discipline Differences on the Lack of Scientific and Technological Talents of High - level Women*

Cornell University psychologist Ceci and Kansas University economist Ginther analysis the status of of Western science and technology workers in the academic field. they think that women in high demand mathematical ability science areas occupy a relatively weak proportion. such as geography, engineering, economics, mathematics and computer science, physics and other fields. While in non-mathematics demanding scientific fields (LPS), such as life sciences, psychology, and social sciences, women often occupy a higher proportion.

According to the data of the National Natural Science Foundation of China (as shown in Table 1), It analyzed the gender distribution characteristics of the National Science Fund for Distinguished Young Scholars (2012-2016 data) in the natural sciences. The analysis shows that the distribution of young and middle-aged academic leaders in the field of natural science is divided into four levels: the proportion of women in the medical field is the highest; the proportion of women in the three disciplines such as life sciences, chemistry and management science is relatively Optimistic, while in the earth science and engineering and materials science two areas belong to the third level. But in mathematics and science and information science, the proportion of women was significantly less than men, women in the field of mathematics and computer science have significantly disadvantage compare with men.it proves that our women occupy a relatively weak proportion in the fields of science (GEEMP), such as geography, engineering, mathematics and computer science, physics, and so on, which have high demand for mathematical ability. Of the scientific field (LPS), such as life sciences, chemistry, and management science, women often occupy a higher proportion.which is the same as the Western women.

Table2 Women's Declaration of Natural Science Fund Talent Project and gain Funds

Year	2012		2013		2014		2015		2016		Total	
subject	Program number	Female number	Program number	Female number	Program number	Female number	Program number	Female number	Program number	Female number	Female number	Proportion of female (%)
Math science	27	1	26	0	25	1	24	1	24	2	5	3.97
Chemical science	31	5	31	5	31	6	30	5	30	6	27	17.65
Life science	27	4	26	5	25	4	24	5	26	5	23	17.97
Earth science	20	3	21	3	21	2	21	3	21	2	13	12.62
Engineering and materials	37	5	37	4	38	6	38	6	37	6	27	14.44
IT science	26	2	25	1	27	1	28	2	28	2	8	5.97
Management science	7	2	7	1	6	1	7	2	7	1	7	20.59
Medical science	25	5	25	7	25	7	26	6	25	6	31	24.6

In fact, men and women in the intelligent structure shows their different characteristics, men may be more suitable for pure left brain type mathematical reasoning or pure right brain type visual space problem-solving task, while women may be more suitable for right brain functional emotional experience and perceived skills of the task. According to Women's Federation of American University carry out the relevant research also shows that boys and girls, the average level of intelligence is not much difference, girls only in individual recognition ability has their own strengths, boys in the sense of space is better than girls, whole girls in language expression, writing ability better than boys.

In the higher demand for mathematical ability field of science (GEEMP), there has disadvantages in both Western women and women in our country. This natural disadvantage makes their research work and development far less in the field of natural science than men.

2.3. *The Influence of Female Role Orientation on the Lack of Scientific and Technological Talents of High - level Women*

Western scholars believe that there has not much relationship between women in the field of science and technology development and whether she has a family or not. But economic and cultural has big difference between the East and the West, and how does the traditional family concept of our country affect the development of female scientific and technological talents? We randomly selected more than 150 female talents from the national top universities to investigate, the results show that 94.52% of the senior titles and the following female scientific and technological personnel that the traditional concept of the role of women positioning so that they will focus more on Family and education of children; and 97.21% of women with senior titles of scientific and technological personnel that they are in the development process of family and children's education on the investment too little energy, their success to some extent benefited from other family members to bear Their responsibilities and duties as mothers, daughters and wives. This is in line with the study of Western scholars, they believe that some outstanding female talent to a large extent did not fulfill the traditional women in marriage and family obligations. China's traditional culture in the positioning of women is "good wife and mother", the female positioning in the "assist husband and bring up children". The development of female scientific and technological talents will experience the objective events such as marriage and childbirth. These objective events will affect their development, but more importantly, the atmosphere of public opinion of Chinese traditional culture and their cost of family and hard work The measure between earnings and the impact of their development.

The following through the game theory to establish scientific and technological personnel to women to take care of the family income and gains the quantitative models within scientific research development, analyse Chinese traditional culture for women to take care of the family role of women, such as the effect of talent development.

(1) Model parameters

G: Scientific research output;

C: Capital investment, for the convenience of research, scientific research will be put into the experimental equipment, materials and other material inputs are funded;

P: time input;

g_1 : Scientific research ability coefficient ($0 < g_1 < 1$), that is women's scientific and technological talent to obtain greater scientific and technological achievements of the possibility.

N: take care of family output;

g_2 : Take care of the family competency factor ($0 < g_2 < 1$), obviously $g_2 > g_1$.

(2) Model building

Borrow the Douglas production function expression method $y=f(X_1, X_2, \dots, X_n)=AX_1^{\alpha_1}X_2^{\alpha_2}\dots X_n^{\alpha_n}$, which is located in the scientific research on α, β ($0 < \alpha, \beta < 1$) for the money and time on the contribution rate of scientific research output, $G=(G, P)=g_1C^{\alpha}P^{\beta}$, the output function is increasing function. Kappa, predominate on to take care of a family in κ, λ ($0 < \kappa, \lambda < 1$), the

contribution rate of output for the money and time taking care of family, obviously κ 、 λ predominate were greater than α 、 β , $N=(N, P)=g_2C^kP^\lambda$, the output function also is increasing function.

(3)Game analysis

At the same time money put into C and time put into P, $N=g_2C^kP^\lambda > g_1C^\alpha P^\beta$, research output significantly less than the output of to take care of the family, so in the current social economic and cultural background, the more women talents of science and technology will put more effort into family care and nurture children, rather than scientific research and professional development.

3. The Main Promotion Measures of Female Talent Development

Women's scientific and technological personnel is an important part of the national scientific and technological personnel. promoting women's participation in science and technology plays a role in line with the values and expectations of modern society. It is the content and signs of social progress, but also an important task of national scientific and technological personnel work.

(1)Strengthen cultivation of Women 's Scientific and Technological Talents. From high school, university, postgraduate education to form a training system, and gradually strengthen the guidance of women to change the traditional concept, to encourage them to focus on their career development.

(2)Strengthen public opinion advocacy. Increase the performance of women's scientific and technological talent and contribute to the propaganda efforts to improve the social status of female talent, the formation of respect for women's social and cultural talent, and strengthen the development of women's self-confidence.

(3)Improving the fund project in the proportion of female winners, women give priority to the provisions of the project funded under certain conditions. Especially the major scientific research projects to increase the participation of female scientific and technological personnel to promote women's scientific and technological personnel to actively participate in scientific and technological management and major decision-making.

(4)Establishing female career development fund. Fund management departments to address the pregnant and lactating women face temporary suspension of career development and postpartum return post and other special difficulties for women's scientific and technological personnel to help them return to scientific research as soon as possible.

(5)On a certain basis, gradually increase the proportion of female review experts in various types of talent programs or reward assessment.

(6)Appropriating relax the female application fund age limit, consider the growth and development of female talent law, appropriate to extend the pregnant women to bear the implementation of research projects in the time.

4. Conclusion

The study found that the main reason for the lack of high-level female scientific and technological talents in China is not gender discrimination, which is different from the western culture. In fact, in the field of high demand for mathematical ability (GEEMP), China's women and Western women have natural disadvantages, and the development of women's scientific and technological talent in China is also the role of female stereotypes and traditional culture. Therefore, the main reasons for the lack of high-level female scientific and technological talents in our country are the natural inferiority of women's thinking on mathematics; the influence of women's birth and traditional culture on women's role and values.

At present, the relevant departments have been highly concerned about the development of China's female talent, which has developed a positive support policy to promote women's scientific and technological talent and breakthrough bottleneck, pursue equal development. "National Medium and Long-term Talent Development Plan" is to promote the growth of female talent to write the contents of which, the National Natural Science Foundation in the subject guide has also been clear under the same conditions, the principle of women's priority, senior professional and technical personnel equal

retirement policy Further emphasized. with the whole society's attention and policy support, the development of female talent will be getting better . the contribution of social development will be more than before. How to quickly return to scientific research work, how to guide women in the middle school and university education focus on the breakthrough the disadvantage of GEEMP, the development rule of female talent and the whole process of training women's talent mechanism, these issues should be engaged in scientific and technological personnel evaluation, management and Study the attention of the relevant personnel to carry out in-depth study.

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