Original Paper

The Relationship between Age and Growth Rate of Wages and the Gender Wage Gap in the Financial Sector in China

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Abstract

Using CGSS data, this paper explores the relationship between age and wage growth rates in China's financial sector by developing a fixed effects model. I find that the wage growth rate declines slowly with age, although the absolute value of wages has been rising. After a brief comparison of the financial sector, the information technology sector, and agriculture, I find that the pattern of their wage growth rates is similar, i.e., the wage growth rate declines slowly with age. Then, through empirical tests, I find that a gender wage gap does exist in the finance industry and that the gender wage gap gradually increases with age. Based on this, I further investigate the relationship between the age of female workers and the wage growth rate, and the possible reasons why the wages of female workers are lower than those of male workers. I find that the wage growth rate of female workers also gradually decreases as their age increases. Moreover, having children has a significant negative effect on the wage growth rate, but the marital status does not.

Keywords

fixed effects model, wage growth rate, gender wage gap, women's wage, Chinese financial sector

1. Introduction

With the accelerating development of science and economics, information technology and the financial industry have become two of the most popular industries in China. The number of listed companies in China's financial industry was only 10 in 1990, but with the continuous development of reform and opening up, the financial industry developed rapidly, with 2063 listed companies in 2010 and 4154 in 2020. As of 2017, the scale of China's online assets was nearly $3.5 trillion, and the cumulative transaction volume of online payment, online crowdfunding and online lending reached $70 trillion.

As we all know, in the information technology industry, the market prefers creative young people, and

they tend to be promoted and increased in salary fast. What about the financial industry? What is the relationship between age and the rate of a salary increase? It's an interesting question. Besides, there have been more and more complaints about gender discrimination in the financial industry and the issue of gender discrimination in the financial services industry has captured a lot of headlines in recent years. According to Deloitte, as of June 2021, women held less than 6% of CEO positions within S&P 500 companies across all industries and just 4% of CEO positions within S&P 500 financial services institutions. Is this true? If it is true, does gender discrimination against women get worse as they age? And what causes gender discrimination.

In this paper, I explore the relationship between age and the growth rate of wages, that is, whether the increase in age is conducive to the increase of wages. Then compare the results with the computer industry and the education industry. On this basis, I focus on the gender wage gap in gender discrimination and further examine whether there is a difference in the wage growth between male and female groups, and what is the difference. Finally, I try to find the possible and reasonable reasons for the above research results.

The main contributions and novelties of this article are as follows. It is well known that wages usually grow over the life cycle. But little attention has been paid to which age groups are seeing the fastest wage growth and why, especially in the financial industry. And there is a large literature on male–female wage differentials. However, most of them are based on wage level and very few focus on wage growth rate. Thus, my study differs from the majority of previous work in this area because I focus on wage growth in the financial industry rather than absolute wage levels and try to find reasonable reasons to explain it, although I will also discuss age in relation to wages. Additionally, while the most of Chinese research on wages is macro, such as based on provincial panel data, I plan to use a micro data set called chip.

In conclusion, this study contributes to a more scientific understanding of the wage growth rate and the current situation of the gender wage gap in China's financial industry, and further analysis the sources of the gender wage gap, to provide a reference for the formulation of public policies to promote the equality and reasonable employment and wage of men and women in the labor market.

I have developed hypotheses for how the provision will impact the dependent variables based on literature and economic theory. Hypotheses are as follows:

Hypothesis 1: As age increases, the rate of wage growth gradually falls.

Hypothesis 2: There is a significant gender wage gap, and it becomes wider with age.

Hypothesis 3: Children and marriage can negatively affect women's wages.

The remainder of this paper proceeds as follows. Section 2 is the literature review of the previous work, section 3 is the description of data, section 4 describes models and empirical strategies, section 5 shows the results of regression models, section 6 checks robustness and discusses limitations, and section 7 is the conclusion.

2. Review of Literature

As for age and Wage Growth rate, most researchers focus on life cycle wage growth. David Lagakos (2018) researched how life cycle wage growth varies across countries, he found workers have more advantages in rich countries than in poor countries due to more accumulation of human capital or fewer search frictions. And there is a lot of research about factors contributing to the differences in life cycle wage growth. The canonical model of wage growth is the on-the-job model of human capital investment (e.g., Ben-Porath, 1967; Becker, 1964). Ronni Pavan (2011) built a search model to distinguish the relative importance of various factors for generating wage growth over the life cycle.

On the premise of the economic growth model, Murphy (1989) studied the relationship between capitalists' profits and workers' wages, as well as capitalists' savings rate and workers' wages, and concluded that the higher the capital accumulation rate and profit rate, the lower the wage growth rate of workers. In order to show the importance of a certain factor in wage determination, Chewei Zhang and Xinxin Xue (2008) discussed the influence of ownership factors. Xiuyan Liu (2019) used market potential to explain wage differences. Zewen Yang and Quanfa Yang (2004) discussed the effect of foreign direct investment on wages. Yuan Zhang and Jianqi Chen (2018) discussed the wage effect of industry characteristics.

There are also quite a few scholars who focus on the gender gap in the life cycle of wage growth. Men and women have significantly different life cycle labor market outcomes, as sizable literature has documented (e.g., Betrand et al. (2010), Goldin (2014), Adda et al. (2017)). Hill (1979) was one of the first to examine the effect of motherhood on wage levels. She initially finds a 7% motherhood wage penalty for White women, but after controlling for productivity characteristics it nearly disappears. Waldfogel's (1998a, 1998b) findings suggest a motherhood wage penalty of 4.6% for the first child and 12.6% for two or more children. There is also a large literature on the motherhood penalty. Additional papers to the ones discussed above include Waldfogel (1997), Lundberg and Rose (2000), Anderson et al. (2003), Gangl and Ziefle (2009), and Pal and Waldfogel (2014).

Besides of penalty of being a mother, there are some researches that reflect that a penalty appears to be associated only with being a woman. This is true not only in countries such as the U.S., where job interruptions and the associated wage penalties for women are common (Bronson, 2015) but also in countries like China. Wang Meiyan (2005) adopted Brown's decomposition method and found that only 6.95% of the gender wage difference could be attributed to personal characteristics, while 93.05% was caused by discrimination. Yuhao Ge (2007) used the method of quantile decomposition to study the gender wage difference and found that women were at a disadvantage in terms of the distribution of years of experience and the rate of return on experience, while women were no worse than men in terms of the level of education and the rate of return on education. Shi Li et al. (2014) used the Oaxaca-Blinder decomposition method to decompose the dynamic changes in the gender wage gap by using the data of the Chinese Household Income Survey in 1995, 2002, and 2007, and found that during the period from 1995 to 2007. In particular, from 2002 to 2007, the gender wage gap in China's

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labor market widened significantly, with an increasing proportion of the unexplained part.

3. Data

3.1 Data Source

In this paper, I use data from the Chinese General Social Survey (CGSS), which is panel data. The Chinese General Social Survey (CGSS) was initiated in 2003 and is the earliest national, comprehensive, and continuous academic Survey project in China. It is a micrograph of households and individuals, covering more than 10,000 households in 125 county-level units and 1000 village-level units, and followed every 1-2 years.

So far, this survey has been conducted ten times. I choose data obtained from the last three surveys, 2013, 2015, and 2018, including 92077 subjects. Because I study people who work in the financial industry, I reserve data on individuals who work in the financial sector, in addition to which I collect their personal information, including income, gender, year of birth, marital status, educational background, monthly working hours, and whether they have children. For comparison purposes, I also reserve the sample data from the information technology industry and the agriculture industry (the questionnaire used for CGSS data collection combines agriculture, forestry, livestock, and fisheries into one industry, which is referred to as agriculture in this paper). So my final sample data includes 9023 data from the financial industry, 8015 data from the information technology industry, and 10,091 data from the education industry.

3.2 Indicators and Notations

The explanatory variable in this paper is the rate of wage growth. The rate of wage growth is an important measure of an economy's level of development and people's living standards. Considering that this paper studies the rate of wage growth rather than the absolute value of wages, the logarithm of wages is taken as the explanatory variable. Since only annual income is available in the original data, so I use annual income to approximate annual wage income.

There are many factors affecting wages, after referring to a large amount of literature, this paper decides to select the following indicators as control variables: working hours (wh), which is the total number of working hours per month, including overtime hours, to measure the degree of individual hard work; education level (edu), which is expressed by the number of years of education, i.e., 6 years of elementary school, 9 years of middle school, 12 years of high school, 15 years of college, and 16 years of undergraduate and bachelor's degree is 16 years.

Age is the central explanatory variable throughout the paper. When exploring whether there is a gender wage gap, the core explanatory variables are age and gender. And when exploring the causes of the gender wage gap, the core explanatory variables are marital status and children. In the original data, marriages are divided into six statuses (first marriage, remarriage, cohabitation, divorce, widowhood, and unmarried). To simplify the model, I consider first marriage, remarriage, cohabitation, divorce, and widowhood as married. The key mathematical notations used in this paper are listed in Table 1.

Table 1. Notations Used in This Paper

Symbol	Description
ln_w	ln(wage): Logarithm of annual income
gen	gender: Defined as a dummy variable, female=1, male=0
age	individual's age
mar	marital status: Defined as a dummy variable, married=1, unmarried=0
edu	years of schooling
wh	Working hours : hours on working per month, including overtime
child	Defined as a dummy variable, have children=1, no children=0

3.3 Preliminary Data Analysis

Table 2. Summary Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
gen	9023	0.5465632	0.4981033	0	1
age	9023	43.34146	10.60275	23	80
mar	9023	0.7572062	0.4290093	0	1
edu	9023	14.36364	2.318509	6	18
wh	9023	184.3692	88.59246	-1980	480
wage	9023	71723.13	79392.35	-99	1000000
child	9023	0.7028825	0.4572423	0	1
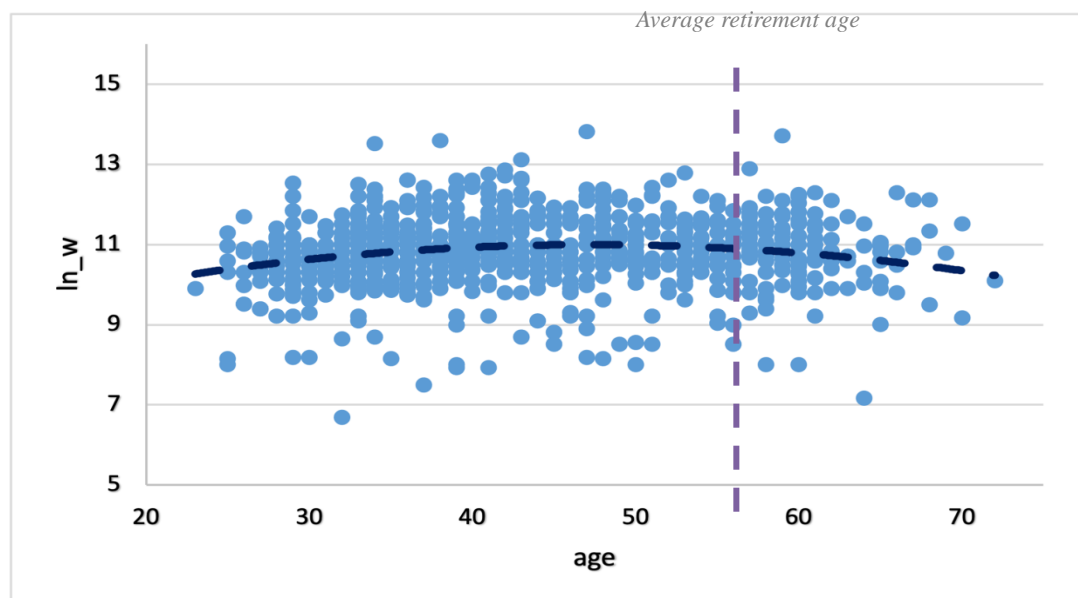
Figure 1. Scatter Plot of Data

Note. The preliminary optimal fitting result is $y = -0.0012x2 + 0.1171x + 8.2327$. According to the 2012 and 2014 "China Labor Force Dynamics Survey" conducted by the Social Science Research Center of Sun Yat-sen University, the average retirement age in China over the past decade has been around 53 years.

Figure 2. Wage Gap between Men and Women

Note. The preliminary optimal fitting result of female data is $y=-0.0009x^{2}+0.0831x+8.9473$. The preliminary optimal fitting result of male data is $y = -0.0018x2 + 0.1717x + 7.1263$. According to the 2012 and 2014 "China Labor Force Dynamics Survey" conducted by the Social Science Research Center of Sun Yat-sen University, the average retirement age in China over the past decade has been around 53 years.
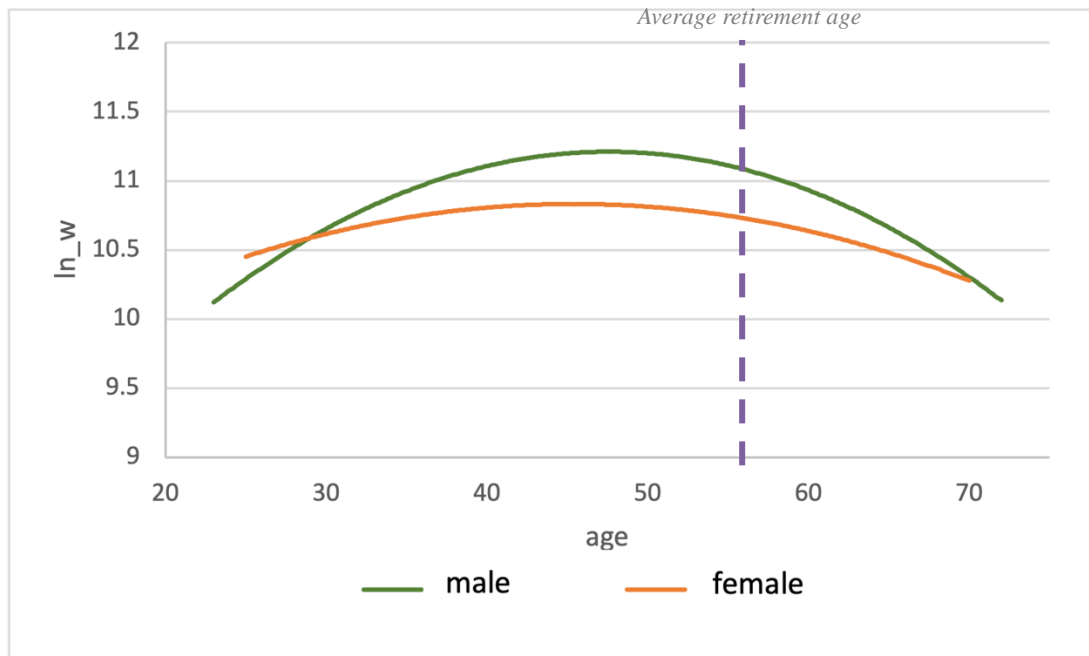
Table 2 displays observations, mean, standard deviation, median, minimum and maximum values of each control and outcome variable.

The scatter plot and the preliminary fit results in Figure 1 shows that there is a nonlinear relationship between the rate of wage growth and age.

From Figure 2, we can see that in the financial industry, women have a slight gender advantage at the initial stage of employment, but men's wages increase significantly faster than women's and quickly surpass women's wages, and there is a significant gender wage gap. Moreover, the gender wage gap widens and then decreases with age.

4. Empirical Models and Strategies

4.1 Panel Regression Models

$$ln(wage) = \alpha_0 + \alpha_1 age + \alpha_2 age^2 + \alpha_3 edu + \alpha_4 wh + v + \epsilon \quad (1)$$

$$ln(wage) = \beta_0 + \beta_1 age + \beta_2 edu + \quad (2)$$

$$\beta_3 wh + \beta_4 gen + \beta_5 age * gen + v + \epsilon$$

$$ln(wage) = \gamma_0 + \gamma_1 age + \gamma_2 age^2 + \gamma_3 edu \quad (3)$$

$$+\gamma_4 wh + \gamma_5 child + \gamma_6 mar + v + \epsilon$$

I use 3 panel regression models to complete my study. Where $\alpha_1 \sim \alpha_4, \beta_1 \sim \beta_5, \gamma_1 \sim \gamma_6$ represent the regression coefficients to be solved, v represents individual heterogeneity and ε is white noise.

Model (1) is used to explore how age affects wages. If the coefficient α_1 and α_2 are significantly non-zero, it indicates that there is a significant relationship between age and the rate of wage growth, laying the groundwork for subsequent in-depth research. Model (2) is used to investigate whether there is a gender wage gap and how the gender wage gap is related to age. If the coefficient β_5 is significant, it indicates that there is a gender wage gap and there is a significant association with age, then the study can be continued to the next step. Model (3) builds on models (1) and (2) to further explore the relationship between age and wages for the female group and the possible causes of the gender wage gap. The female group data for model (3) is derived from the data of model (1) (2).

4.2 Empirical Strategies

4.2.1 Selecting Models by Using Hausman Test

1) Establish the regression fix effect and random effect model, and conduct the Hausman test. If the original hypothesis of the random utility model is rejected, the fix effect model will be adopted.

2) If the hausman test fails to reject the null hypothesis, the random effect regression is performed first, and then the Lagrange Multiplier (LM) test of Breusch & Pagan is performed. If the null hypothesis of Pols regression is rejected (that is, the individual heterogeneity is assumed to be zero), the random effect regression will be used; otherwise, the Pols regression will be used. In order to avoid the correlation between heterogeneous panels and sequences, the robust regression of modified covariance matrix was adopted in the regression.

After conducting Hausmann tests on these three models, I finally build three fixed effect panel models.

5. Results

The results reported in Table 3 show that most of the regression coefficients pass the significance test at the 95% confidence level, indicating the correctness of the data and model selection in this paper.

Table 3. Result of Regression

Variables	Model (1)		Model (2)		Model (3)	
	coefficient	P value(P>z)	coefficient	P value(P>z)	coefficient	P value(P>z)
age	0.104	0.000	0.019	0.000	0.094	0.012
age^2	-0.001	0.000	\	\	-0.001	0.028
edu	0.141	0.000	0.144	0.000	0.152	0.000
wh	0.0006	0.033	0.001	0.088	0.000	0.192
gen	\	\	-0.012	0.000	\	\
gen*age	\	\	-0.003	0.004	\	\
child	\	\	\	\	-0.223	0.010
mar	\	\	\	\	-0.107	0.279
_con	6.092	0.000	7.960	0.000	6.415	0.000

5.1 Model 1

From the result of model 1, we can see that age affects the wage growth rate. Specifically, each unit increase in age will result in a wage change of (10.45-0.18 age) %, which means that as age grows, wages grow and the relationship between age increase and the growth rate of wages depends on the age of the individual. Furthermore, α2=-0.001 indicates that with the increase of age, the wage increases but increase slower and slower. When a person reaches the age of 58, his salary reaches the highest level of his career, but he is likely to be retired by this time. Remember that the average retirement age in China is 53, as I mentioned in the notes of Figure 1 and Figure 2. By the way, for the control variables, the coefficients of education level and working hours are both positive, indicating that they both favor wage growth. In summary, salary increases are fastest when you first enter the industry. As age increases, wages keep increasing, but the rate of increase decreases by a slight margin. The regression results are exactly in line with my hypothesis. Comparing the financial industry with the IT industry and agriculture, the results are shown in the Figure below.
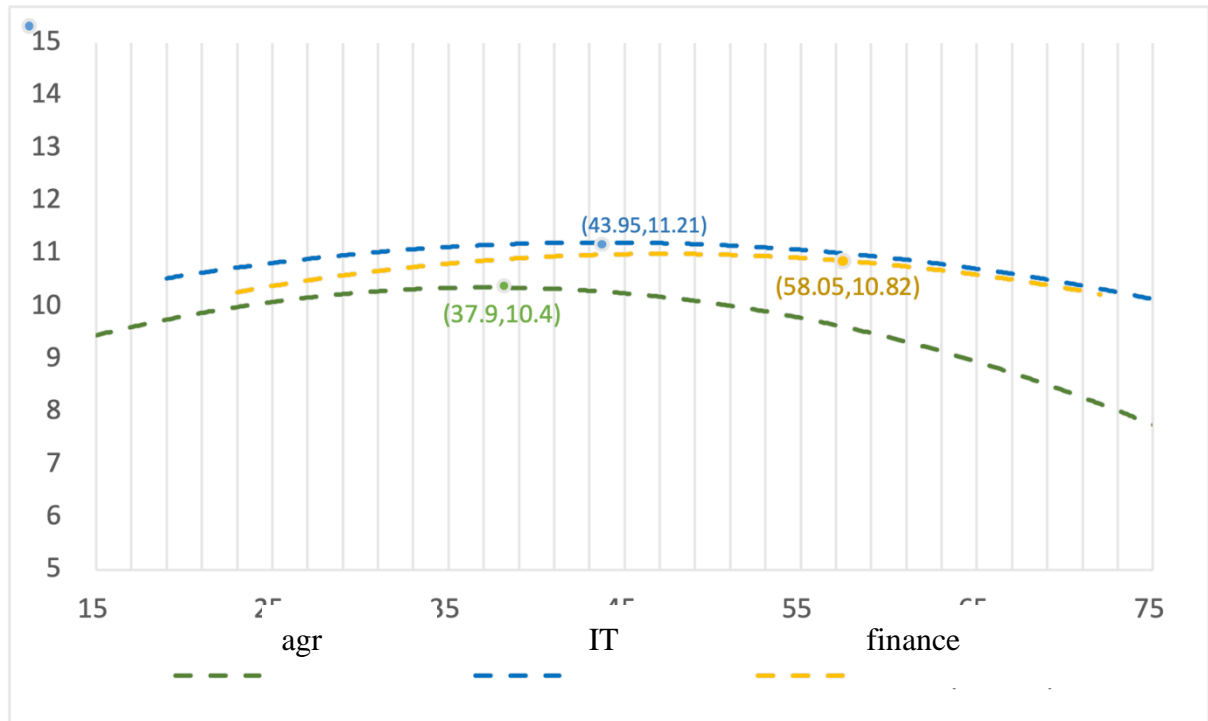
Figure 3. Comparison Chart of the Three Sectors

Note. The figure shows the best-fit curves for the three industries. The horizontal coordinate is age, the vertical coordinate is ln_w, and the marked point is the highest. agr represents agriculture, IT represents the information technology industry, and finance represents the financial industry. All data are from CGSS.

The following findings can be obtained from the graph.

1) In terms of the absolute value of wages, the IT industry is always ahead of the other two industries, regardless of the age stage. The wage level of the financial industry is similar to that of the IT industry, but the wage level of agriculture is far behind that of the financial industry and the IT industry.

2) From the viewpoint of the growth rate of wages, the growth rate of wages all gradually become slower in the rising stage of wages.

3) It is worth mentioning that if we take the average retirement age of 53 years as the reference, the wage in the financial industry is increasing throughout the career, although the wage growth rate is slowing down, while the wage in the IT industry and agriculture is increasing first and then decreasing. Wages in agriculture start to decline before the age of 40, and the rate of decline is obvious and declines faster and faster.

I think the following reasons can explain these phenomena.

1) The difference in the total output value of the industry causes the difference in the absolute value of wages. In other words, the prosperity and development rate of the industry are closely related to the wages of the workers in the industry. Since the reform and opening up, the center of gravity of the

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entire Chinese economy has changed. At first manufacturing and utilities were strong, then the financial sector emerged, while technology-related industries have been the top performers. The financial sector has grown rapidly through the demand for real estate credit and national infrastructure investment credit, while the IT sector has grown through the rise of the Internet industry at the end of the last century and the beginning of the century, and so its income levels have risen rapidly. In addition, China's weak agricultural base and irrational agricultural industry structure have contributed to the generally low wages of Chinese farmers. According to the Chinese National Bureau of Statistics, in 2020, the total agricultural output value will increase by 3.4%, while the IT and financial industries will both increase by about 13%.

2) Young people are in the prime of their lives, both physically and mentally, and usually retain enthusiasm for their work, especially when they first enter the industry. Young people have more potential than middle-aged and older people, and there is more room for promotion and salary increases. So it's easy to see why wages increase at the fastest rate when you're young.

3) The three types of workers in these industries represent three types of workers - experienced workers, brain workers, and manual workers. industries where experienced workers work, such as the financial industry, that have industry barriers. The industry barrier is experience. Experience is accumulated over time and the number of operations. With the passage of time, this industry's barriers are higher and higher, eventually forming an extremely strong irreplaceable, as Warren Buffett often said moat. Of course, this does not mean that the industry does not require technical and mental labor, just that it pays more attention to experience. That's why wages keep rising throughout a career. The work of brain workers is usually somewhat technical, but this technicality is easier to imitate. As they age, their mental and physical strength gradually declines and their skills become more and more replaceable, their income is likely to show a slow downward trend. The wages of manual laborers are often linked to the physical labor they put in, and as they age and their physical strength gradually declines, their wages are also likely to show a downward trend.

Of course, in real life, with the growth of age, IT workers, such as programmers, their wages will not necessarily be reduced, but they are likely to face layoffs, forced to change careers, and other serious challenges.

5.2 Model 2

From the regression results of model (2), all coefficients pass the significance test. The coefficient of gen is -0.012 and the coefficient of the interaction term of gen and age is - 0.003, indicating that there is indeed a gender wage gap in the financial sector in China, where men's wages are generally higher than women's wages, and the wage gap slowly widens with a slight margin as age increases.

After reading a lot of literature, I find some reasons that can contribute to the gender wage gap.

1) Female pregnancy and childbirth bring pressure on business operations and affect business efficiency.

China's Regulations on Labor Protection for Female Workers clearly state that female workers are

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entitled to maternity leave of no less than 98 days, and unfortunately, miscarriages are also entitled to 15 or 42 days of maternity rest, depending on the circumstances. During this period, enterprises not only have to pay direct costs such as wages and filling job vacancies but also have to bear the indirect losses caused by the possible decline of work skills and lack of updated knowledge after returning to work after childbirth. In order to pursue higher efficiency goals, companies are reluctant to hire women or give them the same opportunities for promotion and salary increases as men. In addition, women's pregnancy and breastfeeding will have a certain impact on the efficiency of work, and the double attack of family and work may also cause psychological pressure on female employees, which will have a certain impact on the effectiveness of enterprises and thus on their own wage increase rate. In recent years, with the legalization of three children, more and more women are choosing to have two or even three children. However, most women give birth to their second or third child at an age when they are in the prime promotion period of their career development. And the career interruption caused by the second or third childbirth will inevitably affect the staff planning of enterprises and thus they may miss the opportunity for promotion and salary increase.

2) The stereotypical constraints of traditional gender concepts.

Research shows that traditional gender concepts are one of the reasons why women are rejected in the workplace. The stereotype believes that men are more suitable to participate in social work in terms of physical strength, creativity, and adventurous spirit, while women are more suitable to engage in home production in terms of sensuality and carefulness, and married women will focus on their families and their work efficiency will be greatly reduced compared with that before marriage. In addition, because of the stereotype that women do not have the characteristics of managers such as "competitiveness and influence" when given the same opportunity for promotion, executives prefer men in leadership positions and women in other supporting positions. And this implicit selection bias makes women's career paths more difficult. Li Lu (2016) and Luo Juan (2012) both point out that there is serious employment discrimination and gender discrimination in pay, and companies believe that male workers create more revenue than women, so they tend to pay men more for their work.

These reasons make it far more difficult for women to get promotions and wage increases in the financial sector workplace than men. Over time, the wage gap with men has become larger and larger. So the gender wage gap slowly becomes larger as workers get older.

In Model 3, I focus on verifying whether children and marital status are the cause of the gender wage gap.

5.2 Model 3

From the regression results of model (3), the regression coefficients of age, age*age, and child all pass the significance test at 95% confidence level, indicating that their coefficients are significantly not 0. This means that as age increases, the rate of wages increase for female workers also gradually decreases and having children will have a significant negative impact on their wages. As shown in the survey, the peak of women's childbirth is concentrated in the age group of 23 to 40 years old, which is

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also a critical period for women's career development to enter the rising period. According to a survey conducted by Wisdom Associates, 33% of married women who are not pregnant say that their marital status significantly affects their chances of promotion in the workplace. Therefore, since the opening of China's "three-child" policy, women are more worried about their future career development due to childbirth issues. This confirms part of hypothesis 3. This confirms part of hypothesis 3. However, the coefficient of mar is insignificant, indicating that marital status does not have an effect on wages, which contradicts my hypothesis 3. This shows that it is just a stereotype that married women will focus on the family and work efficiency will be greatly reduced compared to before marriage.

6. Robustness and Limitations

6.1 Robustness

Table 4. Robustness Test Results

Variables	Model (1)		Model (2)		Model (3)	
	coefficient	**P value(P>z)**	**coefficient**	**P value(P>z)**	**coefficient**	**P value(P>z)**
age	0.093	0.000	0.014	0.000	0.094	0.012
age^2	-0.001	0.000	\	\	-0.001	0.028
edu	0.128	0.000	0.130	0.000	0.152	0.000
wh	0.001	0.056	0.000	0.132	0.000	0.192
gen*age	\	\	-0.004	0.003	\	\
child	\	\	\	\	-0.223	0.010
mar	\	\	\	\	0.107	0.280
_con	6.623	0.000	8.379	0.000	6.308	0.000

In this section, I perform robustness tests by varying the econometric method. I use LSDV (Least Squares Dummy Variable method) to reconstruct three models that yield regression results as shown in the table below.

In Model 1, the coefficients of age and age^2 remain significant and the signs remain unchanged. In model 2, the sign and significance of the key variables don't change, although the control variable wh changed from significant to insignificant. The results of model 3 also don't change significantly. This indicates that the results of my study are robust. That's fine as the purpose here is to check the robustness.

6.2 Limitations

In this paper, I have two major limitations. First, I use annual earnings to approximate annual wage , but annual earnings include wage income, dividends, social benefits, and so on, not just annual wage income. Second, I only verify the effect of having children on women's wages, but I do not examine in

depth whether and how having different numbers of children affects women's wages differently.

7. Conclusion

This paper uses the CGSS data to explore the relationship between age and the growth rate of wages in the Chinese financial sector by building fix effect models. I find that the rate of wage growth decreases slowly with age, although the absolute value of wages is always increasing. A simple comparison of the financial sector with the information technology sector and agriculture reveals a similar pattern regarding the growth rate of wages, with both wage growth rates declining slowly with age. Then I find through empirical testing that there is indeed some gender discrimination in the finance industry, which can be reflected by the gender wage gap. Moreover, the gender wage gap slowly becomes larger as age increases. Based on this, I further studied the relationship between age and the wage growth rate of female group and the possible causes of lower wages for female workers than men and found that the wage growth rate of female workers gradually decreases with age. Having children is indeed a serious penalty for the rate of wage growth, but a change in marital status does not have much effect, so having or not having children may be an important reason for the gender wage gap.

In response to the gender discrimination phenomenon mentioned in this paper, I propose the following suggestions: First, improve the relevant laws in the labor market. Through government policy protection, legal guidance, and effective supervision, we can protect women's reasonable and legitimate rights and interests, and ensure that they receive proper treatment in the labor market. Gradually reduce gender discrimination, and promote the effective use and reasonable allocation of labor resources. Second, the government and enterprises should pay attention to the opportunities for women to improve their abilities, and appropriately increase the human capital investment of female employees to improve their core competitiveness. Third, all industrial sectors, especially the non-state sector, must conscientiously implement relevant laws and regulations to effectively protect the legitimate rights and interests of the female labor force and ensure that women are treated appropriately in employment, salary, and promotion, so as to change the discriminatory mindset implicitly.

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