UNIVERSITY OF SOUTHAMPTON

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Department of Economics

The evolution of the wage gap of female rural-to-urban migrants in China

by

Renfei Ouyang

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ABSTRACT

This thesis uses China's CHIP data in 2002, 2007 and 2013, and uses quantitative analysis methods such as wage decomposition method and regression method and mathematical statistics. The gender wage gap of rural-to-urban migrants and the wage gap between female rural-to-urban migrants and female urban natives are studied from multiple perspectives (including region, industry, etc.) on the basis of researching the existing literature of wage gap theories and empirical research of the existing wage gaps.

In early 1958, the Chinese government promulgated the "Regulations on Household Registration of the People's Republic of China". Since then, a food supply system, an employment system, a housing system, an education system, and a medical system that are matching with this household registration system had been further implemented, and a strict household registration management system had been gradually formed. This system strictly distinguishes urban and rural areas, forming an artificial dual economic system. Discrimination against people with rural Hukou has been formed in cities and towns in China. From the 1980s to the beginning of the 21st century, the policy on population mobility was relaxed. The keynote of the policy was to allow farmers to move across regions and to work in cities. However, these farmers do not have urban Hukou and cannot enjoy the same public services and insurances as the citizens of their inflow areas. As a result, China has produced a new huge group, a group of rural-to-urban migrants.

Many theories can be used to analyse the wage gap. These theories include Theory of Human Capital, Compensatory Wage Differential Theory, Labour Market Segmentation Theory, and Discrimination Theory.

I research the gender wage gap of rural-to-urban migrants in chapter 2. I found that the gender wage gap for rural-to-urban migrants in China was still relatively high. According to my research, I found that the gender wage gap was 34% in 2002; it dropped to 17% in 2007; and then rose to 28% in 2013. It is higher than the average gender wage gap in China. From the perspective of quantiles, at each wage quantile the gender wage gap decreased first and then increased from 2002 to 2013. The gender wage gap among rural-to-urban migrants is quite large. Structural effect was the main component of the gender wage gap among rural-to-urban migrants. Structural effect includes discrimination. In general, the gender wage gap showed a trend of first decline and then rise over time. The gender wage gap in developed region first decreased and then increased over time. The economic development of developing region lagged behind that of developed region, and the gender wage gap had been rising. In 2002, the gender wage gap in developed region was higher than that in developing region. After 2007, the gender wage gap in developing region surpassed that in developed region, and this was also true at most quantiles. The gender wage gap in industry A, C and D decreased first and then increased; the gender wage gap in industry B increased consistently. The gender wage gap among people whose highest

educational level was primary school and below increased first and then decreased from 2002 to 2013; the gender wage gap among other groups of people decreased first and then increased from 2002 to 2013. In general, the more individual workers invested in training, the higher their wages and the smaller the gender wage gap. Training time had little effect on the gender wage gap. The U-shaped evolution was the main manifestation of the gender wage gap in 2002-2013, which was reflected in the overall gender wage gap, the gender wage gap at each wage quantile, and the gender wage gap in developed region.

I research the wage gap between female rural-to-urban migrants and female urban natives in chapter 3. The overall average wage gap between female rural-to-urban migrants and female urban natives was more than 20%. The wage gap in industry A increased first and then decreased from 2002 to 2013; the wage gaps in B, C and D industries decreased from 2002 to 2013. Among them, the wage gap was the highest in industry C in 2002, and was the highest in industry D in 2007 and 2013. The wage gap was smallest in industry A in 2002, and was the smallest in industry B in 2007 and 2013. In terms of occupation, the wage gaps of professionals, equipment operators and related personnel, and clerks and related personnel decreased consistently from 2002 to 2013. The wage gap among business and service workers increased first and then decreased.

Through decomposition analysis, it was found that the structural effect was the main component for the gender wage gap. There were also composition effect that had an important impact on the gender wage gap.

As for the wage gap between female rural-to-urban migrants and female urban natives, the wage gap was mainly caused by structural effect. The structural effect mainly included household registration discrimination, and it decreased because China's household registration discrimination was gradually decreasing.

Based on the research results, this thesis puts forward the policies, legislations and action recommendations on improving female rural-to-urban migrants' human capital by funding education and training for rural women, eliminating household registration discrimination by reforming the household registration system, reducing gender discrimination by multiple methods, so as to narrow the wage gap.

Key words: Rural-to-urban Migrants, Wage Gap, Gender Wage Gap, Household Registration Discrimination, Gender Discrimination, Quantile Regression, FFL Decomposition, OLS Regression, Oaxaca-Blinder Decomposition

Declaration of Authorship

Print name: Renfei Ouyang

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I declare that this thesis and the work presented in it is my own and has been generated by me as the result of my own original research.

I confirm that:

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3. Where I have consulted the published work of others, this is always clearly attributed.
4. Where I have quoted the work of others, the source is always given. With the exception of such quotations, this thesis is entirely my own work.
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6. Where the thesis is based on work done by myself jointly by others, I have made clear exactly what was done by others and what I have contributed myself.
7. None of this work has been published before submission.

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Chapter 1 Introduction

There is a special group in China, which is called rural-to-urban migrants; there is also a special phenomenon in China, which is called household registration discrimination against people with rural Hukou[1]. Then, what kind of group is rural-to-urban migrants, and how is household registration discrimination arisen?

1.1 Rural-to-urban migrants and household registration discrimination

Chinese rural-to-urban migrants is a group that emerged from a special stage of China's economic and social development.

The People's Republic of China was established in October 1949 and was an agricultural country with an extremely weak industrial foundation. In order to improve China's industrialization level as soon as possible, the Chinese government had formulated a national development strategy that prioritized the development of heavy industry. At that time, China had just experienced the protracted Anti-Japanese War and the four-year civil war before the founding of the People's Republic of China, the Korean War just after the founding of the People's Republic of China, and it was extremely short of development funds. In order to promote the development of capital-intensive heavy industry, the Chinese government needed to obtain development funds from agriculture and reduce the investment cost of heavy industry development, that is, to reduce capital prices, energy and raw material prices, and labour wages. To ensure the reproduction of labour itself under low wage conditions, the Chinese government needed to lower the price of daily necessities, especially foods. To achieve this goal, the government first implemented a unified purchase and marketing policy, that was, monopolize the pricing, purchase, transportation, and distribution of agricultural products. The purpose of this was to obtain basic agricultural products at low prices and distribute them at low prices to industrial departments and urban natives who used agricultural products as raw materials. In order to ensure the implementation of the unified purchase and marketing policy and the guarantee of food supply, agricultural production must be controlled to ensure that it was produced in accordance with national needs and to prevent the outflow of rural production factors. Therefore, the Chinese government had initiated a household registration system (Hukou).

As early as more than 200 BC, China's central government initiated household registration and implemented a strict household registration management system in order to control the free movement of people. Although this system has changed in

[1] Hukou refers to a legal document prepared by the administrative agency in charge of household registration in the country to record and retain basic information about the household population. It is also the identity certificate of each of our citizens.

successive dynasties, it has been retained. China implemented a planned economy, and also needed to manage the people based on their household registration. In early 1958, the Chinese government promulgated the "Regulations on Household Registration of the People's Republic of China" and established People's Commune System. Farmers were concentrated for labour, agricultural products were uniformly distributed by the state, and rural economic activities and social life were restricted within the People's Communes. More than 10 million rural registered labourers working in cities and towns were forced to return to their hometowns to engage in agricultural production. Since then, a food supply system, an employment system, a housing system, an education system, and a medical system that are matching with this household registration system had been further implemented, and a strict household registration management system had been gradually formed. This system strictly distinguishes urban and rural areas, forming an artificial dual economic system. Since the work of urban natives is uniformly arranged by the government, their income is more than twice that of rural natives, and they can enjoy a series of welfare policies that rural natives cannot enjoy. Their living, work, education, medical and other conditions are significantly better than farmers. Therefore, discrimination against people with rural Hukou has been formed in cities and towns in China. This kind of discrimination due to household registration status is called "household registration discrimination (Hukou discrimination)".

From the 1980s to the early 1990s, China's policies on population mobility were gradually relaxed. The keynote of the policy is to allow farmers to "leave the farmland but not the hometown, and enter the factory but not the city." From the early 1990s to the beginning of the 21st century, the policy on population mobility was further relaxed. The keynote of the policy was to allow farmers to move across regions and to work in cities. However, these farmers do not have urban Hukou and cannot enjoy the same public services and insurances as the citizens of their inflow areas. Although they work and live in cities and towns, discrimination against them due to their rural household registration still exists. As a result, China has produced a new huge group, a group of rural-to-urban migrants. Most rural-to-urban migrants work in non-monopoly sectors.

1.2 Gender inequality and gender wage gap

1.2.1 Gender inequality

Before the birth of country, human beings were in a clan society. In the early and mid-term of clan society, human beings were in matrilineal clan society. In matriarchal society, women played a more important role than men in production activities and contributed more than two-thirds to the survival and development of mankind. Therefore, women were more respected in daily life and society than men. Women occupied a dominant position.

With the development of social productivity and the role of men gradually surpassing women in the production sector, the status of men had gradually improved, and the status of men and women in the clan had finally undergone significant change. Men begun to dominate and became the core of the clan and family, and humans had entered patriarchal clan society. With the weakening of women's social status, human society had gradually produced discrimination against women, and women no longer enjoyed equal rights with men. Although there are still very few matrilineal social groups in the world, it is undeniable that the male-dominated situation in human society has continued. Until modern society, people realized that women should have equal rights with men, and equality between men and women has become the main development direction of the world civilization.

Many countries and international organizations issued conventions, declarations to try to achieve gender inequality. However, due to the inertia of social development, it will take a long time for people to change their minds. Although the United Nations, the International Labour Organization and governments have made great efforts to eliminate gender discrimination and made some progress, today's society, from a global perspective, is still not a true gender-equal society, and discrimination against women still exists. There is still obvious discrimination against women in many aspects such as life, education, employment, and welfare.

The World Economic Forum conducted a survey on gender equality in 136 countries around the world in 2013. The gender gap index[2] of some countries is shown in table 1. The results show that the problem of gender inequality in the world is still prominent. Ten countries including the five Nordic countries, the Philippines in Asia, Ireland and Switzerland in Western Europe, New Zealand in Oceania, and Nicaragua in Latin America are the most gender-equal countries in the world. Pakistan and Yemen are the countries with the most gender inequality among the 136 countries surveyed. Several major economic and populous countries in the world, the United States, China, Japan, Germany, India, France, the United Kingdom, Italy, Brazil, Canada, Indonesia, Nigeria, Bangladesh, Russia ranked 23rd, 69th, and 105th, 14th, 101st, 45th, 18th, 71st, 62th, 20th, 95th, 106th, 75th, 61st positions respectively. It can be seen that regardless of whether it is a developed or a developing country, regardless of the political system and religious beliefs, gender inequality in various countries is a common phenomenon. From the global gender gap change table[3], we can also see that most countries (86%) are slowly improving gender inequality, although this slow improvement cannot make us satisfied, but it still reflects the development trend of our world. This also reminds us that we need to make greater efforts in terms of gender

[2] The Gender Gap Index examines the gap between men and women in four fundamental categories: *economic participation and opportunity, educational attainment, health and survival* and *political empowerment*. It is constructed using a four-step process. First, all data are converted to female/male ratios. As a second step, these ratios are truncated at the "equality benchmark". The third step in the process involves calculating the weighted average of the variables within each subindex to create the subindex scores. The fourth step is *Calculating final scores.*

[3] The World Economic Forum "The Global Gender Gap Report 2013".

equality.

Table 1 Gender gap index table for selected countries

2013 Rank	country	Annual Gender Gap index							
		2013	2012	2011	2010	2009	2008	2007	2006
1	Iceland	0.8731	0.8640	0.8530	0.8496	0.8276	0.7999	0.7836	0.7813
2	Finland	0.8421	0.8451	0.8383	0.8260	0.8252	0.8195	0.8044	0.7958
3	Norway	0.8417	0.8403	0.8404	0.8404	0.8227	0.8239	0.8059	0.7994
4	Sweden	0.8129	0.8159	0.8044	0.8024	0.8139	0.8139	0.8146	0.8133
5	Philippines	0.7832	0.7757	0.7685	0.7654	0.7579	0.7568	0.7629	0.7516
6	Ireland	0.7823	0.7839	0.7830	0.7773	0.7597	0.7518	0.7457	0.7335
7	New Zealand	0.7799	0.7805	0.7810	0.7808	0.7880	0.7859	0.7649	0.7509
8	Denmark	0.7779	0.7777	0.7778	0.7719	0.7628	0.7538	0.7519	0.7462
9	Switzerland	0.7736	0.7672	0.7627	0.7562	0.7426	0.7360	0.6924	0.6997
10	Nicaragua	0.7715	0.7697	0.7245	0.7176	0.7002	0.6747	0.6458	0.6566
14	Germany	0.7583	0.7629	0.7590	0.7530	0.7449	0.7394	0.7618	0.7524
17	South Africa	0.7510	0.7496	0.7478	0.7535	0.7709	0.7232	0.7194	0.7125
18	United Kingdom	0.7440	0.7433	0.7462	0.7460	0.7402	0.7366	0.7441	0.7365
20	Canada	0.7425	0.7381	0.7407	0.7372	0.7196	0.7136	0.7198	0.7165
23	United States	0.7392	0.7373	0.7412	0.7411	0.7173	0.7179	0.7002	0.7042
45	France	0.7089	0.6984	0.7018	0.7025	0.7331	0.7341	0.6824	0.6520
61	Russian Federation	0.6983	0.6980	0.7037	0.7036	0.6987	0.6994	0.6866	0.677
62	Brazil	0.6949	0.6909	0.6679	0.6655	0.6695	0.6737	0.6637	0.6543
69	China	0.6908	0.6853	0.6866	0.6881	0.6907	0.6878	0.6643	0.6561
71	Italy	0.6885	0.6729	0.6796	0.6765	0.6798	0.6788	0.6498	0.6456
75	Bangladesh	0.6848	0.6684	0.6812	0.6702	0.6526	0.6531	0.6314	0.627
95	Indonesia	0.6613	0.6591	0.6594	0.6615	0.658	0.6473	0.655	0.6541
101	India	0.6551	0.6442	0.619	0.6155	0.6151	0.606	0.5936	0.6011
105	Japan	0.6498	0.653	0.6514	0.6524	0.6447	0.6434	0.6455	0.6447
106	Nigeria	0.6469	0.6315	0.6011	0.6055	0.628	0.6339	0.6122	0.6104
125	Egypt	0.5935	0.5975	0.5933	0.5899	0.5862	0.5832	0.5809	0.5786
135	Pakistan	0.5459	0.5478	0.5583	0.5465	0.5458	0.5549	0.5509	0.5434
136	Yemen	0.5128	0.5054	0.4873	0.4603	0.4609	0.4664	0.451	0.4595

Source: The World Economic Forum “The Global Gender Gap Report 2013”.

Table 2 The Change of Global Gender Gap Index

Number of countries	2012–2013	2011–2012	2010–2011	2009–2010	2008–2009	2007–2008	2006–2007	2006–2013
Widening gaps	47	51	60	54	43	41	24	15
Narrowing gaps	86	81	74	78	87	87	91	95
Improving (%)	65	61	55	59	67	68	79	86
Deteriorating (%)	35	39	45	41	33	32	21	14
TOTAL	133	132	134	132	130	128	115	110

Source: The World Economic Forum "The Global Gender Gap Report 2013".

1.2.2 The gender wage gap

Income refers to the total income an individual receives in a year, which is the sum of the income obtained by an individual from various channels, including wage, transfer income, business income, property income, etc. Gender income gap refers to the income gap between men and women.

Wages refer to the remuneration paid by employers or legal employers for the labour of employees in monetary terms in accordance with legal provisions, or industry regulations, or agreements with employees. Wages can be calculated in different forms such as hourly salary, monthly salary, and annual salary. Gender wage gap refers to the wage gap between men and women, which is expressed in this article as follows:

$$W_g = (W_m - W_f)/W_m \quad (1)$$

where:

W_g——gender wage gap;

W_m——male wage;

W_f——female wage.

Since each person's situation is different, people's income composition and the proportion of each component may be very different, and transfer income, business income, and property income have little relationship with this research. Therefore, this thesis determines the research object as gender wage gap. The wages referred to in this thesis include basic wages, performance wages, bonuses, allowances and subsidies, wages for overtime or extended working hours, and wages paid under special circumstances that are closely related to labour.

Gender wage gap is a common phenomenon. ILO surveyed the wages of 80% of salaried workers in 70 countries. The *2018/2019 Global Wage Report*, which was formed after research and analysis, pointed out that, except for several countries, the global gender wage gap is obvious. To achieve gender wage equality, the world still has a long way to go. The ILO has calculated the gender wage gap based on data provided by the surveyed countries, as shown in Table A1 in Appendix A.

As is shown in Table A1, except for a few countries, such as Panama, Thailand, Jordan and the Philippines, there was a significant gender wage gap in all countries. The global gender wage gap (measured by monthly wage) weighted reached more than 20% in 2017.

The gender wage gap was more serious in low-income countries, such as Sierra Leone, where the gender wage gap was as high as 46.6%. In low-middle-income individual countries, such as Pakistan, the gender wage gap was also very serious. Pakistan's gender wage gap of median of monthly wage was as high as 62.5%, and the gender wage gap of the average monthly wage was as high as 42.9%; in middle- and high-income countries, such as Armenia and South Africa, it was about 35% and 30% respectively; on a weighted basis, the gender wage gap was worst in low-income countries, at around 30%. Low-middle-income countries and high-middle-income countries were basically the same, about 20%. China, as the most populous country, belongs to the high-middle-income countries, and the gender wage gap was in the middle of the middle-income countries, at 20%, which was exactly equal to the average. That is the story of the developing world. were the high-income countries doing any better? This is not the case. The gender wage gap in high-income countries was also significant, on average, exceeding that in middle-income countries. The gender wage gap was as high as 40 percent in the Netherlands and 36 percent in the United Kingdom in Europe, 37 percent in South Korea in Asia and 25 percent in the United States in America. Overall, the gender wage gap in high-income countries was about 25%, even higher than in middle-income countries[4].

It can be seen that although the United Nations, governments of various countries and some international organizations have done a lot of work in achieving equality between men and women and eliminating gender discrimination since the 1940s and they have made great efforts and achieved considerable results, there is still a big gap in realizing equality between men and women. The gender wage gap alone still exists globally and is still very common.

Chinese rural-to-urban migrants have experienced all-round discrimination in employment, wages, social security, and education, and this has also led many farmers and rural-to-urban migrants to reduce their own and their children's human capital investment, resulting in intergenerational transmission of low human capital, and objectively maintaining statistical discrimination against rural-to-urban migrants. In response, the Chinese central government has introduced a series of policies and measures, and the situation of rural-to-urban migrants has gradually improved. However, the discrimination against rural-to-urban migrants and the local government's policy to protect the employment of urban natives put the rural-to-urban migrants in a significant disadvantaged position.

Women in the rural-to-urban migrants are at an even more disadvantaged position. They not only suffer from household registration discrimination, but also gender discrimination. This thesis mainly studies the wage gap and its evolution of female

[4] Data source of the paragraph: International Labour Organization: *2018/2019 Global Wage Report*.

rural-to-urban migrants, and makes policy recommendations for reducing this gap. This thesis takes the gender wage gap among rural-to-urban migrants as the main research object. The wage gap between female rural-to-urban migrants and female urban natives is also investigated.

1.3 Review and research on the theory of the wage gap

The wage gap has a long history. The economic circle has done a lot of research on the wage gap and formed some characteristic wage gap theories. To study the rural-to-urban migrants' gender wage gap in China, in addition to understanding the existing wage gap theory, it is also necessary to analyse and study the occurrence, development and change of discrimination and explore the inherent laws of discrimination in combination with the specific situation of China's social development.

The theory of wage gap has not yet formed a system. According to the existing wage gap theory, the author abstracts the theoretical system of wage gap as shown in the figure B1 in Appendix B.

There are four kinds of wage gap theories: human capital theory, compensatory wage difference theory, labour market segmentation theory and discrimination theory. The following will review these classical theories.

1.3.1 Theory of Human Capital

Human capital, also known as "immaterial capital", is opposite to "material capital", which is the capital reflected in workers, such as workers' knowledge and skills, cultural and technological level and health status, etc. Its main characteristic lies in that it is linked with personal freedom and does not shift with the sale of products. It is formed through investment in people. Human capital investment mainly includes education expenditure, health care expenditure and labour mobility expenditure. Education expenditure is the most important, because education can improve the quality of labour force, the working ability and technical level of workers, thus improving labour productivity. Its growth, particularly in education spending, is a source of economic growth.

Becker studied the relationship between human capital and personal income distribution, and believed that personal human capital directly affected personal income. Becker, in his book *Human Capital* (1964) pointed out that a man's ability and quality are the manifestation of human capital, which can be covered by the formal education of the school, the corresponding vocational training, quality training, labour migration and other investment activities, so workers who has the more human capital accumulation will have higher labour productivity. Human capital investment must take into account both future benefits and current benefits. On-the-job training is an important content of human capital; the collection of information is also the content of human capital, which also has economic value. He proposed the formula

for calculating the rate of return on human capital investment in the book, proposed the age-income curve, illustrates the rate of return of higher education, and compared the difference in the rate of return between different education levels; pointed out that because most women expected their careers to be shorter than men's, women's investment in human capital was less than men's. Becker used the micro-methods in economics to study human capital investment, laying a solid foundation of microeconomic analysis for the development of human capital theory, and making human capital theory more precise and general. Becker's theory of studying labour income distribution through microeconomic analysis is still one of the most widely used theories in modern economic research.

Jacob Mincer published his book *Human Capital Investment and Personal Income Distribution* in 1958, and for the first time established a mathematical model between the labourer's personal income distribution and the amount of training the labourer received. Mincer established the functional relationship between the income gap of labourers and the years of education and working years of labourers. In 1974, Mincer revised the original model in the book *School Education, Experience and Income*, and established a relatively complete income distribution model on the accumulation of human capital, further demonstrating that in the life cycle of an individual, the income level generally shows a rising trend, and shows a convex change trajectory with increasing age. Mincer initiated a branch of human capital research, and his proposal of taking labourers' years of education as an indicator to measure human capital investment and Mincer's wage equation are still widely used in today's income gap research.

The main viewpoint of human capital theory about gender wage differences is that human capital is the most important factor determining personal income in a perfectly competitive labour market. The elements of human capital affect income of labourers by affecting labour productivity. Compared with male workers, female workers have lower levels of human capital such as education, work experience, and skill training, which ultimately leads to lower incomes of female workers than male workers.

Family Responsibility Theory is in line with human capital theory which can also explain part of the gender wage gap. Becker's (1985) Family Responsibility Theory holds that a person's energy and time are limited. If a person invests more time and energy in his or her family, the energy and time he or she invests in work will be correspondingly reduced, thus his or her performance in the labour market will be correspondingly affected. According to this theory, women's time and energy are allocated between the family and the workplace. If women have already given birth to children, then women will take on more family responsibilities, and women's energy and time devoted to the family will increase, and the amount of time and energy devoted to work will decrease, and women's careers will be greatly negatively affected.

Spence (1974) believes that the personal characteristics of workers are an important signal for employers to make choices in the labour market. Because the signals in the labour market are incomplete, employers will measure individual

abilities based on the signals that have been observed. Those who leave work for a long time and lack job responsibilities cannot have the same income improvement space as those who are loyal to their jobs. Women spend a lot of time caring for their children and family, which signals lower productivity, which can be used to explain women's low wage income (Malmberg 2007). The consideration of women's marriage and family care actually reflects employers' "rational concerns" about the production costs and productivity of hiring female labourers, which is essentially due to human capital considerations.

Married female workers are under "double pressure" from work and family. In order to balance work and family responsibilities, they are more likely to choose informal employment with lower wages, such as part-time workers and temporary workers. Married female workers are also likely to suffer "Career Break" due to childbirth or family care. "Career Break" shortens women's accumulation of work experience, reduces opportunities for on-the-job training and promotion, resulting in the devaluation of human capital. The devaluation of human capital has a significant negative impact on the wage levels of women who return to the Labour market after a "Career Break". These are gender wage differences all caused by women's "Family Responsibilities".

The impact of health conditions on workers' ability to work is obvious; although labour migration behaviour can change the wage income of workers, migration does not change the human capital of a worker, but only changes the stage of human capital play. Moreover, this thesis studies the rural-to-urban migrants gender wage gap after migration, so it will not be described here.

1.3.2 Compensatory Wage Differential Theory

Compensatory wage differences refer to the same workers, that is, workers who have no qualitative differences in knowledge and skills, when they are engaged in labour with different working conditions and social environments, their wages will be different. Especially refers to those because of their working conditions and social environment in a disadvantaged position, so that they have to bear more physical and psychological pressure, such as hard working environment, hard work, boring, there is a certain danger, can cause people's health loss and mental loss. In a sense, they pay more labour than those who are not in the same position. Therefore, in order to compensate for the unfavourable position of these people in working conditions and social environment, there is a wage difference, which is called compensatory wage difference.

As early as 1776, Adam Smith proposed five cases of occupational differences, those were in the chapter *On Wages and Profits depending on the Use of Labour and Capital* in his representative book *A Study of the Nature and Causes of National Wealth*, That is, "First, labour wages vary due to difficulty or ease, dirt or cleanliness, dignity or inferiority of work; Second, labour wages vary depending on the difficulty or ease of business learning, and the amount of tuition; Third, labour wages for various

occupations vary due to business stability and instability; Fourth, labour wages vary according to the size of the responsibilities that workers have to bear; Fifth, the labour wages of various occupations vary with the degree of possibility of obtaining qualifications". Because these professional differences may lead to extra effort and unhappiness for workers, employers need to pay higher wages to these workers than under normal working conditions, that is, extra wages to compensate for these discomforts. Therefore, the essence of compensatory wage differences is reflected in the term "compensation".

There are three basic assumptions for the establishment of the theory of compensation wages: first, workers seek to maximize utility rather than maximize wage income; second, workers understand important information related to job characteristics; third, workers are mobile. Compensatory wage differentials are actually a price at which workers can buy good working conditions or sell poor working conditions to workers. Whether a worker chooses to work in a unit or position with a poor working environment depends on the worker's risk appetite and the worker's reservation price. Workers have different preferences for work characteristics, some pay more attention to income, and some pay more attention to working conditions. The theory of compensatory wages allows us to understand how workers with different preferences and units with different job characteristics are "paired", and it also allows us to understand an important reason for wage differences.

Rosen (1974) transformed the hedonistic wage theory into a corresponding model, in which it introduced in detail the wage differences caused by "compensating factors". The basic idea is to observe the impact of one or more job characteristic variables on the salary level on the basis of controlling the basic characteristics of the individual:

$$\ln W=\alpha+\beta X+\gamma P+u \qquad (2)$$

where W is the labourer's monthly wage or hourly wage rate; X is a series of individual characteristic factors that affect labour's productivity; P is one or more job characteristic variables; u is a random error term including unobservable factors. And what we are most concerned about is the performance of γ. It is not difficult to derive, When the explained variable W appears in logarithmic form, γ measures the percentage of wage change caused by job characteristics. According to the core idea of the theory of compensatory wage difference, if market competition is sufficient, $\gamma > 0$, that is, negative job characteristics are compensated by wages.

Smith (1979) and Filer (1985) made further research. They believe that even if the salary is low, but the professional environment is relatively relaxed or can provide certain benefits, the low salary can also be compensated. For example, for mothers, they may choose relatively easy jobs and jobs that are more friendly to the role of mother, which allows them to consider the role of mother. Polachek (1981) and England (1992) also conducted in-depth research on the occupations of mothers, and further explained that when women give birth or plan to have children, they often choose wages that are non-monetary compensation instead of choosing high-paying jobs. For them, the benefits of non-monetary compensation work are higher than the

benefits of high-wage jobs, that is, they will choose jobs with lower wages that are suitable for them to take on their mother's responsibilities.

1.3.3 Labour Market Segmentation Theory

The segmentation of the labour market refers to the division of labour market due to the effect of social and institutional factors; different groups of people have different access to labour market information and access to the labour market, leading to significant differences in employment sectors, positions, and income patterns among different groups of people. Labour Market Segmentation Theory, also known as the dual labour market model, was put forward by American economists Doringer, P. and Piore, M. in the 1960s.

1.3.3.1 Dual labour market model

The origin of the labour market segmentation theory can be traced back to John Stuart Mill and John Maynard Keynes, who opposed Adam Smith's theory of the competitive nature of the labour market, and tended to believe that the labour market was non-competitive. From the 1960s to the 1970s, the theory of labour market segmentation challenged the labour market theory of neoclassical economics. The more representative one is the dual structure of labour market.

The neo-structuralist sociologist Piore, M. first proposed the dual structure theory. He divided the labour market into a primary market and a secondary market. The primary market has the characteristics of high wages, good working conditions, stable employment, good safety, standardized management process, and many promotion opportunities; the secondary market has low wages, poor working conditions, unstable employment, rough management, and no promotion opportunities. The primary labour market mainly produces capital-intensive products, and it is easier to form an internal labour market. The wages of workers are determined by the ladder status of the workers in the internal labour market, and they can get higher wages than the market; employers in the secondary labour market are not interested in developing the internal labour market, and the wages of workers depend on the labour supply and demand in the market.

In the dual labour market, human capital becomes a signal, playing a screening function. The primary labour market has higher requirements for human capital, and workers have higher wages; those with less education are considered to have low training potential and can only occupy the end of the labour ladder or are employed in the secondary labour market, with relatively low wages. Due to the low human capital of female rural-to-urban migrants, they account for a high proportion of employment in the secondary market, which is also a reason for the gender wage gap among rural-to-urban migrants.

1.3.3.2 Gender Occupational Segmentation Theory

In the early part of the last century, Fawcett (1917) and Edgeworth (1922) both put forward the concept of "crowding". They believed that women's wages were lower than men's because women were restricted to narrow occupational fields. When other conditions are the same, if there are too many women in a certain industry, their wages will decline, thus forming a gender wage gap. In 1974, Bergmann formally put forward the "crowding theory hypothesis". He believed that the gender wage gap between men and women was caused by discrimination against women and different occupational distribution. The labour market for men and women is separated from each other and cannot move freely. Many occupations are limited to women. Women can only concentrate in certain occupations. As a result, the supply of labour in these occupations exceeds the demand, which further reduces the wages of these professional women. This lower wage in turn makes them more attractive to enterprises. This makes it difficult to disappear for occupational segregation or crowding. At the same time, when female workers cannot enter the occupations dominated by male workers, the labour supply of these occupations will be relatively insufficient, which may further increase the wage level of the occupation. These factors lead to a further gender wage gap.

Brown et al. (1980) and Kidd et al. (1996) believed that there are divisions in the labour market between men and women in the labour market system and the division of men and women's dominant occupations respectively; the wage gap between men and women is caused by lower wage rates in female-dominated occupations than in male-dominated occupations; in different countries, the proportions are different of gender discrimination within occupations, gender discrimination between occupations, differences in personal characteristics within occupations, and differences in personal characteristics between occupations.

At present, the theory of labour market segmentation still has a wide range of applications in the study of wage differences.

China's labour market is in a very severe state of segmentation. This segmentation mainly exists between urban natives and rural-to-urban migrants, men and women, and workers in different regions and industries. In time, this division has led to differences in labour conditions and income levels.

1.3.4 Discrimination Theory

According to the definition of *The Convention on the Elimination of All Forms of Discrimination against Women*, the term "discrimination against women" shall mean any distinction, exclusion or restriction made on the basis of sex which has the effect or purpose of impairing or nullifying the recognition, enjoyment or exercise by women, irrespective of their marital status, on a basis of equality of men and women, of human rights and fundamental freedoms in the political, economic, social, cultural, civil or

any other field.

There are three main types of discrimination that lead to the wage gap. The first is exclusive discrimination, the second is statistical discrimination, and the third is taste discrimination.[5] These discriminations reflect deep-rooted inequality, which not only has a great negative impact on female groups and society, but also affects the supply of social labour and social progress.

1.3.4.1 Exclusionary Discrimination Theory

Social exclusion in the labour market means that social groups or individuals in the labour market are unemployed, or low-level employment due to many factors such as their own physiological differences, personal abilities, social policies, institutional arrangements, and social discrimination. The most common type of this discrimination is the exclusion of certain groups in terms of employment and housing. These exclusionary discrimination against certain groups will further strengthen discrimination. Among them, the exclusion of women belongs to exclusionary gender discrimination, which has some similarities with gender occupational segregation. Women experience different degrees of exclusionary discrimination before entering the labour market, in the labour market, being fired, and re-entering the labour market. Exclusionary discrimination in the labour market is mainly the exclusion of women's wages and career advancement and the higher unemployment rate than men. When women are unemployed and re-enter the labour market, they encounter exclusionary discrimination again, resulting in a lower employment rate than men. When women move from one industry to another, or when they transfer from one occupation to another, they also encounter exclusionary discrimination. At this time, this kind of discrimination can also be regarded as mobility barrier discrimination.

1.3.4.2 Statistical Discrimination Theory

In 1972, American scholar Phelps formally put forward the theory of statistical discrimination in the *American Economic Review*. Phelps defines statistical discrimination as discrimination that occurs due to incomplete access to information, and employers regard the typical characteristics of a certain group as the characteristics of all individuals in the group, and regard this characteristic as an employment standard. The victims of this discrimination are generally good members of a poor group. Samuelson believes that statistical discrimination arises from the interaction of incomplete information and improper incentives. Statistical discrimination not only categorizes the individual's group characteristics, but also weakens the individual's incentive to invest in education and training, which in turn strengthens the stereotypes about the original group's characteristics.

Phelps & Arrow (1972) believes that employers may, based on their own experience and observations, believe that women who have given birth are relatively

[5] Samuelson's "Economics" nineteenth edition.

inefficient, often take leave during work, and are not engaged in work. However, in the case of insufficient information, employers may make a "one size fits all" decision for all women who have given birth to them, and pay lower wages to women who have given birth than women who have not given birth. Thurow (1975) explains statistical discrimination from the perspective of men and women. Thurow believes that even though most women are willing to work hard for life, there is no difference from men, but employers cannot judge which individual is really willing to do so. Employers will make decisions based on their own experience. The average labour supply time of men is greater than that of women. Therefore, employers make a "one size fits all" decision, giving priority to men in both employment and promotion. The average wage income of men will also be higher than that of women, thus widening the gender wage gap. Statistical discrimination has increased women's job search costs, causing too many women to concentrate in a few industries (or occupations), leading to aggravation of the crowding effect and strengthening industry or occupational segregation. Statistical discrimination is a way for employers to maximize efficiency under incomplete information. The most fundamental reason lies in the market failure caused by incomplete information. This kind of discrimination may exist in the labour market for a long time.

1.3.4.3 Taste Discrimination

The American economist Gary S. Becker proposed the Taste-for-Discrimination Model in his book *Discrimination Economics* published in 1957. His theoretical basis is the subjective feeling of "displeased body and mind", which means that some people would rather bear a certain amount of expenses than interact with members of a certain group. This unpleasant feeling comes purely from personal preference. In Becker's words, "if a person has a discriminatory preference", then he is willing to substitute one group for another group and pay for it, regardless of this cost directly or indirectly. Becker further pointed out, "When discriminatory acts are carried out, in order to exercise this privilege, the person either pays directly for this or gives up part of the income. When we simplify the problem to look at it in this way, we touch the essence of prejudice and discrimination." In the words of Paul A. Samuelson, "The reason why things are like this is because people want it to be like this."

Employers with personal preference for gender, their employment decision does not solely depend on the marginal labour productivity of workers, but more on their discriminatory preference for gender. Becker (1957) believes that discrimination derived from personal prejudice not only originates from employers, but may also originate from employees and customers. Personal preference discrimination will have such effects: If male employers have prejudice against female employees, even if women and men have the same labour productivity, they only want to hire men. Unless the wage gap between female and male employees is large enough to offset prejudice against women, women will be hired. And gender discrimination from employees has two effects on labour demand: one is that employers must pay higher wages to retain biased employees; the other is to reduce the number of women who are prejudiced in

hiring, or pay them less, which not only leads to an increase in the production cost of the company, but also a decrease in the number of products produced by the company, causing a decline in total labour demand. Discrimination from customers will also affect employment. For example, for surgeons, drivers, etc., customers like services provided by men, which will have a negative impact on the employment of women in this field.

The problem of rural-to-urban migrants is not a simple economic problem, but a complex social problem. Among them, female rural-to-urban migrants not only suffer from household registration discrimination, but also suffer from gender discrimination that has been continuing in history. They are a disadvantaged group that deserves more attention and help. Research on the issue of female rural-to-urban migrants involves many aspects. This thesis mainly studies the wage gap of female rural-to-urban migrants, not only the wage gap between male rural-to-urban migrants and female rural-to-urban migrants, but also the wage gap between female urban natives and female rural-to-urban migrants. What is the status quo of the gap? What are the values of composition effect and structural effect? What are the development trends? Only by clarifying these issues can we make corresponding policy recommendations on how to further improve and how to speed up the improvement process. These are the problems that this empirical chapters of this thesis will study and try to solve.

Chapter 2 The evolution of the gender wage gap among rural-to-urban migrants in China

2.1 Introduction

Modern Chinese society has undergone many changes. Despite the efforts of the government and society, there is still significant gender discrimination. Women, especially female rural-to-urban migrants, as a vulnerable group among vulnerable groups, discrimination is especially harmful to them.

This chapter analyses the evolution of the average gender wage gap and the gender wage gap in each quantile among rural-to-urban migrants from various perspectives (including region, industry, educational level, and training status). I use OLS regression, quantile regression, Oaxaca-Blinder decomposition, and FFL decomposition based on RIF-regression to analyse it. I find that the gender wage gap for rural-to-urban migrants in China is still relatively high. From 34% in 2002, it dropped to 17% in 2007, and then rose to 30% in 2013. In 2002 the gender wage gap was larger at the upper tail of wage distribution, indicating a “glass ceiling effect”. In 2007 the gender wage gap fluctuated around 0.15. In 2013 the gender wage gap fluctuated around 0.25.

2.1.1 Structure of the analysis and contribution

2.1.1.1 Structure of the analysis

This chapter is divided into six parts, the specific content is briefly described as follows:

The first part, introduction, briefly introduces the current status of gender wage gap among Chinese rural-to-urban migrants, research content and significance.

The second part discusses and analyses the research situation of gender wage gap among rural-to-urban migrants in China.

The third part introduces the data and research methods.

The fourth part is an empirical study on the gender wage gap and its evolution among rural-to-urban migrants in China. This thesis mainly studies several problems and their causes:

First, how big is the gender wage gap among rural-to-urban migrants in China (including quantile distribution);

Second, how much structural effect contributes to the rural-to-urban migrant gender wage gap;

Third, how to evolve over time the gender wage gap among rural-to-urban

migrants in China;

Fourth, what is the economic geographic spatial distribution, difference, and evolution of the gender wage gap among rural-to-urban migrants in China;

Fifth, how is the gender wage gap among rural-to-urban migrants in China distributed by industry, how big the difference is, and how it evolves;

Sixth, the distribution, difference, and evolution of the gender wage gap among rural-to-urban migrants in China based on education and training;

The fifth part is robustness checks.

The sixth part is conclusion.

2.1.1.2 Research contribution

Through a comprehensive analysis across time and multiple perspectives, I can have a deeper and more comprehensive understanding of the current situation of rural-to-urban migrants' wage gap, which will help us to understand the rural-to-urban migrant gender wage gap distribution by region, by industry, and the effects from policy of the country.

I explore the changing laws of gender wage gap; explore the relationship between society, structural effect and the gender wage gap, and promoting women's initiative striving for the legitimate rights and interests of gender equality; put forward targeted, pragmatic and feasible policy recommendations, alleviating labour shortage, and promote the implementation of the concept of equal pay for equal work, so as to promote economic development and the realization of social fairness and justice; put forward legislative suggestions to promote legal protection of the rights and interests of female rural-to-urban migrants.

This research helps to make society pay more attention to the development and changes of structural effect which includes gender discrimination, not just the research on the impact of gender discrimination. This research is helpful to promote the development of gender wage gap research towards a more comprehensive and in-depth direction.

The existing research only studied the gender wage gap among rural-to-urban migrants in one year. No paper studied the evolution of the gender wage gap among rural-to-urban migrants. This research studies the evolution of the gender wage gap among rural-to-urban migrants, filling the research gap in this field. The analysis of the gender wage gap among rural-to-urban migrants will be more comprehensive. Rural-to-urban migrant workers promote the development of urbanization, and urbanization increases rural-to-urban migrants' wages. Researching the evolution of the gender wage gap among rural-to-urban migrants can help us find out with the development of urbanization whether the relative wages of female migrants increase or decrease and whether female migrants benefit from urbanization relative to male migrants. It can also help us find out whether the gender wage gap is different for different cohorts.

2.1.2 Background

In 1978 of the last century, China began to implement a reform and opening-up policy, carried out economic system reforms, and allowed the existence of a private economy. Before the reform and opening-up policy, China basically did not trade with foreign countries. After the reform and opening-up policy, China traded with other countries and allowed foreign investors to invest in China. At the same time, in rural China, a household contract responsibility system was implemented. Before this reform, peasants' income was fixed and did not depend on their performance. After the reform, peasants' income depended on their performance, and the national policy centred on economic construction has stimulated people's incentives for labour. The policy of allowing some people to get rich first has given birth to a group of self-employed workers and private business owners.[6] Surplus labour in rural areas was released, and more and more farmers gradually left the land and immigrated to cities and towns to become self-employed labourers and employees of private enterprises. Over time, these rural-to-urban migrants have increased and become an extremely large force in China's economic growth.

China implements the Hukou policy of separating towns and villages. With the rapid development of China's urbanization, a large number of rural-to-urban migrants have acquired urban Hukou and become urban residents. By residing in urban areas, rural migrants will keep their hukou unless they manage to obtain an urban one. When the reform and opening up began in 1978, China's urban residents accounted for only 17.92% of the total population. By 2013, 35 years later, China's urban residents accounted for more than half of the total population, accounting for 53.73% of the total population, an increase of 35.81%; China's urban residents accounted for 60.6% of the total population by 2019 (The above data comes from the National Bureau of Statistics of China). At the same time, there are still a large number of rural-to-urban migrants who have not obtained urban Hukou, and are still urban labourers with rural Hukou. The number of rural-to-urban migrant is growing rapidly. In 1990 there were 34 million rural-to-urban migrants, in 2005, rural-to-urban migrant workers accounted for 20% of urban labour force (Magnani and Zhu, 2012). According to statistics from China's National Health and Family Planning Commission, by 2013, rural migrant workers without urban Hukou in Cities totalled 245 million, while by 2019, the total number of rural migrant workers without urban Hukou in cities has reached 290.77 million. Among them, 102.06 million are women, accounting for 35.1% (from the Rural-to-Urban Migrant Monitoring Survey 2019, National Bureau of Statistics of China). Most rural-to-urban migrants do not have unemployment insurance, and their jobs are not stable. Since rural-to-urban migrant do not get urban Hukou, they cannot enjoy the same rights as urban residents and gradually fall into a huge vulnerable group. Due to traditional culture, traditional consciousness, and lower education level than male rural-to-urban migrants, under the

[6] Before the reform China implemented an egalitarian distribution policy. The income gap was very low and nearly all people were poor.

action of market economy mechanism, female rural-to-urban migrants suffer gender discrimination as well as Hukou discrimination and become the vulnerable group among the vulnerable groups. Most rural-to-urban migrants earn low wages. They work in sectors where there is scarce labour employment protection or even in informal unprotected sectors. Because of rural hukou, often they cannot access welfare such as social assistance; their children often do not have access to "good" schools and might themselves face discrimination at an early age. Migrants often live in poorer areas of the cities (often in firms' dormitories).According to the *Main data report of the third Survey on The Social Status of Chinese Women in 2010* (jointly conducted and released by All-China Women's Federation and National Bureau of Statistics), more than 70% of women have a clear knowledge of discrimination, believing that "not being hired or promoted because of gender", "unequal pay for equal work", "being fired because of marriage/pregnancy/childbirth", and "being looked down upon because of having a girl child" are forms of discrimination, while more than 14% of female rural-to-urban migrants personally experience discrimination.

Article 1 of *The Convention on The Elimination of All Forms of Discrimination against Women (CEDAW)* clearly defines Discrimination against Women, "Discrimination against Women means that any discrimination or exclusion or restriction of its effect or purpose on the basis of sex is sufficient to prevent or deny women (whether married or unmarried) from realizing or exercising their human rights and fundamental freedoms in political, economic, social, cultural or any other field on the basis of equality of men and women". Discrimination against women has a long and deep-rooted history in the world, and the multiple discrimination against female rural-to-urban migrants even violates the basic right of equality of all female rural-to-urban migrants. The gender wage gap not only harms women, but also affects urban labour supply, economic and social development, and social equity and justice. The increase of the gender wage gap can lead to decrease of GDP per capita. Cavalcanti and Tavares (2016) construct an economic growth model with various endogenous variables including saving, productivity, etc. and find that a 50% increase in gender pay gap leads to a 35% decrease in GDP per capita in steady state in America.

Discrimination against female rural-to-urban migrants is reflected in many aspects, such as education discrimination, employment discrimination, equal pay discrimination, development discrimination, inheritance discrimination, domestic violence and so on. A joint survey by All-China Women's Federation and The National Bureau of Statistics of China in 2010 shows that average annual labour income of women with rural Hukou is only 56% of that of men, resulting in an income gap of 44%. In the rural low-income group, women accounted for 65.7% which is 31.4% higher than men. *The Gender Difference of Rural-to-Urban Migrants' Performance in the Urban Labour Market* conducted by The Institute of Economics of the Chinese Academy of Social Sciences in 2008 showed that female rural-to-urban migrants' monthly salary was significantly lower than that of male rural-to-urban migrants, with male and female rural-to-urban migrant's monthly salary being 1100.24 yuan and 910.78 yuan respectively, representing a gender wage gap of 17.2%.

2.1.2.1 The current situation of females and female rural-to-urban migrants in China

Chinese women are huge in size. According to the latest figures released by China's National Bureau of Statistics, the female population in China is 688.44 million. In the three years studied in this thesis, the female population was 623.38 million in 2002, 640.81 million in 2007, and 663.44 million in 2013. In 2002, 2007 and 2013, based on household registration, the proportion of rural population was 60.91%, 55.06% and 49.27% respectively. This means that in this period, the rural female population is 320-380 million.

In 1978, China adopted the policy of reform and opening up. Prior to this, China carried out planned economy and strict Hukou policy to control people's movement, therefore, there was no rural-to-urban migrants. After the reform and opening up, China gradually relaxed restrictions on the movement of people, allowing urban residents and rural labourers to leave household registration (Hukou) location for work. Since there is a large number of surplus labour in rural areas, and the rapid development of urban areas requires more labour, more and more rural labour are attracted to work in urban areas, gradually forming the rural-to-urban migrant group with a population of 300 million. The number of female rural-to-urban migrants has reached 100 million.

Although the Chinese government advocates gender equality, there is still a long way to go to achieve true gender equality due to the strong inertia of the traditional sense of male superiority over female. In China's 13th National People's Congress in 2018, female representatives accounted for 24.9% and female standing committee members accounted for 11.0%. In 2003, the figures were 20.2% and 13.2%, respectively. The proportion of women in leadership positions is low, and there are fewer women as principals. In the organizations where top talents work, only 19.5% of the top leaders are female, and 20.4% of the leadership group have no women. [7]This indicates that the proportion of women participating in politics and management is low.

As of December 2019, the proportion of female academicians of the Chinese Academy of Sciences is 6%, and the proportion of female academicians of the Chinese Academy of Engineering is 5.2%, indicating that in the field of science and technology, women are also in a clearly disadvantaged position. [8]

According to *The Report of the Third Survey on the Social Status of Chinese Women* in 2010, "Most women felt that they were in good health. Among women aged 18-64, 64.2% of women rated their health as "good", 80.9% of women reported that they were not troubled by chronic diseases, and 60.0% of women believed that they had basically no mental health problems."

[7] Data source: www.npc.gov.cn

[8] Data source: https://www.cas.cn/ and https://www.cae.cn/

The average educational years of Chinese women have been increasing, but there is still a gap compared with men. “The average number of years of schooling for women aged 18-64 is 7.9 years, with 9.8 years for urban women and 5.9 years for rural women. The average educational years of young women are significantly higher than that of middle-aged and elderly women. Women’s average years of education are 0.8 years less than men’s.”

Among the population aged 18-64, the proportion of women employed is lower than that of men; the proportion of rural women employed is 80.2% which is 13.4% lower than rural men; the proportion of urban women employed is 60.8% which is 19.7% lower than urban men.

The gender wage gap is significant. 87.9% of women on the move are gainfully employed, mainly in manufacturing and services. Female workers aged 18-64 are mostly concentrated in the low-income and low-middle-income groups. In the urban and rural low-income group, women accounted for 59.8% and 65.7%, respectively, 19.6 and 31.4 percentage points higher than men respectively; in the urban and rural high-income group, women account for only 30.9% and 24.4% respectively, which are significantly lower than men; the average annual labour income of working women in urban and rural areas are only 67.3% and 56.0% of men’s respectively.

The social security of women is not much different from that of men. 85.4% and 83.8% of males and females have old-age security for urban employed workers respectively; the percentage of rural women with social pension security is 31.1%, is slightly lower than the 32.7% of men. The proportion of rural workers with old-age security is low; nearly 93% of urban employees have medical insurance for men and women; rural women’s and men’s social medical security coverage rates are similar, reaching 95%.

Women have a heavy burden of housework. The proportion of women who undertake “most” and “all” household chores such as cooking, washing dishes, washing clothes, cleaning, and taking care of children in the family is higher than 72.0%, while the proportion of men is lower than 16.0%.

Gender discrimination still exists, most prominently in employment and domestic violence. According to the survey, 24.7% of female college students encounter unequal treatment in employment, and 24.7% of women have experienced various forms of domestic violence in their marriage.

The human capital investment of female rural-to-urban migrants in China is relatively low; their employment is mainly concentrated in low-income industries or positions, mainly in private enterprises, foreign companies, or self-employed individuals; they have a high proportion of informal employment and change jobs frequently; their level of social security is low; their family responsibilities are heavy; some of them still suffer from gender discrimination.

To solve these problems, the Chinese government has made many efforts, but there are still many shortcomings. The two important laws, *The Labour Law* and *The Law on the Protection of Women’s Rights and Interests*, have only a few provisions on women’s employment. The Outline for *The Development of Chinese Women (1995-2000)*, issued in 1995, stipulates that “equal pay for equal work shall be achieved for

men and women in urban and rural areas throughout the country", and that, among other policies and measures, "I shall actively develop areas and forms of employment suitable to women's characteristics, provide more employment opportunities for women and guide them in finding jobs". *The second Program for the Development of Chinese Women (2001-2010)*, issued in 2001, set the goal of eliminating gender discrimination in employment and achieving equal employment between men and women. In 2004, "Respecting and protecting human rights" was written into *The Constitution*, providing a constitutional guarantee for the development of women's human rights and the elimination of discrimination against women. In 2005, China acceded to *The Convention on the Elimination of Discrimination in Employment and Occupation*. In August 2007, Chapter III of *The Employment Promotion Law of the People's Republic of China* stipulates that fair employment should be realized, providing a legal basis for eliminating discrimination against women in employment and guaranteeing women's labour rights, triggering the discussion of "female employment discrimination" in the society, and creating a good social atmosphere. The gender wage gap dropped significantly that year. In April 2009, the State Council Information Office issued *The National Human Rights Action Plan (2009-2010)*, which stipulated that "women's right to work and equal rights to economic resources should be guaranteed. Sex discrimination is prohibited in recruitment." On June 2, 2011, *The Outline of Twelfth Five-Year Plan for the Development of Human Resources and Social Security* issued by the Ministry of Human Resources and Social Security stipulated that "further strengthen women's employment, eliminate employment discrimination, and create a social environment for fair employment." Compared with the outline of the *11th Five-Year Plan*, the *12th Five-Year Plan* stipulates that women and other groups should also obtain employment security, and further stipulates the elimination of discrimination against women in employment, which provides policy support for the elimination of discrimination against women in employment. In July 2011, The State Council issued the Outline for the Development of Chinese Women (2011-2020), which stipulates that "equal pay for equal work for men and women should be fully implemented". In 2019, the Ministry of Human Resources and Social Security and other nine departments issued *The Notice on Further Regulating Recruitment Behaviours to Promote Women's Employment*, clarifying six types of gender discrimination behaviours in employment that must not be implemented in response to the problem that gender discrimination has been repeatedly banned but still exists.

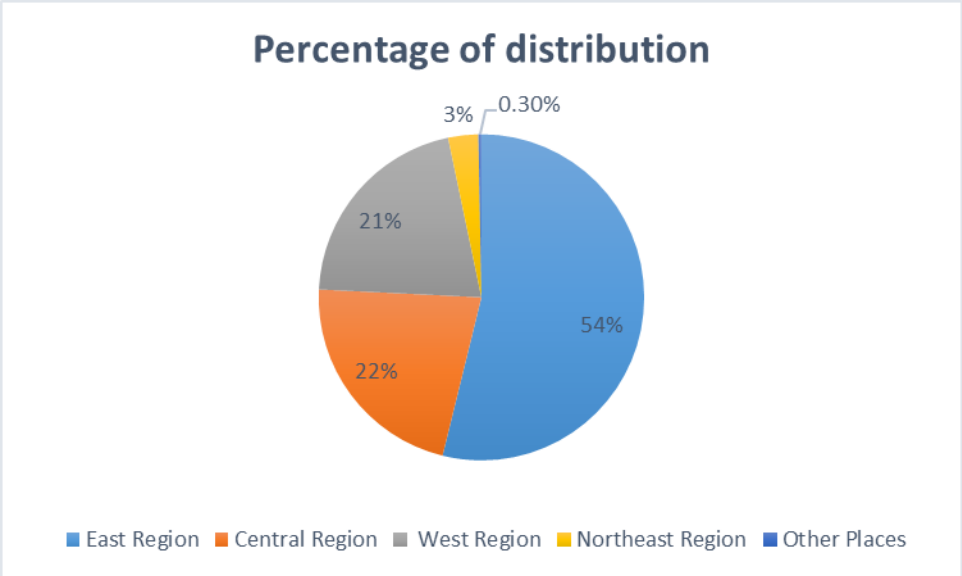
Although the Chinese government has made many efforts to eliminate gender discrimination, the implementation effects of these laws and policies are not satisfactory. Especially in the non-public economy that absorbs most of the employed population, gender discrimination persists, and the gender wage gap caused by discrimination has not been eliminated.

2.1.2.2 The current situation of gender wage gap among rural-to-urban migrants in China

Due to the rural-urban dual economic structure in China, rural-to-urban migrants are discriminated, and male rural-to-urban migrants are mostly engaged in jobs that urban natives do not want to do when they first enter the city to work. These jobs have poor conditions, have low pay, are instable and have no social security. In other words, most of them are employed in the secondary labour market. Female rural-to-urban migrants have not been spared either, and the proportion of jobs at the low-income end is even higher. There is a wage gap between rural-to-urban migrants and urban natives, and there is a wage gap between female rural-to-urban migrants and male rural-to-urban migrants. In other words, overall, female rural-to-urban migrants are the group with the lowest wages. Although with the development of Chinese society, the working conditions, income, and social security of rural-to-urban migrants have been improved, the situation of female rural-to-urban migrants at the low end of income has not fundamentally changed.

According to the data from the *Rural-to-urban Migrant Monitoring Survey Report 2019* by the Ministry of Human Resources and Social Security of China, the distribution of rural-to-urban migrants by employment area is shown in the figure 1 below.

Figure 1 The regional distribution of rural-to-urban migrants



Data source: *Rural-to-urban Migrant Monitoring Survey Report 2019.*

In the eastern region of China where economy is developed, more than half of rural-to-urban migrants work there, and the number is as high as 157 million; the central and western regions are similar, with 62.23 million and 61.73 million working there respectively; 3% of rural-to-urban migrants work in the northeast China; there are 860,000 rural-to-urban migrants working in other regions, accounting for the lowest proportion, only 0.3%.

Before 1978, the female working-age population in China basically achieved universal employment. The female labour force participation rate exceeded 90%, and the female labour force accounted for almost half (48%) of the total labour force. After the reform and opening up, a variety of economic systems coexisted, and China's wage system gradually changed, and the female labour force participation rate and gender wage gap also changed dramatically.

In January 1985, The State Council issued the *Notice on Wage Reform in State-owned Enterprises*, establishing a performance-based wage system. Consider the state, enterprises and individuals when allocating wages, and the autonomy of enterprises has greatly increased.

In July 1986, Chinese state-owned enterprises began to implement the contract system, and then the contract system was extended to various enterprises. Since then, the contract system has become a basic feature of China's labour and employment relations. The autonomy of employees in enterprises has increased, but it is still difficult to dismiss workers.

In 1988, the average wage of female employees accounted for 84% of the average wage of male employees (Li and Li, 2008).

In 1992, China made clear the reform goal of "building a socialist market economic system." In 1993, China established an income distribution system that focuses on distribution according to labour, gives priority to efficiency and considers fairness; At the same time, the non-public economy and the public economy are allowed to coexist, and the level of wage inequality in non-public enterprises has become higher.

In 1996, China began to reform small state-owned enterprises, and a large number of workers were laid off, which had a great social impact. Many female labourers are forced to withdraw from the labour market.

In 1998, with the country's further reform of state-owned enterprises, state-owned enterprises began to reduce their employees, and the number of laid-off workers from state-owned enterprises began to rise. At the same time, the company's wage determination mechanism has begun to be further improved.

In 2000, enterprises gradually began to establish and improve the basic salary system based on post wages, and implemented the principle of competition for posts and fixed salary according to posts. Since then, China's labour and wage system reform has been basically completed.

According to the survey results of the rural-to-urban migrant labour force conducted by the Rural Investigation Team, in 2002 the average monthly salary of Chinese men was 710.42 yuan, and the average monthly salary of women was 555.39 yuan, and the gender wage gap was 21.8%. According to the household survey data conducted by the joint research team of Beijing Normal University and the Australian National University in 15 representative cities in China in 2008, Li and Yang (2010) found that the age of rural-to-urban migrants is relatively low. The sample size under 35 years old accounts for about 2/3 (67.85%), of which women are younger than men, and women in the two age groups of 16-20 years and 21-25 years old account for two thirds (67.85%). The proportions are higher than the corresponding proportions of

men, and in all age groups over the age of 25, the proportion of men is basically higher than that of women. In 2007, the average monthly salary of female rural-to-urban migrants was 80.84% of that of male rural-to-urban migrants. With the increase of age, the gender wage gap continues to increase, and the gender wage gap is the largest in the age group of 36 to 40, reaching 28%. Su et al. (2018) conducted research using 9 survey data (1989, 1991, 1993, 1997, 2000, 2004, 2006, 2009, 2011) published by the China Health and Nutrition Survey (CHNS) over a span of 23 years, and found the gender wage gap was widening. In 1990, women's wages were 77.35% of men's, but in 2011 the number dropped to 67.18%.

2.2 Review of literature related to gender wage gap of rural-to-urban migrants

China's female rural-to-urban migrants are a huge social group of about 100 million people[9]. However, the society pays little attention to China's female rural-to-urban migrants and researches on the gender wage gap among rural-to-urban migrants are little, and not deep enough. There is no research on the evolution of the gender wage gap among rural-to-urban migrants in China, however, there are many researches on the related issue, namely the gender wage gap. These studies mainly focus on the degree of gender wage gap, the determinants of gender wage gap, and the countermeasures to reduce gender wage inequality caused by discrimination. Although the research perspectives are becoming more and more abundant, most of the works are relatively single, starting from a single perspective, or only studying the gender wage gap at a certain point in time. In terms of interventions to reduce the gender wage gap, only policy and legislative recommendations have been put forward, without realizing that this is the responsibility of the entire society. All aspects of the society should be mobilized to reduce the gender wage gap. Among these studies, some study gender wage differences in average, some study gender wage differences in quantile points, some study the gender wage gap caused by differences in personal endowments, some study the gender wage gap caused by gender discrimination, and some study the gender wage gap within the industry, some research the gender wage gap in different countries or regions, some research the impact of different economic ownerships on the gender wage gap, some research the impact of childbirth on gender wage gap, and some research employment on the gender wage gap. However, there are not many comprehensive and in-depth studies on multiple perspectives and multiple dimensions.

It has become a consensus that part of the gender wage gap is caused by discrimination, and the size of this gap will vary with changes in many external environmental conditions and other factors. From the perspective of research content, research on wage gap mainly focuses on rural-urban wage gap and industry wage gap,

[9] National Bureau of Statistics of China: *The Rural-to-Urban Migrant Monitoring Survey 2019*

while gender wage gap research mainly focuses on the gender wage gap among urban workers and rural-to-urban migrants. There are also some studies on the evolution of the gender wage gap among urban workers, but there is a lack of research on the evolution of the gender wage gap among rural-to-urban migrants.

2.2.1 Review of literature related to the gender wage gap among rural-to-urban migrants at a certain point in time

Economic researchers initially focused on the gender gap in average wages. In the early 1970s, Oaxaca (1973) and Blinder (1973) almost simultaneously proposed a method for the decomposition of wage differences, laying the foundation for wage gap decomposition methods. Since then, many scholars have adopted this method to conduct measurement research on the gender wage gap. Kuai and Zhang (2016) used this method to study rural-to-urban migrant gender wage differences, and found that rural-to-urban migrant gender wage differences existed significantly, which was concerned with the traditional thinking that "women are not as good as men", enterprises worrying about conflicts between female family and work, the absolute low level of female working hours and training participation rates, and gender differences in social network characteristics. At the same time, it was found that the return on working time and training participation rate of women was significantly higher than that of men. Huang (2010) used Brown's decomposition method to study the gender wage gap of rural-to-urban migrants and found that the human capital gap caused 19.3% of the gender wage gap, and the other 80.7% was caused by gender discrimination. Magnani and Zhu (2012) researched the gender wage gap among rural-to-urban migrants at different quantiles, finding that the gender wage gap was larger at high quantiles. The contribution of discrimination to the wage gap was larger than composition effect. The contribution of discrimination to the wage gap was larger at low quantiles. Zhang (2013) found that the monthly wage of female rural-to-urban migrants was only 73.94% of that of male rural-to-urban migrants, while the hourly wage of female rural-to-urban migrants was only 73.36% of male rural-to-urban migrants; age, years of education, marital status, total length of service, and type of work have a significant impact on the gender wage gap; the unexplainable part of the gender wage gap accounted for about 75%, thinking that obvious gender discrimination among rural-to-urban migrants might exist. Luo's (2015) research on the floating population found that the floating population with low education and rural Hukou and employed in low-end industries in backward areas and labour-intensive industries had low wages and more obvious gender differences; gender wage gap was mainly caused by gender discrimination and others caused by unobservable factors, and age, years of working outside the home, and the nature of Hukou have a greater impact on discrimination. The gender wage gap of the floating population reached 21%, and it showed a "sticky floor effect"; the differences in personal characteristics, mobility characteristics, and employment characteristics between men and women

could only explain 13.24% of the gender wage gap, and discrimination accounted for as high as 86.76%. The common point of the above studies is that they mainly described the size of the gender wage gap, and generally believed that gender discrimination is the main reason for the gender wage gap, but they just described the results and did not explain it.

2.2.2 Review of literature related to gender wage gap among rural-to-urban migrants based on quantile

With the deepening of the research on the wage gap, scholars have extended the research from the average wage gap to the research on the wage gap across different wage levels, so a quantile study on the wage gap has emerged. Quantile regression was originally introduced by Roger Koenker and Gilbert Bassett in 1978, and then it has been widely used. Wang (2010) found that the gender wage gap of rural-to-urban migrants showed a "glass ceiling effect"; however, at the highest end of the wage distribution, the gender wage gap began to shrink. Wang and Zhou (2012) used quantile regression to study the gender wage gap among rural-to-urban migrants in 2011, and found that female rural-to-urban migrants suffered significant discrimination and "sticky floor effect", and the return on work experience was higher than the return on education. They did not research the evolution of the gender wage gap among rural-to-urban migrants at various wage quantiles.

2.2.3 Review of literature related to the distribution of gender wage gap among rural-to-urban migrants

This mainly refers to the research on the regional distribution and industry distribution of the gender wage gap. In different industries, there are gender wage gaps within the industry, and there are also differences in wages between industries. The marginal productivity of labour in each occupation is different, and the wages are different. At the same time, because of the different human capital of each occupation group, the gender wage gap is also different. Many scholars have noticed these problems. Luo (2010) studied the rural-to-urban migrant wages of various occupational groups, and found that rural-to-urban migrants and their various occupational groups have obvious gender differences in wages, and the differences were gradually increasing over time; gender discrimination had a strong explanatory power for the gender differences in wages of various occupational groups of rural-to-urban migrants, and this explanatory power was gradually increasing over time. Li and Zhang et al. (2016) studied gender discrimination, industry segregation and rural-to-urban migrant gender wage differences based on the improved Brown decomposition, and concluded that rural-to-urban migrant gender wage differences were mainly caused by gender discrimination, and it was usually reflected in the

discriminatory effect within the industry; industry segregation had a smaller effect on the gender wage gap of rural-to-urban migrants. Luo (2017) used Appleton's decomposition method to find that there was a certain degree of industry gender segregation among rural-to-urban migrants. Compared with male rural-to-urban migrants, female rural-to-urban migrants were more concentrated in labour-intensive low-paying industries; rural-to-urban migrant gender wage differences included not only differences between industries, but also differences within industries, which were mainly caused by different pay between men and women in the industry and gender discrimination when entering the industry. The gender wage difference caused by industry segregation could explain 23.2% of the total difference. Wu et al. (2020) researched the gender wage gap among rural-to-urban migrants, finding that structural effect was the main reason of the gender wage gap. Using the manufacturing industry as the control group, the regression method was used to study the wage premium of various industries relative to the manufacturing industry. The authors also calculated the proportion of women in each industry, finding that women gathered in low-wage industries, and men gathered in high-wage industries.

The common point of the above studies is that they all believe that the main reason for the gender wage gap in the industry is gender discrimination, and occupational segregation has a certain contribution to the gender wage gap. The disadvantage is that the distribution of gender wage gaps among industries has not been studied.

There are few papers studying gender wage gap among rural-to-urban migrants in China. Most of the existing literature only researches the gender wage gap among rural-to-urban migrants in China at one point of time, and does not research the evolution of the gender wage gap among rural-to-urban migrants. Some literatures have studied the evolution of the gender wage gap in China, but the research object is only the gender wage gap of urban residents. In this chapter, I use CHIPs 2002, 2007 and 2013 data to research the mean, range, distribution and evolution of the gender wage gap among rural-to-urban migrants in China. I first use descriptive statistical methods to study the rural-to-urban migrant gender wage gap from different perspectives, then use Oaxaca-Blinder decomposition method to decompose the average wage gap in 2002, 2007 and 2013, finally I use FFL decomposition method to decompose the gender wage gap at each quantile. On the basis of the calculation, on the basis of the theory of the wage gap, combined with the historical and cultural traditions of the Chinese society, social development and changes after the reform and opening-up and the actual situation in today's society, I analyse these results, and on the basis of comprehensive analysis, I put forward suggestions to reduce the gender wage gap among rural-to-urban migrants, to promote social equity and justice contribute my strength.

2.3 Data and research methods

2.3.1 Data and summary statistics

I use Chinese Household Income Project (CHIPs) data in 2002, 2007 and 2013. The data is provided by China Institute for Income Distribution at Beijing Normal University. The 2002 survey was carried out by the National Bureau of Statistics (NBS). The 2007 urban survey was carried out by the NBS, and the 2007 rural-to-urban migrants survey was carried out by a survey company. The 2013 survey was conducted by the Annual Household Survey Office of Integration of Urban and Rural in National Bureau of Statistics. Detailed information was collected on incomes and expenditures, employment status, family structure, and social and economic characteristics at both personal and household level in data. The 2002 survey includes ten datasets. One of them is Urban Individual Income, Consumption, and Employment Data, containing 151 variables and 20632 cases. Another one is Rural-to-urban Migrant Individual Data, containing 76 variables and 5327 cases. In this study I use the two datasets above. The 2007 survey was a part of the RUMiC (Rural-to-urban Migrants in China) survey project. The data contained 5000 households in migration sample, and 5000 households in urban sample. The sample of CHIP 2013 is coming from the big sample of the annual integration household survey sample of NBS in 2013. The latter contains 160 thousand households in 31 provinces. The CHIP sample was selected by systematic sampling method in three layers of east, center and west and contains 15 provinces, 126 cities, 234 counties, 18948 households and 64777 individuals. The CHIP 2002 data includes Beijing, Liaoning, Shanxi, Jiangsu, Anhui, Henan, Hubei, Guangdong, Chongqing, Sichuan, Yunnan, Gansu province. The CHIP 2007 urban survey data includes Beijing, Liaoning, Shanxi, Jiangsu, Anhui, Henan, Hubei, Guangdong, Chongqing, Sichuan, Yunnan, Shanghai, Zhejiang, Fujian, Hunan, Gansu province. The CHIP 2007 rural-to-urban migrants survey data includes Guangdong, Henan, Anhui, Chongqing, Jiangsu, Hubei, Sichuan, Shanghai, Zhejiang province. The CHIP 2013 data includes Beijing, Liaoning, Shanxi, Jiangsu, Anhui, Henan, Hubei, Guangdong, Chongqing, Sichuan, Yunnan, Hunan, Shandong, Gansu province. I choose the three years of data because they represent the process of urbanization and I can see whether female rural-to-urban migrants benefited from urbanization.

The rural-to-urban migrants are defined as people who live in urban areas but have rural Hukou. The urban natives are defined as people who live in urban area and have urban Hukou.

I only reserve female people whose ages are 16-55 and male people whose ages are 16-60, because female people will retire by 55 and males will retire by 60. In 2002 and 2007 the provinces are Guangdong, Henan, Anhui, Chongqing, Jiangsu, Hubei and Sichuan; in 2013 the provinces are Beijing, Shanxi, Liaoning, Jiangsu, Anhui, Henan, Hubei, Hunan, Guangdong, Chongqing, Sichuan, Yunnan, Gansu, and Shandong. I also use sample weights.

Table 3 shows summary statistics. Female migrants' average education years were lower than male migrants' in 2002, 2007 and 2013. Female and male migrants'

average education years both increased consistently from 2002 to 2013. Female migrants' average working experience was lower than male migrants' in 2002, 2007 and 2013. Female and male migrants' average working experience both decreased first and then increased from 2002 to 2013.

Table 3 Summary statistics

		2002		2007		2013	
		education years	experience	education years	experience	education years	experience
female migrants	mean	7.55	6.57	9.02	5.84	9.51	10.01
	standard deviation	2.87	4.44	2.64	5.61	3.15	6.96
	number of observations	906		1883		507	
male migrants	mean	8.55	8.21	9.33	7.61	9.64	10.81
	standard deviation	2.48	5.43	2.41	6.50	2.75	7.50
	number of observations	1150		2913		728	

Note: data source: chips data. If the sum of one person's educational years plus 6 is greater than or equal to 16, his experience is defined as: age-educational years-6; if the sum of one person's educational years plus 6 is less than 16, his experience is defined as: age-16.

From the table, I can also see that although the education level of both male and female rural-to-urban migrants has continued to improve, women's education level has improved faster, and the gap in work experience between the sexes has generally narrowed, indicating that the growth rate of level of human capital of women is higher than that of men. In 2013, the work experience of rural-to-urban migrants was relatively high. The work experience of female rural-to-urban migrants increased significantly. This was because after the 2008 global financial crisis, China's economy was also been hit hard. After the government's RMB 4 trillion investment was digested, the economy was in a trough, even if female rural-to-urban migrants are older, they still need to go out to work to maintain family expenditure and living standards.

2.3.2 Research methods

I use quantile regression, Oaxaca-Blinder decomposition method, and FFL decomposition method in this thesis.

2.3.2.1 Quantile regression

The method of quantile regression was proposed by Koenke and Basset (1978).

Definition 1: Let the distribution function of a random variable be F. For any 0<τ<1, define

$$F^{-1}(\tau) = \inf\{y: F(y) \geq \tau\} \quad (3)$$

as the τ-quantile of Y.

Definition 2: The empirical distribution function of random variable Y is $F_n(y) = n^{-1}\sum_{i=1}^{n} I(Y_i \leq y)$, where $I(Y_i \leq y)$=1 when $Y_i \leq y$, and $I(Y_i \leq y)$=0 when $Y_i > y$. For any 0<τ<1, define

$$F_n^{-1}(\tau) = \inf\{y: F_n(y) \geq \tau\} \quad (4)$$

as the τ sample quantile of Y.

From the definition of sample quantile, I know that the τ sample quantile of the random variable Y is the smallest y which makes $F_n(y) \geq \tau$. Order all sample values from small to large. Take the part that accounts for τ of the total sample, and the maximum value of this part of the sample points is the τ sample quantile of Y.

Make a point estimate for the random variable Y whose distribution function is F. The loss function is

$$\rho_\tau(Y - \hat{y}) = (Y - \hat{y})\big(\tau - I(Y < \hat{y})\big), \quad (5)$$

where τ is a quantile. Y represents the true value of the quantity to be estimated. $\hat{y}$ is the estimate. $I(Y < \hat{y})$ equals to 1 when $Y < \hat{y}$, and equals to 0 when $Y \geq \hat{y}$. It can be proved that the $\hat{y}$ that minimizes the average loss is the τ quantile of Y.

In most cases this loss function is an asymmetric piecewise linear function, only when $\tau = 0.5$ it becomes a symmetric linear function. This loss function is to make up for the deficiency of the symmetric loss function in the application. In practical problems, the losses caused by overestimation and underestimation are often not the same. For example, in risk prediction, in order to ensure safety, I would rather overestimate rather than underestimate. When estimating the scores of college entrance examination, I would rather underestimate than overestimate. Therefore, the asymmetric linear loss function has a place in statistics. For the loss function $\rho_\tau(Y - \hat{y}) = (Y - \hat{y})\big(\tau - I(Y < \hat{y})\big)$, if $\tau = 0.75$, when it is underestimated, $Y > \hat{y}$, $\rho_{0.75}(Y - \hat{y}) = 0.75|Y - \hat{y}|$; when it is overestimated, $Y < \hat{y}$, $\rho_{0.75}(Y - \hat{y}) = 0.25|Y - \hat{y}|$. The severity of the loss when underestimated is three times as severe as when overestimating. To balance this, choose $\hat{y}$ so that the probability of $Y < \hat{y}$ is three times the probability of $Y > \hat{y}$, that is, $P(Y \leq \hat{y}) = 3P(Y > \hat{y})$. When $\hat{y}$ is the 0.75 quantile of Y, this formula is satisfied.

Given $\{(x_i, y_i), i = 1,2, \dots, n\}$ and

$$y_i = \beta_0 + x_i\beta_1 + \varepsilon, \quad (6)$$

I want to estimate β_0 and β_1. The OLS regression method is to choose β_0 and β_1 which minimizes $\sum_{i=1}^{n}(y_i - \beta_0 - x_i\beta_1)^2$. The quantile regression method is similar. The estimated β_0 and β_1 of quantile regression is the solution which minimizes

$$\sum_{i=1}^{n} \rho_\tau(y_i - \beta_0 - x_i\beta_1). \quad (7)$$

2.3.2.2 Oaxaca-Blinder decomposition method

This method was proposed by Oaxaca (1978) and Blinder (1978). If men's

relative wages are higher than women's relative wages when there is no discrimination, it can be said that there is discrimination against women. Discrimination coefficient (D) can be used to estimate discrimination:

$$D = \frac{\frac{W_m}{W_f} - (\frac{W_m}{W_f})^0}{(\frac{W_m}{W_f})^0}, \tag{8}$$

where $\frac{W_m}{W_f}$ is the actual ratio of male to female wages, $(\frac{W_m}{W_f})^0$ is the ratio of male to female wages without discrimination. From equation (7), I know:

$$\ln(D+1) = \ln\left(\frac{W_m}{W_f}\right) - \ln(\frac{W_m}{W_f})^0. \tag{9}$$

Assume that employers abide by the principle of cost minimization in the absence of discrimination, then

$$(\frac{W_m}{W_f})^0 = \frac{MP_m}{MP_f}, \tag{10}$$

where MP_m is male marginal product, MP_f is female marginal product.

Because $\ln(\frac{W_m}{W_f})^0$ is unknown, to estimate D is equivalent to estimating $\ln(\frac{W_m}{W_f})^0$. Assuming that in the absence of discrimination, the current wage structure of women is also applicable to men, and the existing wage structure of men is also applicable to women. OLS can be used to estimate wage structure. Male wage equation is

$$\ln(W_{mi}) = Z'_{mi}\beta_m + u_{mi},\ \text{i=1,2,…,n1} \tag{11}$$

where W_{mi} is the wage of the i[th] male; Z'_{mi} is the personal characteristics vector of the i[th] male; β_m is a vector of coefficients for males; u_{mi} is residual. Female wage equation is

$$\ln(W_{fi}) = Z'_{fi}\beta_f + u_{fi},\ \text{i=1,2,…,n2} \tag{12}$$

where W_{fi} is the wage of the i[th] female; Z'_{fi} is the personal characteristics vector of the i[th] female; β_f is a vector of coefficients for females; u_{fi} is residual.

Let

$$G = (\overline{W_m} - \overline{W_f})/\overline{W_f}, \tag{13}$$

then

$$\ln(G+1) = \ln(\overline{W_m}) - \ln(\overline{W_f}), \tag{14}$$

where $\overline{W_m}$ is male average wage; $\overline{W_f}$ is female average wage. It can be seen from the property of OLS regression that

$$\ln(\overline{W_m}) = \overline{Z'_m}\widehat{\beta_m} \tag{15}$$

$$\ln(\overline{W_f}) = \overline{Z'_f}\widehat{\beta_f} \tag{16}$$

where $\overline{Z_m'}$ and $\overline{Z_f'}$ are the vectors of mean values of independent variables for men and women respectively. $\widehat{\beta_m}$ and $\widehat{\beta_f}$ are the estimation of the vectors of coefficients. Substitute equation (15) and (16) into (14), I have

$$\ln(G+1) = \overline{Z_m'}\widehat{\beta_m} - \overline{Z_f'}\widehat{\beta_f} \tag{17}$$

Let

$$\Delta\bar{Z}' = \overline{Z_m'} - \overline{Z_f'} \tag{18}$$

$$\Delta\hat{\beta} = \widehat{\beta_m} - \widehat{\beta_f} \tag{19}$$

then

$$\ln(G+1) = \Delta\bar{Z}'\widehat{\beta_m} + \overline{Z_f'}\Delta\hat{\beta} \tag{20}$$

Based on the assumption that the current wage structure of men is also applicable to women in the absence of discrimination, it can be concluded that

$$\ln\left(\frac{W_m}{W_f}\right)^0 = \Delta\bar{Z}'\widehat{\beta_m}, \tag{21}$$

$$\ln(D+1) = \overline{Z_f'}\Delta\hat{\beta}. \tag{22}$$

Equation (20) represents the contribution of the differences in personal characteristics between men and women to the gender wage gap, and equation (21) represents the contribution of discrimination to the gender wage gap.

2.3.2.3 FFL decomposition method based on RIF regression

I use decomposition method based on RIF regression to analyse the contribution of wage discrimination to gender wage gap and the contribution of the difference in characteristics between males and females to the gender wage gap. The decomposition method is proposed in Firpo et al. (2018).

The recentered influence function of group t is defined as:

$$\text{RIF}(w_t;\ v_t, F_t) \equiv v(F_t) + IF(w_t;\ v_t, F_t), \text{ t=m, f} \tag{23}$$

m denotes males, and f denotes females. w_s denotes wages of group t. F_s is wage distribution function of group t. v is a function of quantile. IF is influence function. From the definition of influence function, I know that:

$$\int_{-\infty}^{+\infty} IF(w;\ v)\, dF(y) = 0 \tag{24}$$

So

$$\begin{aligned} \text{E}[\text{RIF}(w_t;\ v_t, F_t)] &= \int \text{RIF}(w_t;\ v_t, F_t)\, dF(w_t) \\ &= \int [v(F_t) + IF(w_t;\ v_t, F_t)]\, dF(w_t) = v(F_t) \end{aligned} \tag{25}$$

Using the law of iterated expectations, I know that:

$$v(F_t) = \text{E}[\text{RIF}(w_t;\ v_t, F_t)] = E[\text{E}[\text{RIF}(w_t;\ v_t, F_t)|X_t]] \tag{26}$$

X_t is covariate matrix of group t. Define

$$m_t(\text{X}) = \text{E}[\text{RIF}(w_t;\ v_t, F_t)|X_t] \tag{27}$$

This is RIF regression. Assume that RIF regression satisfies the parametric linear assumption:

$$m_t(\mathrm{X}) = \mathrm{E}[\mathrm{RIF}(w_t;\ v_t, F_t)|X_t] = X_t\beta_t \tag{28}$$

So

$$v(F_t) = E\big(X_t\beta_t\ \big) = E(X_t)\beta_t \tag{29}$$

$$v(F_m) - v\big(F_f\big) = \underbrace{\big[E(X_m) - E\big(X_f\big)\big]\beta_m}_{composition\ effect} + \underbrace{E\big(X_f\big)\big[\beta_m - \beta_f\ \big]}_{structural\ effect} \tag{30}$$

Composition effect is due to the difference in characteristics between males and females. Structural effect is due to the difference in coefficients between males and females. According to the principle of equal pay for equal work, structural effect includes the contribution of wage discrimination to the gender wage gap.

2.3.2.4 Other methods

Neumark (1988) proposed a method to decompose the average wage gap. Neumark assumed males benefit from the discrimination against females. He decomposed the average gender wage gap as

$$\ln(\overline{W_m}) - \ln\big(\overline{W_f}\big) = \underbrace{\big(\overline{Z_m'} - \overline{Z_f'}\big)\beta^*}_{composition\ effect} + \underbrace{[\overline{Z_m'}\big(\widehat{\beta_m} - \beta^*\big) + \overline{Z_f'}\big(\beta^* - \widehat{\beta_f}\big)]}_{structural\ effect} \tag{31}$$

β^* is the estimation of non-discriminatory wage structure. Neumark used the wage structure of pooled regression as the non-discriminatory wage structure. I think maybe some males benefit from the discrimination because they are more likely to be promoted, but I have already controlled the variable of occupation, and the number of males who benefit from discrimination is very small. Most males earn non-discriminatory wages, so I use Oaxaca-Blinder decomposition method and use male wage structure as non-discriminatory wage structure.

Machado and Mata (2005) proposed a method to decompose the wage gap at different quantiles. Their method can also be used to decompose gender wage gap. To generate a counterfactual wage distribution of females when they face male wage structure, they first drew a female observation randomly, then drew a quantile randomly, and then used the observation and male coefficients at this quantile to generate a counterfactual wage. Repeated the process many times, we could obtain the counterfactual wage distribution. The way of generating counterfactual distribution is not precise enough for its random match between wage structure and individual characteristics. FFL decomposition method solved the problem, so I use FFL decomposition method in this chapter.

2.4 Empirical results

2.4.1 The raw gender wage gap

Table 4 shows the evolution of the raw average gender wage gap. Male average

wages and female average wages both increased consistently from 2002 to 2013. The raw gender wage gap = (males wages – female wages)/male wages. The raw gender wage gap decreased first and then increased.

Table 4 The evolution of the raw average gender wage gap

	2002	2007	2013
female migrants' average wage	703.12	1245.21	1910.80
male migrants' average wage	1060.73	1498.45	2639.54
gender wage gap	0.34	0.17	0.28

Notes: I use urban price index to change nominal wages into real wages (take the price in 2002 as 1). The urban price index comes from the website of National Bureau of Statistics in China. The gender wage gap = (males wages – female wages)/male wages.

Table 5 and figure 2 show the raw gender wage gap at different quantiles. In 2002 the gender wage gap was larger at the upper tail of wage distribution, indicating a "glass ceiling effect". This is because the level of human capital of female rural-to-urban migrants is low, and there is a significant gap with male rural-to-urban migrants, forming part of the wage gap. Lower human capital also makes female rural-to-urban migrants more discriminated against, which in turn creates part of the wage gap. The combination of the two makes the wages of female rural-to-urban migrants no longer rise after reaching a certain level, thus the "glass ceiling effect" appears. In 2007 the gender wage gap fluctuated around 0.15. In 2007, China's economy was in good shape. The average age of rural-to-urban migrants was relatively low and their education level was relatively good. Although men's human capital was still higher than women's, the gap in human capital between men and women was small, so the gender wage gap was the lowest that is in line with my analysis above. In 2013 the gender wage gap fluctuated around 0.25.

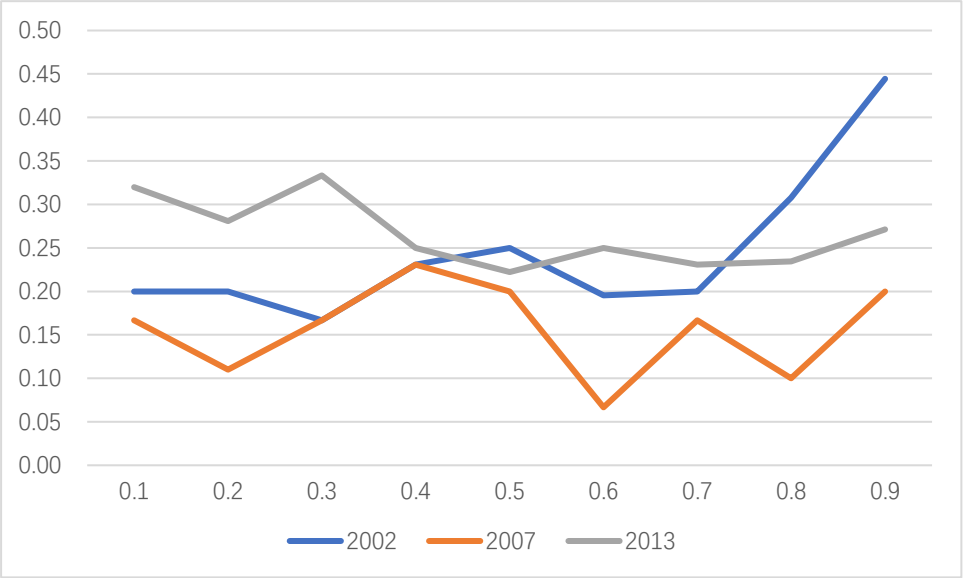
Table 5 The raw gender wage gap across wage distribution

quantile	2002	2007	2013
0.1	0.20	0.17	0.32
0.2	0.20	0.11	0.28
0.3	0.17	0.17	0.33
0.4	0.23	0.23	0.25
0.5	0.25	0.20	0.22
0.6	0.20	0.07	0.25
0.7	0.20	0.17	0.23
0.8	0.31	0.10	0.23
0.9	0.44	0.20	0.27

Notes: I use urban price index to change nominal wages into real wages (take the price

in 2002 as 1). The urban price index comes from the website of National Bureau of Statistics in China. The gender wage gap = (males wages – female wages)/male wages.

Figure 2 The raw gender wage gap across wage distribution



Notes: The X-axis is wage quantile, and the Y-axis is the gender wage gap. The wage gap is raw wage gap.

2.4.2 The gender wage gap calculated by regressions

In order to calculate the gender wage gap, I run wage regressions and use the variable of female dummy (The variable of female dummy is defined as 1 when the observation is a woman, and 0 when the observation is a man), working experience, educational years, region dummy, industry, ownership type and occupation as independent variables. The coefficient of the variable of female dummy is the gender wage gap.

Table 6-8 shows the results of OLS wage regressions. From 2002 to 2013 the gender wage gap decreased first and then increased with some variables controlled. I test the difference of gender wage gap in column (1) to column (5), and find that the difference is not significant.

Table 6 The OLS wage regression in 2002

	(1)	(2)	(3)	(4)	(5)
Female dummy	-0.212***	-0.217***	-0.223***	-0.180***	-0.168***
	(-8.01)	(-8.40)	(-8.75)	(-7.09)	(-6.64)

Other control variables	Yes	Yes	Yes	Yes	Yes
Region dummy	No	Yes	Yes	Yes	Yes
Ownership type	No	No	Yes	Yes	Yes
Industry	No	No	No	Yes	Yes
Occupation	No	No	No	No	Yes
Constant	6.147***	6.068***	5.811***	6.113***	6.211***
	(111.57)	(102.87)	(82.64)	(23.05)	(23.77)
N	2060	2060	2056	2056	2054

Notes: t statistics in parentheses. *** represents significance at 0.01 level. The dependent variable is monthly log wages. I use urban price index to change nominal wages into real wages (take the price in 2002 as 1). The urban price index can be found at the website of National Bureau of Statistics in China. Other control variables include educational years, experience, experience square.

Table 7 The OLS wage regression in 2007

	(1)	(2)	(3)	(4)	(5)
Female dummy	-0.135***	-0.140***	-0.140***	-0.131***	-0.128***
	(-10.18)	(-10.78)	(-10.67)	(-9.75)	(-9.73)
Other control variables	Yes	Yes	Yes	Yes	Yes
Region dummy	No	Yes	Yes	Yes	Yes
Ownership type	No	No	Yes	Yes	Yes
Industry	No	No	No	Yes	Yes
Occupation	No	No	No	No	Yes
Constant	6.739***	6.595***	6.661***	7.105***	7.163***
	(227.50)	(206.29)	(158.35)	(29.12)	(29.99)

N	4818	4818	4717	4715	4710

Notes: t statistics in parentheses. *** represents significance at 0.01 level. The dependent variable is monthly log wages. I use urban price index to change nominal wages into real wages (take the price in 2002 as 1). The urban price index can be found at the website of National Bureau of Statistics in China. Other control variables include educational years, experience, experience square.

Table 8 The OLS wage regression in 2013

	(1)	(2)	(3)	(4)	(5)
Female dummy	-0.327***	-0.329***	-0.326***	-0.298***	-0.286***
	(-8.15)	(-8.21)	(-8.2)	(-7.6)	(-7.13)
Other control variables	Yes	Yes	Yes	Yes	Yes
Region dummy	No	Yes	Yes	Yes	Yes
Ownership type	No	No	Yes	Yes	Yes
Industry	No	No	No	Yes	Yes
Occupation	No	No	No	No	Yes
Constant	7.177***	7.195***	7.473***	5.207***	5.327***
	(57.77)	(53.43)	(38.56)	(11.82)	(12.30)
N	1262	1262	1259	1258	1235

Notes: t statistics in parentheses. *** represents significance at 0.01 level. The dependent variable is monthly log wages. I use urban price index to change nominal wages into real wages (take the price in 2002 as 1). The urban price index can be found at the website of National Bureau of Statistics in China. Other control variables include educational years, experience, experience square.

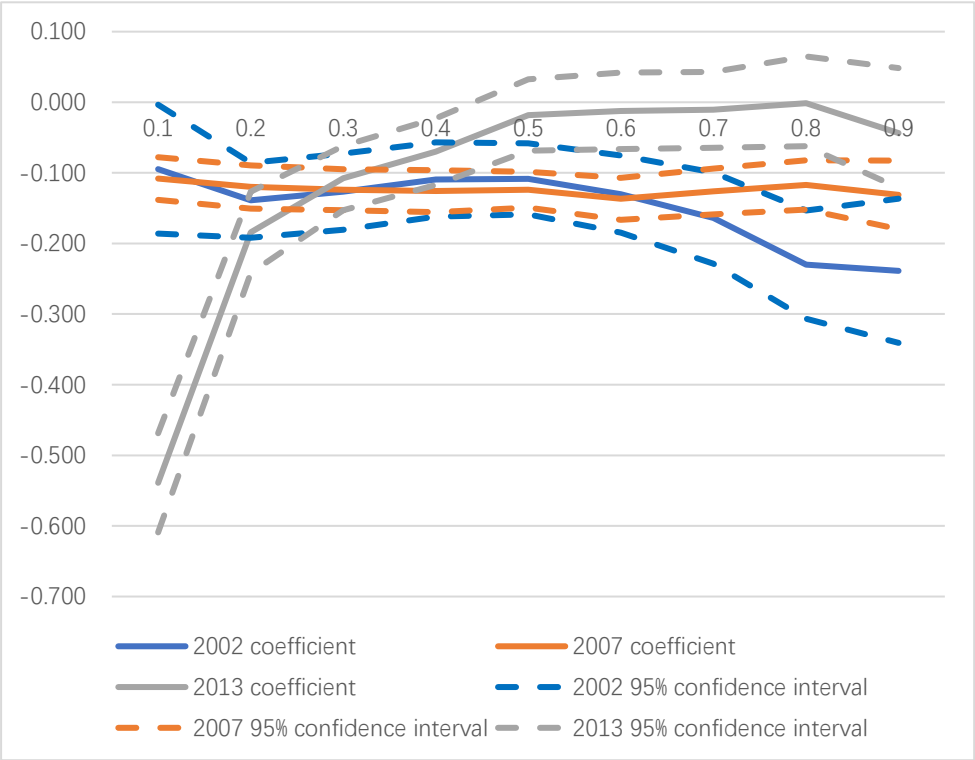
Then I use quantile regression to research the within-group gender wage gap across wage distribution. Table 9 and figure 3 show the coefficients of female dummy in quantile regression. In 2002 the within-group gender wage gap was higher at high wage quantiles, because the gender discrimination was higher at high wage quantiles. In 2007 the within-group gender wage gap fluctuated between -0.15 and -0.1. In 2013 the within-group gender wage gap was higher at low wage quantiles. The gender wage gap was not significant at high wage quantiles, because the gender discrimination was low at high wage quantiles.

Table 9 The coefficient of female dummy in quantile regression

decile	2002	2007	2013
1	-0.095 ** (0.047)	-0.108 *** (0.015)	-0.539 *** (0.036)
2	-0.139 *** (0.027)	-0.120 *** (0.016)	-0.184 *** (0.029)
3	-0.126 *** (0.028)	-0.124 *** (0.015)	-0.108 *** (0.023)
4	-0.109 *** (0.027)	-0.126 *** (0.015)	-0.070 *** (0.024)
5	-0.109 *** (0.026)	-0.124 *** (0.013)	-0.018 (0.026)
6	-0.130 *** (0.028)	-0.137 *** (0.015)	-0.012 (0.028)
7	-0.164 *** (0.033)	-0.126 *** (0.017)	-0.011 (0.027)
8	-0.230 *** (0.039)	-0.117 *** (0.018)	-0.001 (0.032)
9	-0.239 *** (0.052)	-0.131 *** (0.025)	-0.044 (0.043)

Notes: Standard error in parentheses. *, ** and *** represent significance at 0.1, 0.05 and 0.01 level respectively. The dependent variable is monthly log wages. I use urban price index to change nominal wages into real wages (take the price in 2002 as 1). The urban price index comes from the website of National Bureau of Statistics in China. Each coefficient refers to each decile. The independent variables include educational year, experience, experience square, region dummies, industry dummies, occupation dummies, ownership type dummies.

Figure 3 The coefficient of female dummy in quantile regression



Notes: The x-axis denotes quantiles, and the y-axis denotes the value of coefficient from quantile regression.

2.4.3 Decomposition of the gender wage gap

I first use Oaxaca-Blinder decomposition method to decompose the average gender wage gap, then I use FFL decomposition method based on RIF regression to decompose the gender wage gap at different quantiles.

Table 10 shows the decomposition results of using Oaxaca-Blinder method. The explanatory variables are education years, working experience, working experience square, regions, sectors, industries, and occupations.

The value of the structural effect decreased and then increased from 2002 to 2013. The value of the contribution of the difference in characteristics between males and females decreased consistently from 2002 to 2013. The percentage of the structural effect increased from 2002 to 2013, while the percentage of the contribution of the difference in characteristics between males and females to the gender wage gap decreased. In 2007, China's economy ran well. According to the data published in the website of National Bureau of Statistics, annual GDP growth in 2007 was the highest between 2002 and 2013. Labour demand increased, and labour competition decreased. He and Zhang (2009) found that in terms of total amount, China's rural-to-urban migrants still had the characteristic of unlimited supply; but there was structural shortage. In terms of age structure, rural-to-urban migrants under 30 were in short supply. In terms of gender characteristics, female workers were in short supply. In

terms of skills, skilled workers were in short supply. Moreover, the development of information technology made it easier for women to learn about recruitment information. Female migrants had more choices and would go to companies with relatively weak gender discrimination. Companies with a high degree of discrimination had to reduce the degree of discrimination in order to recruit female workers, and the overall discrimination and the effect of discrimination decreased. In 2013, China's economy has entered the post-financial crisis era, and due to the mutation of discrimination caused by the change in family planning policies, under the conduction effect, discrimination against female migrants increased.

The value of composition effect decreased consistently from 2002 to 2013, indicating that the contribution of difference in personal characteristics between males and females to the gender wage gap decreased. It is because the gender difference in educational years was high in 2002. With educational expansion the gender difference in educational years decreased.

Table 10 The result of using Oaxaca-Blinder decomposition

		2002	2007	2013
composition effect	value	0.1268	0.0436	0.0157
	percentage	46.05%	25.74%	5.09%
structural effect	value	0.1485	0.1259	0.2934
	percentage	53.95%	74.26%	94.91%

Notes: I use urban price index to change nominal wages into real wages (take the price in 2002 as 1). The urban price index comes from the website of National Bureau of Statistics in China.

Then I use FFL decomposition method based on RIF regression to estimate the structural effect at different quantiles.

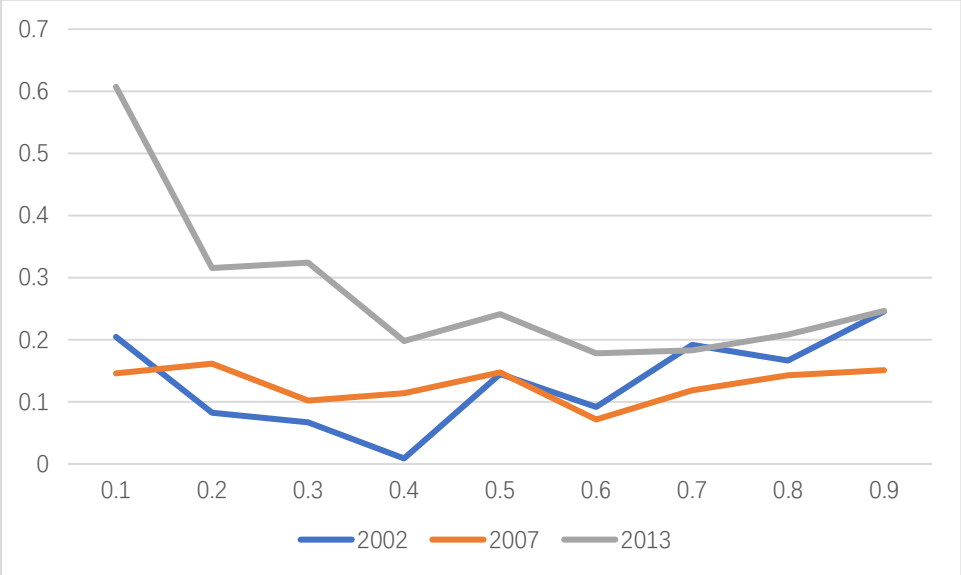
Figure 4 and 5 show the decomposition results. The explanatory variables include education years, working experience, working experience square, region, sectors, industries, and occupations.

The structural effect was much higher at high wage quantiles and low wage quantiles in 2002, indicating a "sticky floor effect" and "glass ceiling effect". The structural effect fluctuated around 0.13 in 2007. The structural effect was higher at low wage quantiles in 2013.

In 2007 the composition effect fluctuated around 0.05. In 2002 and 2013 the contribution of difference in characteristics between males and females was higher at high wage quantiles. In 2002 female migrants suffered pre-market discrimination and few female migrants went to colleges, while many male migrants went to colleges, so the composition effect was higher at high wage quantiles in 2002. In 2007 with educational expansion many female migrants went to colleges, so the composition effect at high wage quantiles decreased. In 2013 the discrimination against females increased. Females suffered discrimination when they got promoted as leaders, so

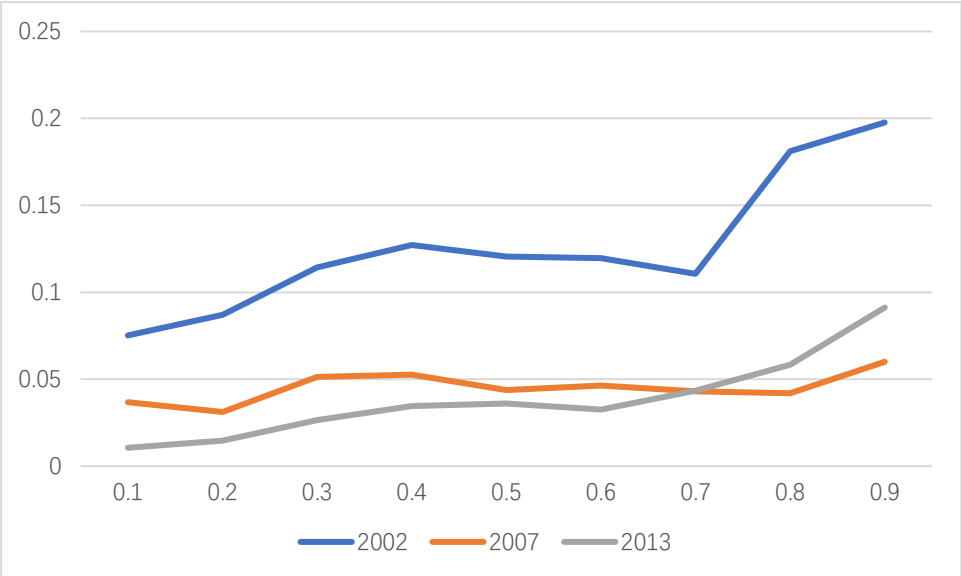
more males became leaders than females. The composition effect was higher at high wage quantiles. While in 2007 the discrimination was not so fierce. The composition effect decreased consistently at most quantiles, indicating that the contribution of the difference in characteristics between males and females decreased consistently.

Figure 4 Structural effect in FFL decomposition



Notes: The X-axis is wage quantile, and the Y-axis is the structural effect.

Figure 5 Composition effect in FFL decomposition



Notes: The X-axis is wage quantile, and the Y-axis is the composition effect.

2.4.4 The gender wage gap in each region

China is divided into developed region and developing region according to the

level of economic development. Developed region is eastern region; developing region includes middle region and western region. At the beginning of China's reform and opening up, experiments were first conducted in the eastern region to explore a new model of economic development, and after several years of exploration, other region followed one after another. Later, the eastern region became China's economically developed region. It can be said that the reform and development of the eastern region started 10 years earlier. Later, developed region developed faster and faster, not only attracted half of the rural-to-urban migrants, but also attracted a large number of talents from developing region. The brain drain from developing region was severe, and the gap between developed region and developing region became wider. Not only are the levels of economic development different, the ideological concepts of developed region are also more advanced than those of developing region, which also affects gender wage discrimination.

Table 11 shows the gender wage gaps in each region calculated by regressions. The gender wage gap in developed region decreased first and then increased, because gender discrimination decreased first and then increased. The gender wage gap in developing region increased consistently, because China's developing region were still in the stage of increasing marketization, and their level of development was in the first half of the gender wage gap curve, which was the rising stage. Therefore, the gender wage gap in developing region was on the rise. In 2002 the gender wage gap in developed region was higher than that in developing region; in 2007 and 2013 the gender wage gaps in developed region were lower than that in developing region.

Table 11 OLS regression in each region

	2002 Developed region	2002 Developing region	2007 Developed region	2007 Developing region	2013 Developed region	2013 Developing region
Female dummy	-0.201***	-0.102***	-0.0989***	-0.179***	-0.298***	-0.299***
	(-4.28)	(-3.64)	(-5.22)	(-9.16)	(-5.1)	(-5.22)
Other control variables	Yes	Yes	Yes	Yes	Yes	Yes
Ownership type	Yes	Yes	Yes	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes	Yes	Yes
Occupation	Yes	Yes	Yes	Yes	Yes	Yes

Constant	6.790***	5.804***	7.455***	7.045***	4.348***	8.020***
	(12.00)	(23.96)	(26.53)	(12.78)	(6.67)	(11.76)
N	655	1399	1906	2804	529	706

Notes: t statistics in parentheses. *** represents significance at 0.01 level. The dependent variable is monthly log wages. I use urban price index to change nominal wages into real wages (take the price in 2002 as 1). The urban price index can be found at the website of National Bureau of Statistics in China. Other control variables include educational years, experience, experience square.

Table 12 shows the gender wage gap in developed region and developing region. In developed region the gender wage gap decreased first and then increased, while in developing region the gender wage gap increased consistently from 2002 to 2013. In 2002 the gender wage gap in developed region was higher than that in developing region, while in 2007 and 2013 the gender wage gap in developed region was lower than that in developing region. This is because economic and social development and people's ideology in developing region is far behind that in developed region. At the beginning of economic development, with the increase in marketization, people's wages have increased rapidly, and the gender wage gap has been widening. The main factors causing the gender wage gap are human capital and gender discrimination. After the gender wage gap reaches a certain level, people realize the harm of discrimination, and discrimination will decline to a certain extent and show a state of inertial fluctuation, and the gender wage gap will also show a state of inertial fluctuation. From 2002 to 2013, China's developing region was still in the stage of increasing marketization, and its level of development was in the first half of the gender wage gap curve, which is the rising stage. Therefore, the gender wage gap in developing region was on the rise. In 2002, the gender wage gap in developing region was smaller than that in developed region, indicating a large gap in economic development between the two; in 2007 and 2013, the gender wage gap in developing region had been higher than that in developed region, indicating that the economic development of developing region had reached a certain level after years of sustained development, which also indicates that the gender wage gap in developing region would show inertia fluctuation in the near future. Although the gender wage gap caused by gender discrimination is unreasonable, I have to face this fact. It also shows that gender equality still has a long way to go.

Table 12 The gender wage gap in developed region and developing region

	developed region	developing region
2002	0.38	0.21
2007	0.13	0.27

2013	0.27	0.29

Notes: I use urban price index to change nominal wages into real wages (take the price in 2002 as 1). The urban price index comes from the website of National Bureau of Statistics in China. The gender wage gap = (males wages – female wages)/male wages.

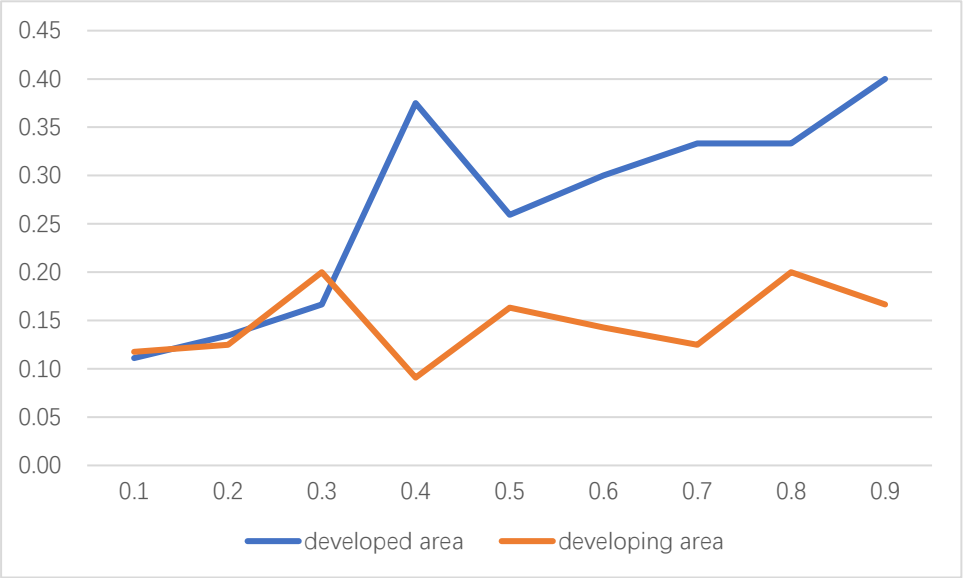
Table 13 and figure 6 show the gender wage gap across wage distribution in 2002. The gender wage gap in developed region increased first, reaching 0.38 at 0.4 quantile, and then decreased to 0.26 at 0.5 quantile, finally increased to the highest value 0.4 at 0.9 quantile. There is obvious "glass ceiling effect" in developed region. In general, the gender wage gap increased as quantile increased in developed region. In developing region, the gender wage gap fluctuated between 0.09 and 0.2. The gender wage gap in developed region was higher than that in developing region at nearly all quantiles except 0.1, 0.2 and 0.3 quantile. This is because in 2002, the level of economic development in developing region was still relatively low, the degree of marketization was not high, gender discrimination was not serious, and population mobility was insufficient, so the gender wage gap was smaller than in developed region.

Table 13 The gender wage gap across wage distribution in 2002

quantile	developed region	developing region
0.1	0.11	0.12
0.2	0.13	0.13
0.3	0.17	0.2
0.4	0.38	0.09
0.5	0.26	0.16
0.6	0.3	0.14
0.7	0.33	0.13
0.8	0.33	0.2
0.9	0.4	0.17

Notes: I use urban price index to change nominal wages into real wages (take the price in 2002 as 1). The urban price index comes from the website of National Bureau of Statistics in China. The gender wage gap = (males wages – female wages)/male wages.

Figure 6 The gender wage gap across wage distribution in 2002



Notes: The X-axis is wage quantile, and the Y-axis is the gender wage gap.

Table 14 and figure 7 show the gender wage gap across wage distribution in 2007. The gender wage gap in developed region fluctuated between 0 and 0.25, while the gender wage gap in developing region fluctuated between 0.22 and 0.33. The gender wage gap in developed region was lower than that in developing region at most quantiles. In the five years after 2002, the economies of developing region had developed rapidly, the degree of marketization had increased, and the gender wage gap had increased correspondingly. At that time, China's economy was developing steadily and prosperously, and the level of discrimination was not much different in each quantile, so the gender wage gap in each quantile was not much different.

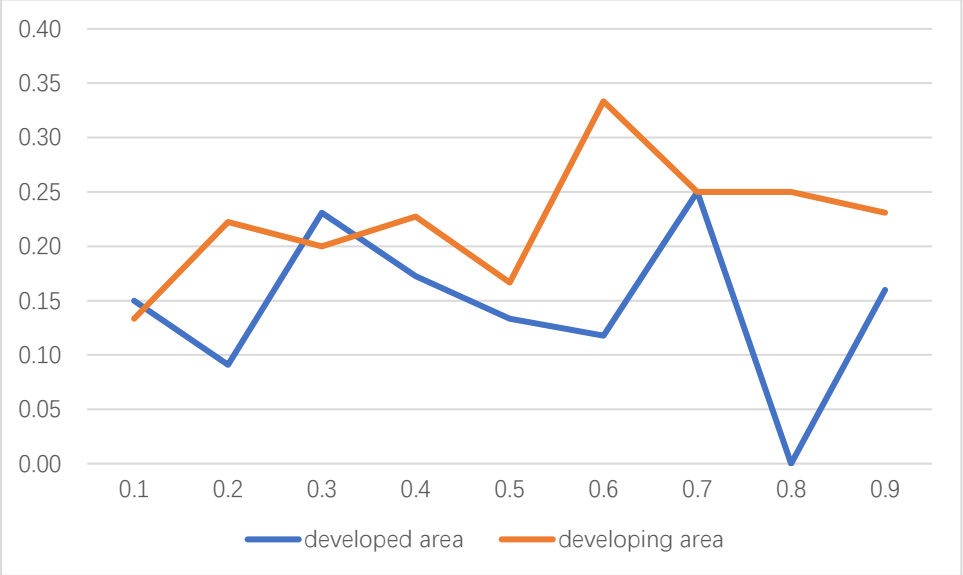
Table 14 The gender wage gap across wage distribution in 2007

quantile	developed region	developing region
0.1	0.15	0.13
0.2	0.09	0.22
0.3	0.23	0.2
0.4	0.17	0.23
0.5	0.13	0.17
0.6	0.12	0.33
0.7	0.25	0.25
0.8	0	0.25
0.9	0.16	0.23

Notes: I use urban price index to change nominal wages into real wages (take the price in 2002 as 1). The urban price index comes from the website of National Bureau of

Statistics in China. The gender wage gap = (males wages – female wages)/male wages.

Figure 7 The gender wage gap across wage distribution in 2007



Notes: The X-axis is wage quantile, and the Y-axis is the gender wage gap.

Table 15 and figure 8 show the gender wage gap across wage distribution in 2013. The gender wage gap was higher at low quantiles and high quantiles in developed region. The gender wage gap was higher at low quantiles in developing region. The gender wage gap was lower in developed region than that in developing region at most quantiles. Competition in the low quantile of wage does not have the ability to conduct upwards and can only passively bear downward conduction. Therefore, in addition to being affected by its own human capital and discrimination, it is also affected by the cumulation effects of discrimination in the upper quantile. The "sticky floor effect" strengthens.

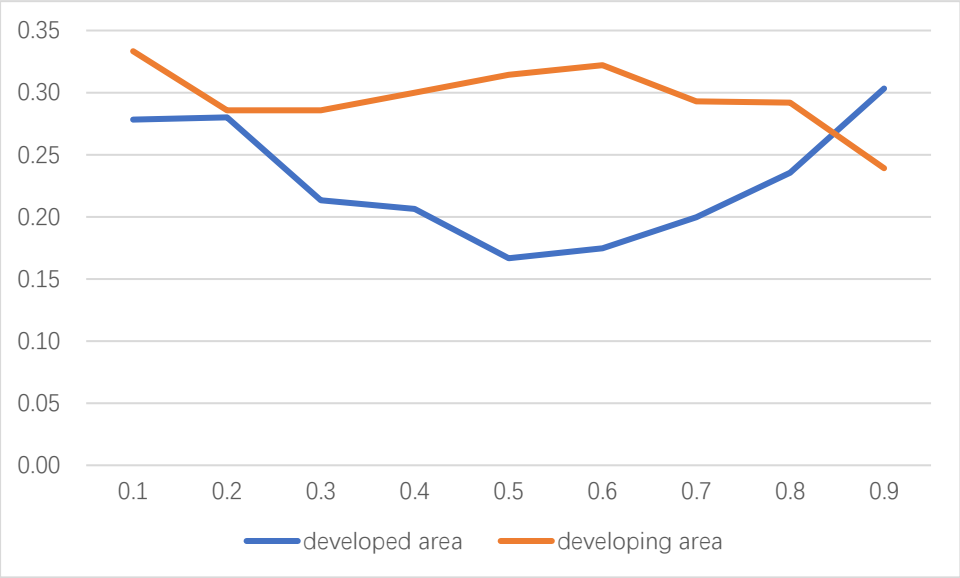
Table 15 The gender wage gap across wage distribution in 2013

quantile	developed region	developing region
0.1	0.28	0.33
0.2	0.28	0.29
0.3	0.21	0.29
0.4	0.21	0.30
0.5	0.17	0.31
0.6	0.17	0.32
0.7	0.20	0.29
0.8	0.24	0.29
0.9	0.30	0.24

Notes: I use urban price index to change nominal wages into real wages (take the price

in 2002 as 1). The urban price index comes from the website of National Bureau of Statistics in China. The gender wage gap = (males wages – female wages)/male wages.

Figure 8 The gender wage gap across wage distribution in 2013



Notes: The X-axis is wage quantile, and the Y-axis is the gender wage gap.

2.4.5 The gender wage gap in each industry

I divide industries into 4 types: type B is low-paying service industry which needs workers with low level of knowledge, including wholesale and retail, accommodation and catering, social services industry; type C is high-paying service industry which needs workers with high level of knowledge, including finance, insurance, real estate, transportation, communications, scientific research and technology; type D is low-paying service industry which needs workers with high level of knowledge, including education, culture, radio, film and television, health and sports, social welfare, party and government agencies and social organizations; type A is other industry, including manufacturing, mining, construction, hydropower and coal supply industries, water conservancy, environment and public facilities management industries. The industries are separated according to workers' wages and knowledge. Different industries have different requirement of physical strength, different ownership types and different extent of discrimination, so the gender wage gap is different in different industries.

Table 16-18 show the gender wage gaps in each industry calculated by regressions. In 2002 the gender wage gap was highest in industry C and lowest in industry D. In 2007 the gender wage gap was highest in industry A and lowest in industry C. In 2013 the gender wage gap was highest in industry D and lowest in industry B. The number of observations in industry C is too small in 2013, so I do not

run regression in industry C in 2013.

Table 16 OLS regression in each industry in 2002

	(1) Industry A	(2) Industry B	(3) Industry C	(4) Industry D
Female dummy	-0.453***	-0.0948***	-0.570***	-0.0931
	(-5.73)	(-3.43)	(-2.88)	(-1.00)
Other control variables	Yes	Yes	Yes	Yes
Ownership type	Yes	Yes	Yes	Yes
Region	Yes	Yes	Yes	Yes
Occupation	Yes	Yes	Yes	Yes
Constant	6.681***	5.746***	6.959***	5.563***
	(29.92)	(68.27)	(14.09)	(22.84)
N	303	1470	78	75

Notes: t statistics in parentheses. *** represents significance at 0.01 level. The dependent variable is monthly log wages. I use urban price index to change nominal wages into real wages (take the price in 2002 as 1). The urban price index can be found at the website of National Bureau of Statistics in China. Other control variables include educational years, experience, experience square.

Table 17 OLS regression in each industry in 2007

	(1) Industry A	(2) Industry B	(3) Industry C	(4) Industry D
Female dummy	-0.167***	-0.136***	-0.106**	-0.159***
	(-8.15)	(-7.15)	(-2.15)	(-2.80)
Other control variables	Yes	Yes	Yes	Yes
Ownership type	Yes	Yes	Yes	Yes

Region	Yes	Yes	Yes	Yes
Occupation	Yes	Yes	Yes	Yes
Constant	7.425***	6.873***	6.797***	6.427***
	(66.67)	(89.85)	(30.29)	(22.36)
N	1456	2601	441	187

Notes: t statistics in parentheses. *** represents significance at 0.01 level. ** represents significance at 0.05 level. The dependent variable is monthly log wages. I use urban price index to change nominal wages into real wages (take the price in 2002 as 1). The urban price index can be found at the website of National Bureau of Statistics in China. Other control variables include educational years, experience, experience square.

Table 18 OLS regression in each industry in 2013

	(1) Industry A	(2) Industry B	(3) Industry D
Female dummy	-0.293	-0.229***	-0.591***
	(-3.88)	(-4.26)	(-3.44)
Other control variables	Yes	Yes	Yes
Ownership type	Yes	Yes	Yes
Region	Yes	Yes	Yes
Occupation	Yes	Yes	Yes
Constant	9.037***	7.539***	7.562***
	(19.36)	(29.48)	(12.73)
N	353	645	77

Notes: t statistics in parentheses. *** represents significance at 0.01 level. The dependent variable is monthly log wages. I use urban price index to change nominal wages into real wages (take the price in 2002 as 1). The urban price index can be found at the website of National Bureau of Statistics in China. Other control variables include educational years, experience, experience square. The number of observations in industry C is too small, so I do not run regression in industry C.

Table 19 shows the gender wage gap within industries. In 2002 the gender wage

gap was the highest in industry A and C and lowest in industry B. Industry A is dominated by manual labour. Because of the large difference in physical strength between men and women, women suffer serious discrimination in industry A, so the gender wage gap in industry A was large. Industry C is a relatively high-income industry and requires high human capital for employees. Because the human capital of rural-to-urban migrants is generally low, and gender discrimination in the industry C is serious, they are mainly employed in low-paid and low-human capital service positions in the C industry, and there is a large gender wage gap. In 2007 the gender wage gap was the highest in industry D and lowest in industry A. In 2007, China's economic situation was good, with the lowest degree of gender discrimination. Since most organizations in industry D is state-owned and mainly implement national wage policies, the labour market and socio-economic development have little impact on wages. Although the gender wage gap declined, but the magnitude is smaller than other industries, industry D has the largest gender wage gap. The main cause of the gender wage gap in industry A was discrimination. When discrimination decreased, industry A had the biggest drop in the gender wage gap, so the gender wage gap in industry A was the lowest. In 2013 the gender wage gap was the highest in industry A and B and lowest in industry C. In 2013, China's employment pressure was great. The expansion of university enrolment caused too much accumulation of college students. The family planning policy has just been reformed. Competition for white-collar jobs is fierce, the competition transmission effect is strong. Therefore, there is a sudden increase in discrimination against women. As a result, the overall gender wage gap widened. From the perspective of evolution, I can see that the gender wage gap in industry A, C and D decreased first and then increased; the gender wage gap in industry B increased consistently. The gender wage gap in industry A is mainly affected by gender discrimination, so its rise and fall rule is consistent with discrimination; with the economic development, the work quality requirements in industry B were getting higher and higher. In order to reduce the increasing cost, the actual workload of employees in these industries was increasing, and the physical fitness requirements of the employees were getting higher and higher. Because of the natural nature of men and women physical fitness differences, the gender wage gap in the B industry was gradually increasing; the difference in human capital between men and women in the C and D industry is small, and the gender wage gap is mainly determined by discrimination, so its rise and fall laws are also consistent with the changes in discrimination. Appendix table C1 shows migrants' average wages in each industry.

Table 19 The gender wage gap within industries

Industry	2002	2007	2013
A	0.54	0.15	0.27
B	0.16	0.18	0.27
C	0.54	0.17	0.21

D	0.3	0.21	0.25

Notes: I use urban price index to change nominal wages into real wages (take the price in 2002 as 1). The urban price index comes from the website of National Bureau of Statistics in China. The gender wage gap = (males wages – female wages)/male wages.

Table 20 shows the gender wage gap within industries in developed and developing region in 2002. Industry C has high requirements for human capital, while the human capital of rural-to-urban migrants is generally low, which cannot meet the requirements of industry C, causing that the numbers of observations from industry C in developed region and developing region are too small, so I do not calculate the gender wage gap in industry C.

In developed region the gender wage gap was the highest in industry A and the lowest in industry B, while in developing region the gender wage gap was highest in industry A and lowest in industry B and D. In industry A and D the gender wage gaps in developed region were higher than that in developing region, while in industry B the gender wage gap in developed region was lower than that in developing region. In the A industry in developed region, the manufacturing and construction industries are relatively developed and account for a relatively high proportion. Workers work longer hours, often reaching more than 10 hours/day. This job requires high physical fitness, and men receive more compensatory wages. In addition, the gender discrimination in the A industry was also high, so the gender wage gap was the largest; industry A in developing region has the same nature, but their working hours are not long and the construction industry is often shut down due to the season, so the gender wage gap was not as high as in developed region. In the accommodation, catering and social service industries in the B industry, women have an advantage, while the B industry in developed region is more developed, and the working hours are generally longer, many of which reach 12 hours a day, and employees receive more compensatory wages; the human capital of men employed in the B industry is higher than that of women, and the proportion of men in higher-paying positions is higher, so there is still a gender wage gap, but the gender wage gap in the B industry was the smallest; in the B industry in developing region, working hours are relatively short, and the compensation wages received are not as high as in developed region. Therefore, the gender wage gap was slightly higher than in developed region. The degree of marketization in developed region in 2002 was relatively high, and the degree of gender discrimination was relatively high. Therefore, the gender wage gap in the D industry in developed region was higher than that in developing region.

Table 20 The gender wage gap within industries in 2002

Industry	developed region	developing region
A	0.57	0.37
B	0.15	0.17

D	0.34	0.17

Notes: I use urban price index to change nominal wages into real wages (take the price in 2002 as 1). The urban price index comes from the website of National Bureau of Statistics in China. The gender wage gap = (males wages – female wages)/male wages.

Table 21 shows the gender wage gap within industries in developed and developing region in 2007. In developed region the gender wage gap was the highest in industry D and the lowest in industry B, while in developing region the gender wage gap was highest in industry B and lowest in industry D. In industry D the gender wage gap in developed region was higher than that in developing region, while in industry A, B, and C the gender wage gaps in developed region were lower than that in developing region. In 2007, China's economy developed well, social competition was the lowest, gender discrimination in developed region declined significantly, and gender wage gaps in various industries were significantly reduced; due to the lagging economic development of developing region, they were experiencing the previous development process of developed region and gender discrimination was on the rise. Therefore, the industry gender wage gap in developing region was generally higher than that in developed region; only in industry D the gender wage gaps in developed region was higher than that in developing region, because most organizations in industry D are state-owned and are heavily influenced by policies, the gender wage gap did not increase, but declined slightly, and was lower than that in developed region.

Table 21 The gender wage gap within industries in 2007

Industry	developed region	developing region
A	0.15	0.23
B	0.12	0.29
C	0.13	0.24
D	0.23	0.15

Notes: I use urban price index to change nominal wages into real wages (take the price in 2002 as 1). The urban price index comes from the website of National Bureau of Statistics in China. The gender wage gap = (males wages – female wages)/male wages.

Table 22 shows the gender wage gap within industries in developed and developing region in 2013. The numbers of observations in industry C in developed region and developing region are too small, so I do not calculate the gender wage gap in industry C.

In developed region the gender wage gap was the highest in industry B and the lowest in industry D, while in developing region the gender wage gap was highest in industry D and lowest in industry B. In industry A and D the gender wage gaps in developed region were lower than that in developing region, while in industry B the gender wage gap in developed region was higher than that in developing region. As mentioned in the previous article, due to three major changes in the Chinese labour

market in 2013, the gender wage gap increased. Now, after distinguishing between developed and developing region, I can see that the two regions were affected in the same trend.

In developed region the gender wage gap decreased first and then increased in industry A and B, and decreased consistently in industry D from 2002 to 2013. In developing region, the gender wage gap decreased first and then increased in industry A and D, increased and then decreased in industry B. Most workers in industry A do manual labour and the gender wage gap in industry A was mainly affected by gender discrimination. Gender discrimination decreased first and then increased, so the gender wage gap in industry A decreased first and then increased. Most occupations in industry C require workers to have high educational human capital. Most rural-to-urban migrants do not have such basic conditions, are unable to meet such professional requirements, and cannot be employed in most occupations of this industry; most rural-to-urban migrants employed in this industry are employed in auxiliary and service occupations. Therefore, the number of observations in each region in industry C is small and under-represented, so I do not deal with it accordingly. The continuous decline in the gender wage gap in industry D was due to policy factors that played a leading role. The gender discrimination was more severe in developing region than in developed region. In 2013 the overall gender discrimination increased, and the gender discrimination increased in developing region, so the gender wage gap decreased first and then increased in developing region in 2013.

Table 22 The gender wage gap within industries in 2013

Industry	developed region	developing region
A	0.27	0.35
B	0.29	0.23
D	0.05	0.46

Notes: I use urban price index to change nominal wages into real wages (take the price in 2002 as 1). The urban price index comes from the website of National Bureau of Statistics in China. The gender wage gap = (males wages – female wages)/male wages.

Table 23 shows the gender wage gap within industry A. In 2002 the gender wage gap increased as quantile increased, while in 2007 and 2013 the gender wage gap decreased first and then increased as quantile increased. Men have a advantage in industry A. The working conditions in mining, construction, water supply, and manufacturing are relatively poor. Workers can get compensatory wages. Women have lower human capital than men. Discrimination leads to lower wages and less compensatory wages. With the increase in workload in the industry, this wage gap has become more and more significant. Therefore, in 2002, as the quantile point rose, the gender wage gap was even greater; in 2007, the degree of discrimination generally declined, but in the low-end and high-end wages of the A industry, the difference in human capital is relatively large, so the gender wage gap was high at both ends and low at the middle; in 2013, discrimination increased in general, but the characteristics

of the gender wage gap in the A industry remained unchanged, and still showed a phenomenon of high at both ends and low in the middle.

Table 23 The gender wage gap within industry A

quantile	2002	2007	2013
0.25	0.17	0.17	0.28
0.5	0.28	0.13	0.17
0.75	0.47	0.25	0.18

Notes: I use urban price index to change nominal wages into real wages (take the price in 2002 as 1). The urban price index comes from the website of National Bureau of Statistics in China. The gender wage gap = (males wages – female wages)/male wages.

Table 24 shows the gender wage gap within industry B. In 2002 and 2013 the gender wage gap increased as quantile increased, while in 2007 the gender wage gap increased first and then decreased as quantile increased. Women have an advantage in industry B. However, women were discriminated when got promoted, so the gender wage gap in industry B increased with the increase in the quantile. In 2007 the discrimination decreased, so the gender wage gap was smaller at high wage quantiles. In 2013 the discrimination increased, so the gender wage gap became larger at high wage quantiles.

Table 24 The gender wage gap within industry B

quantile	2002	2007	2013
0.25	0.1	0.1	0.25
0.5	0.14	0.24	0.27
0.75	0.2	0.2	0.27

Notes: I use urban price index to change nominal wages into real wages (take the price in 2002 as 1). The urban price index comes from the website of National Bureau of Statistics in China. The gender wage gap = (males wages – female wages)/male wages.

Table 25 shows the gender wage gap within industry C. In 2002 the gender wage gap increased as quantile increased, while in 2007 the gender wage gap increased first and then decreased as quantile increased, and in 2013 the gender wage gap decreased as quantile increased. Most positions in industry C needs workers with higher educational human capital, while workers with low educational capital are mainly concentrated in low-wage occupations in the transportation and communications industries. Rural-to-urban migrants are mainly workers with low educational capital. In their employment positions, physical requirements are higher, men have an advantage, and female rural-to-urban migrants have lower human capital than male rural-to-urban migrants. Therefore, the gender pay gap existed among rural-to-urban migrants in industry C. In 2002, China’s economy was in a stage of rapid development,

and gender discrimination was high, and the gender wage gap in the C industry was large; at high wage quantiles, men could get more compensatory wages, which further widened the gender wage gap. In 2007, discrimination was greatly reduced, and the gender wage gap was also greatly reduced. The gender wage gap at the low-wage and high-wage quantiles most affected by discrimination fell more significantly. In 2013, intensified competition and discrimination were mainly conducted to the low-wage end, which made the gender wage gap at the low-wage end widened in 2013; the difference in human capital between men and women at the middle wage quantile and the high wage quantile had become smaller. Therefore, the gender wage gap at the 0.5 and 0.75 quantiles was slightly lower than in 2007.

Table 25 The gender wage gap within industry C

quantile	2002	2007	2013
0.25	0.38	0.10	0.33
0.5	0.40	0.27	0.17
0.75	0.53	0.25	0.14

Notes: I use urban price index to change nominal wages into real wages (take the price in 2002 as 1). The urban price index comes from the website of National Bureau of Statistics in China. The gender wage gap = (males wages – female wages)/male wages.

Table 26 shows the gender wage gap within industry D. In 2002 the gender wage gap increased as quantile increased, while in 2007 and 2013 the gender wage gap decreased first and then increased as quantile increased. The gender wage gap in industry D is greatly affected by policies. In 2002, the non-public economy was far less developed than that in 2007 and 2013. The two largest groups of women in the D industry, namely education and medical care, have the largest number of employees and have advantages. Men are discriminated against in some positions in these two groups. I can see that at the low-wage quantile, women's wages were higher than men's, and the gender wage gap was negative. In 2007, the gender wage gap was not large in all quantiles, and the gender wage gap was basically the same in all quantiles. In 2013, due to conduction effect the gender wage gap at low wage quantiles reached a historically high level; due to fierce competition at high-wage quantiles, the gender wage gap reached a relatively high level.

Table 26 The gender wage gap within industry D

quantile	2002	2007	2013
0.25	-0.13	0.16	0.41
0.5	0.05	0.15	0.17
0.75	0.2	0.17	0.33

Notes: I use urban price index to change nominal wages into real wages (take the price in 2002 as 1). The urban price index comes from the website of National Bureau of

Statistics in China. The gender wage gap = (males wages – female wages)/male wages.

Table 27 shows the gender wage gap across wage distribution in industry A in each region. In developed region as wage quantile increased the gender wage gap increased in 2002; and decreased first and then increased in 2007 and 2013. In developing region as wage quantile increased the gender wage gap increased in 2002 and 2013, and increased first and then decreased in 2007. The degree of marketization in developed region was high in 2002. Discrimination in the A industry reached a high point that was about to fluctuate downward. However, due to the lagging development and low degree of marketization in developing region, the impact of the original system was greater, and the impact of gender discrimination was small. Therefore, the gender wage gap is smaller than that in developed region in general, and the value of the gap in each quantile reflects the overall regional development difference. In 2007, the degree of gender discrimination in developed region was reduced to the minimum, and the gender wage gap was also minimized. However, the developing region was in the upward stage of marketization. As a result, gender discrimination and gender wage gaps rose, and the gender discrimination at each quantile exceeded that of developed region. In 2013, due to fierce employment competition in developed region, discrimination rose again, and the gender wage gap at low quantiles increased, but it was lower than the gender wage gap in 2002; the marketization of developing region was basically completed, the gender wage gap reached the level of 2002 in developed region. This result shows that the A industry in the developing region lagged behind the developed region for 10 years, which coincides with the lagging time of economic reform and development in the developing region.

Table 27 The gender wage gap across wage distribution in industry A

	quantile	developed region	developing region
2002	0.25	0.29	0.10
	0.5	0.30	0.21
	0.75	0.40	0.30
2007	0.25	0.08	0.20
	0.5	0.07	0.33
	0.75	0.25	0.28
2013	0.25	0.21	0.28
	0.5	0.05	0.34
	0.75	0.14	0.43

Notes: I use urban price index to change nominal wages into real wages (take the price in 2002 as 1). The urban price index comes from the website of National Bureau of Statistics in China. The gender wage gap = (males wages – female wages)/male wages.

Table 28 shows the gender wage gap across wage distribution in industry B in

each region. In developed region as wage quantile increased the gender wage gap increased first and then decreased in 2002 and 2007, while decreased first and then increased in 2013. In developing region as wage quantile increased the gender wage gap decreased in 2002, while decreased first and then increased in 2007, increased first and then decreased in 2013. In B industry, women had an advantage. There was a phenomenon of zero gender wage gap at several quantiles, which is in line with my analysis of this industry. Especially in the developed region, the marketization development is highly mature, and women are in a dominant position in this industry. Therefore, from 2002 to 2007, the gender wage gap at the low and high quantiles was relatively low; however, at middle wage quantile, the gender wage gap was large due to the human capital gap in B industry in developed region. In 2013 the gender discrimination increased and was more severe at low and high wage quantiles in developed region, so the gender wage gap was larger at low and high wage quantiles. In the developing region, the B industry is underdeveloped, and women had not yet occupied the dominant position in this industry. Generally, the gender wage gap had been increasing, and the gender wage gap was generally much higher than that in developed region. By 2013, the gender wage gap had reached a very high level. This shows that B industry in developing region lags behind B industry in developed region by more than 10 years, and still has not reached the level of developed region 10 years ago by 2013.

Table 28 The gender wage gap across wage distribution in industry B

	quantile	developed region	developing region
2002	0.25	0.00	0.17
	0.5	0.25	0.13
	0.75	0.10	0.00
2007	0.25	0.00	0.20
	0.5	0.13	0.17
	0.75	0.00	0.35
2013	0.25	0.20	0.20
	0.5	0.18	0.30
	0.75	0.26	0.28

Notes: I use urban price index to change nominal wages into real wages (take the price in 2002 as 1). The urban price index comes from the website of National Bureau of Statistics in China. The gender wage gap = (males wages – female wages)/male wages.

Table 29 shows the gender wage gap across wage distribution in industry D in each region. In developed region as wage quantile increased the gender wage gap increased first and then decreased in 2002, decreased first and then increased in 2007 and 2013. In developing region as wage quantile increased the gender wage gap decreased first and then increased in 2002 and 2013, and increased first and then

decreased in 2013. Industry D is an industry that requires high education human capital, which is heavily influenced by policies and has little market impact. In the process of reform and development, the role of human capital has been strengthened, and human capital and discrimination have a major impact on the gender wage gap. In developed region in 2002, because female rural-urban migrants had lower human capital than men, the gender wage gap existed; in 2007, the increase in human capital of female rural-to-urban migrants at low wage quantiles was not enough to make the status of low-wage rural-to-urban migrants in the D industry underwent a qualitative change, so the gender wage gap increased at low wage quantiles; however, in the middle and high wage quantiles, human capital increased significantly, the labour productivity of workers increased, and the gender wage gap decreased. By 2013, there was no gender wage gap at high wage quantiles and middle wage quantiles, and the wages of female rural-to-urban migrants at middle and high wage quantiles were even higher than that of male rural-to-urban migrants. In the developing region, in 2002, the effect of discrimination on female rural-to-urban migrants with low human resources was not particularly large, and the gender wage gap was smaller than that in developed region; in 2007, the gender wage gap at middle wage quantile widened, and narrowed at low and high wage quantile, but overall the gender wage gap was not large; in 2013, the gender wage gap at each wage quantile increased, because gender discrimination increased. In 2013, the gender wage gap at low and high wage quantile suddenly increased sharply. This was because of the fierce competition for white-collar jobs across the country in 2013, and the D industry was no exception. Discrimination at high wage quantile also increased sharply, resulting in a sudden increase in the gender wage gap. The conduction effect leaded to the increase of discrimination at low wage quantiles.

Table 29 The gender wage gap across wage distribution in industry D

	quantile	developed region	developing region
2002	0.25	-0.18	0.25
	0.5	0.25	0.11
	0.75	0.2	0.14
2007	0.25	0.25	0.03
	0.5	0.13	0.16
	0.75	0.15	0.08
2013	0.25	0.10	0.57
	0.5	-0.14	0.32
	0.75	-0.03	0.47

Notes: I use urban price index to change nominal wages into real wages (take the price in 2002 as 1). The urban price index comes from the website of National Bureau of Statistics in China. The gender wage gap = (males wages – female wages)/male wages.

2.4.6 The gender wage gap within groups of people with different educational levels

As rural-to-urban migrants with college degree or above are very few, accounting for a very low proportion, this thesis divides rural-to-urban migrants into three groups according to their educational level, namely, senior high school and above, junior high school, primary school and below. Most rural-to-urban migrants' educational levels are primary school, junior high school or senior high school, so I cut the data at this level of education. Many females in rural area suffer education discrimination. Their parents do not let them receive education as high as males, so women's average educational level is lower than males'.

Table 30-32 show the gender wage gap within groups of people with different educational levels calculated by regressions. In 2002 the gender wage gap was the highest among people with senior high school and above degree, lowest among people whose highest educational level was primary school and below; in 2007 the gender wage gap was the highest among people whose highest educational level was primary school and below, lowest among people whose highest educational level was senior high school and above; in 2013 the gender wage gap was the highest among people whose highest educational level was junior high school, lowest among people whose highest educational level was primary school and below. The gender wage gap among people whose highest educational level was primary school and below increased first and then decreased from 2002 to 2013; the gender wage gap among other groups of people decreased first and then increased from 2002 to 2013.

Table 30 OLS regression in each educational level in 2002

	(1) primary school and below	(2) junior high school	(3) senior high school and above
Female dummy	-0.139***	-0.160***	-0.289***
	(-3.12)	(-4.51)	(-4.93)
Other control variables	Yes	Yes	Yes
Industry	Yes	Yes	Yes
Region	Yes	Yes	Yes
Occupation	Yes	Yes	Yes

Ownership type	Yes	Yes	Yes
Constant	6.310***	6.494***	7.025***
	(13.89)	(20.55)	(14.13)
N	527	1104	421

Notes: t statistics in parentheses. *** represents significance at 0.01 level. The dependent variable is monthly log wages. I use urban price index to change nominal wages into real wages (take the price in 2002 as 1). The urban price index can be found at the website of National Bureau of Statistics in China. Other control variables include experience, experience square.

Table 31 OLS regression in each educational level in 2007

	(1) primary school and below	(2) junior high school	(3) senior high school and above
Female dummy	-0.165***	-0.136***	-0.100***
	(-4.23)	(-7.79)	(-4.13)
Other control variables	Yes	Yes	Yes
Industry	Yes	Yes	Yes
Region	Yes	Yes	Yes
Occupation	Yes	Yes	Yes
Ownership type	Yes	Yes	Yes
Constant	7.453***	7.107***	7.356***
	(21.24)	(29.26)	(22.04)
N	580	2692	1438

Notes: t statistics in parentheses. *** represents significance at 0.01 level. The dependent variable is monthly log wages. I use urban price index to change nominal wages into real wages (take the price in 2002 as 1). The urban price index can be found at the website of National Bureau of Statistics in China. Other control variables include experience, experience square.

Table 32 OLS regression in each educational level in 2013

	(1) primary school and below	(2) junior high school	(3) senior high school and above
Female dummy	-0.131	-0.363***	-0.319***
	(-1.31)	(-6.71)	(-4.11)
Other control variables	Yes	Yes	Yes
Industry	Yes	Yes	Yes
Region	Yes	Yes	Yes
Occupation	Yes	Yes	Yes
Ownership type	Yes	Yes	Yes
Constant	6.016***	7.687***	8.008***
	(7.83)	(11.05)	(13.42)
N	189	634	412

Notes: t statistics in parentheses. *** represents significance at 0.01 level. The dependent variable is monthly log wages. I use urban price index to change nominal wages into real wages (take the price in 2002 as 1). The urban price index can be found at the website of National Bureau of Statistics in China. Other control variables include experience, experience square.

Table 33 shows the gender wage gap within groups of people with different educational levels. In 2002 the gender wage gap was the highest among people with senior high school and above degree, lowest among people whose highest educational level was primary school and below; in 2007 the gender wage gap was the highest among people whose highest educational level was primary school and below, lowest among people whose highest educational level was senior high school and above; in 2013 the gender wage gap was the highest among people whose highest educational level was junior high school, lowest among people whose highest educational level was primary school and below. The gender wage gap among people whose highest educational level was primary school and below increased first and then decreased from 2002 to 2013; the gender wage gap among other groups of people decreased first and then increased from 2002 to 2013. Most people whose highest educational level was primary school and below do manual labour. Women's physical strength is lower than men's. With more and more rural-to-urban migrants entered into urban labour market, the discrimination against women whose highest educational level was

primary school and below increased in 2007. In 2013 many female rural-to-urban migrants were fired because of the bad economic situation. The female rural-to-urban migrants who still could work in urban areas had better physical strength, so the discrimination against women whose highest educational level was primary school and below decreased in 2013. Many people of other groups are skilled workers. Skilled workers were in short supply. The discrimination against women in other groups decreased first and then increased.

Table 33 The gender wage gap among groups of people with different educational levels

	2002	2007	2013
primary school and below	0.21	0.22	0.20
junior high school	0.32	0.19	0.29
senior high school and above	0.38	0.10	0.27

Notes: I use urban price index to change nominal wages into real wages (take the price in 2002 as 1). The urban price index comes from the website of National Bureau of Statistics in China. The gender wage gap = (males wages – female wages)/male wages.

Table 34 shows the gender wage gap among people whose highest educational level was primary school or below across wage distribution. As quantile increased the gender wage gap increased first and then decreased in 2002 and 2007, and increased in 2013. The gender wage gap at high quantile increased over time, and increased first and then decreased over time at low and middle quantiles. This group is the lowest wage group. In 2002, the wages of workers were generally low. At the 0.25 point of the lowest-wage group, their wages could barely enough to survive, and the gender wage gap could not break through this bottom line, so the gender wage gap was 0. At the 0.5 and 0.75 quantiles, there was a gender wage gap due to differences in labour productivity, statistical discrimination, gender occupational segregation, and industry segregation. However, for the same reason, the gender wage gap was not large. In 2007 and 2013, the wages of workers increased substantially. The gender wage gap had the basis to exist. At this time, due to industry segregation and gender occupational segregation, the gender wage gap was already very considerable.

Table 34 The gender wage gap among people whose highest educational level was primary school or below across wage distribution

quantile	2002	2007	2013
0.25	0	0.2	0.14
0.5	0.17	0.23	0.2

0.75	0.13	0.17	0.22

Notes: I use urban price index to change nominal wages into real wages (take the price in 2002 as 1). The urban price index comes from the website of National Bureau of Statistics in China. The gender wage gap = (males wages – female wages)/male wages.

Table 35 shows the gender wage gap among people whose highest educational level was junior high school across wage distribution. As quantile increased the gender wage gap increased first and then decreased in 2002, increased in 2007, and decreased in 2013. Industry segregation, gender occupational segregation, differences in work experience and on-the-job training, statistical discrimination, and other factors all contributed to the gender wage gap. In 2002, because the overall wage was at a low level, the gender wage gap at the low quantile was not large, which was mainly caused by industry segregation and gender occupational segregation; in the middle and high quantiles, the effects of industry segregation and occupational segregation were relatively significant, so the gender wage gap was much larger than the low quantile. In 2007, discrimination was drastically reduced, and industry segregation and gender occupational segregation were weakened. As a result, the gender wage gap was reduced to zero at low quantiles; however, at the middle and high quantiles, industry segregation and gender occupational segregation were not significantly weakened, and the gender wage gap was in a state of fluctuation. In 2013, due to the conduction effect of competition, the gender wage gap at low and middle quantiles significantly widened; at high quantile, women's work experience increased significantly, and the gender wage gap narrowed.

Table 35 The gender wage gap among people whose highest educational level was junior high school across wage distribution

quantile	2002	2007	2013
0.25	0.09	0	0.28
0.5	0.25	0.20	0.27
0.75	0.20	0.25	0.21

Notes: I use urban price index to change nominal wages into real wages (take the price in 2002 as 1). The urban price index comes from the website of National Bureau of Statistics in China. The gender wage gap = (males wages – female wages)/male wages.

Table 36 shows the gender wage gap among people with senior high school and above degrees across wage distribution. This is the high-wage group among rural-to-urban migrants. As quantile increased the gender wage gap increased in 2002 and 2007, decreased first and then increased in 2013. From the perspective of time, the gender wage gap decreased first and then increased, because gender discrimination decreased first and then increased.

Table 36 The gender wage gap among people with senior high school and above degrees across wage distribution

quantile	2002	2007	2013
0.25	0.17	0.09	0.28
0.5	0.29	0.13	0.25
0.75	0.31	0.15	0.30

Notes: I use urban price index to change nominal wages into real wages (take the price in 2002 as 1). The urban price index comes from the website of National Bureau of Statistics in China. The gender wage gap = (males wages – female wages)/male wages.

2.4.7 The gender wage gap and training

In China, social training requires the trainee to pay a high training fee, and the trainee can generally receive high-quality professional training, so as to better master a certain trained skill. Corporate internal training is generally of a lower quality than social training in developing region, but it is more targeted and the quality is also high in developed region. I want to research the gender wage gap across the training types to get a better understanding of the gender wage gap.

Table 37 shows the gender wage gap within groups of people attending different kinds of training calculated by regressions in 2007. The gender wage gap among people attending non-agricultural training in society was the largest, and the gender wage gap among people attending corporate internal training was the lowest. The quality of non-agricultural training in society varies widely. In average, women attended lower quality training than men, so the gender wage gap among people attending non-agricultural training in society was the largest. The quality of corporate internal training varies little, so the gender wage gap among people attending corporate internal training was the lowest.

Table 37 OLS regression in each training type in 2007

	(1) never attend non-agricultural training	(2) attend corporate internal training	(3) attend non-agricultural training in society
Female dummy	-0.125***	-0.0819***	-0.128*
	(-8.29)	(-2.61)	(-1.91)
Other control	Yes	Yes	Yes

variables			
Industry	Yes	Yes	Yes
Region	Yes	Yes	Yes
Occupation	Yes	Yes	Yes
Ownership type	Yes	Yes	Yes
Constant	7.144***	7.040***	6.686***
	(29.75)	(18.24)	(20.55)
N	3519	783	265

Notes: t statistics in parentheses. *** represents significance at 0.01 level. * represents significance at 0.1 level. The dependent variable is monthly log wages. I use urban price index to change nominal wages into real wages (take the price in 2002 as 1). The urban price index can be found at the website of National Bureau of Statistics in China. Other control variables include education years, experience, experience square.

Table 38 shows the gender wage gaps within groups of people attending different kinds of training in 2007. The average wage of people attending non-agricultural training in society was the highest, the gender wage gap was the lowest because females had the ability to choose better jobs and the occupation segregation was the lowest. The average wage of people never attending non-agricultural training was the lowest and the gender wage gap was the highest for the biggest difference in human capital between men and women. The gender wage gap was the highest among people never attending non-agricultural training, and lowest among people attending non-agricultural training in society. The gender wage gap for employees who have attended internal corporate training is in the middle position.

Table 38 The gender wage gaps within groups of people attending different kinds of training in 2007

	male average wage	female average wage	the wage gap
never attend non-agricultural training	1453.44	1147.57	0.21
attend corporate internal training	1463.59	1207.08	0.18
attend non-agricultural training in society	1570.15	1393.90	0.11

Notes: I use urban price index to change nominal wages into real wages (take the price in 2002 as 1). The urban price index comes from the website of National Bureau of Statistics in China. The gender wage gap = (males wages – female wages)/male wages.

Table 39 shows the gender wage gaps within groups of people attending different kinds of training in both region in 2007. In developed region male average wage and female average wage were the highest among people attending non-agricultural training in society, lowest among people never attending non-agricultural training. In developing region male average wage was the highest among people attending non-agricultural training in society, lowest among people attending non-agricultural corporate internal training; female average wage was the highest among people attending non-agricultural training in society, lowest among people never attending non-agricultural training. Male and female average wages in developed region were higher than that in developing region.

In developed region employees who had not participated in the training had the largest human capital gap, so the gender wage gap was the highest among people never attending non-agricultural training. The wages of female employees who had participated in the company's internal training had increased more than men's, so gender wage gap was the lowest among people attending corporate internal training. In developing region the gender wage gap was the highest among people never attending non-agricultural training, and lowest among people attending non-agricultural training in society because the quality of corporate internal training is not as good as social training. The gender wage gap among people attending non-agricultural training in society in developed region was the same as that in developing region; while the gender wage gaps in other groups in developed region were lower than that in developing region because gender discrimination in developing region was higher than that in developed region in 2007.

Table 39 The gender wage gaps within groups of people attending different kinds of training in both region in 2007

	developed region	developing region
never attend non-agricultural training	0.13	0.38
attend corporate internal training	0.1	0.29
attend non-agricultural training in society	0.11	0.11

Notes: I use urban price index to change nominal wages into real wages (take the price in 2002 as 1). The urban price index comes from the website of National Bureau of Statistics in China. The gender wage gap = (males wages – female wages)/male wages.

Table 40 The average wages of groups of people attending different kinds of training in both region in 2007

	developed region		developing region	
	male average wage	female average wage	male average wage	female average wage
never attend non-agricultural training	1509.2	1311.2	1356	839.55
attend corporate internal training	1525.07	1376.07	1312.78	934.85
attend non-agricultural training in society	1606.3	1428.46	1519.81	1353.51

Notes: I use urban price index to change nominal wages into real wages (take the price in 2002 as 1). The urban price index comes from the website of National Bureau of Statistics in China. The gender wage gap = (males wages – female wages)/male wages.

Table 41 shows the gender wage gaps within groups of people attending different kinds of training across wage distribution in 2007. As quantile increased the gender wage gap increased among people never attending non-agricultural training, increased first and then decreased among people attending non-agricultural corporate internal training, decreased among people attending non-agricultural training in society. Rural-to-urban migrants who had not received any training, due to industry segmentation, gender occupational segregation, and human capital gap, the gender wage gap widened with the increase in the quantile. After receiving corporate internal training, female employees at low wage quantile could better adapt to work requirements, and the gender wage gap had been significantly reduced; the human capital gap between female employees and men at high wage quantile had narrowed, and the gender wage gap had also narrowed, but the narrowing rate was not as much as that at low wage quantile. For employees who had received social training, the wage increase of women at low and high wage quantile was small, and the gender wage gap was large; at middle wage quantile, although training had a direct impact on wages, this impact was the same for men and women, and there was no change in the gender wage gap.

Table 41 The gender wage gaps within groups of people attending different kinds of training across wage distribution in 2007

	quantile	the wage gap
never attend non-	0.25	0.2

agricultural training	0.5	0.2
	0.75	0.25
attend corporate internal training	0.25	0.07
	0.5	0.2
	0.75	0.15
attend non-agricultural training in society	0.25	0.23
	0.5	0.2
	0.75	0.19

Notes: I use urban price index to change nominal wages into real wages (take the price in 2002 as 1). The urban price index comes from the website of National Bureau of Statistics in China. The gender wage gap = (males wages – female wages)/male wages.

Table 42 shows the gender wage gaps within groups of people attending different kinds of training across wage distribution in both region in 2007. In developed region as quantile increased the gender wage gap decreased first and then increased among people never attending non-agricultural training, increased among people attending non-agricultural corporate internal training, increased first and then decreased among people attending non-agricultural training in society. In developing region as quantile increased the gender wage gap stayed the same among people never attending non-agricultural training, decreased first and then increased among other two groups.

In developed region, the gender wage gap for employees who had never received training was relatively stable, fluctuating around 15%. This gap was mainly caused by industry segregation, gender occupational segregation and human capital gap; the gender wage gap for employees who had received internal training in the company was even smaller, because companies recognized their training effects. There was no gender gap in the low- and middle-wage quantiles. At high quantile, there was a 10% gender pay gap due to the glass ceiling effect; rural-to-urban migrants who had received social training had relatively high wages, but due to statistical discrimination and differences in human capital, the gender wage gap was still relatively high, especially in the low- and middle-wage quantiles, which exceeded 20%.

In developing region, the gender wage gap for untrained employees stabilized at a level of 33%. Since the human capital gap in each quantile was unlikely to be completely consistent, this one-size-fits-all situation was more in line with the feature of statistical discrimination; the gender wage gap of employees who had received internal corporate training and social training had the same changing law, only slightly different in quantity, and both had a sticky floor effect and a glass ceiling effect. From the perspective of developed and developing region, the gender wage gap in developing region was higher in most quantiles than that in developed region.

Table 42 The gender wage gaps within groups of people attending different kinds of training across wage distribution in both region in 2007

	quantile	developed region	developing region
never attend non-agricultural training	0.25	0.17	0.33
	0.5	0.13	0.33
	0.75	0.15	0.33
attend corporate internal training	0.25	0.00	0.20
	0.5	0.00	0.17
	0.75	0.10	0.33
attend non-agricultural training in society	0.25	0.23	0.22
	0.5	0.29	0.17
	0.75	0.09	0.25

Notes: I use urban price index to change nominal wages into real wages (take the price in 2002 as 1). The urban price index comes from the website of National Bureau of Statistics in China. The gender wage gap = (males wages – female wages)/male wages.

Table 43 shows the gender wage gaps within groups of people receiving different lengths of training in 2007. The gender wage gap was the lowest among people receiving training for 7 days and below. The gender wage gaps were the same among other two groups. From the table, I can see that the length of training time had little effect on the gender wage gap, which was around 20%. This is because some occupations need to master simple skills, and after 7 days of training, it is enough to allow employees to work normally; some skills require a longer training period to be mastered, but the gender wage gap was still the same for male and female employees who had also received training. This is the result of the combined effect of the difference in human capital between men and women, industry segregation, gender occupational segregation, and gender discrimination.

Table 43 The gender wage gaps within groups of people receiving different lengths of training in 2007

7 days and below	0.19
8-30 days	0.21
31 days and above	0.21

Notes: I use urban price index to change nominal wages into real wages (take the price in 2002 as 1). The urban price index comes from the website of National Bureau of Statistics in China. The gender wage gap = (males wages – female wages)/male wages.

Table 44 shows the gender wage gaps within groups of people receiving different lengths of training across wage distribution in 2007. As quantile increased the gender wage gap increased first and then decreased among people receiving training for 7

days and below, increased consistently among people receiving training for 8-30 days, increased and then stayed the same among people receiving training for 31 days and above. In the rural-to-urban migrants who received training for more than 8 days, the gender wage gap was 0 at low wage quantiles. At middle quantile, the gender wage gap was stable at 20%, which was mainly related to differences in human capital, gender occupational segregation, and statistical discrimination. At high wage quantile, apart from the impact of gender occupational segregation and statistical discrimination on the gender wage gap, human capital differences played a major role, and the gender wage gap fluctuated around 20%.

Table 44 The gender wage gaps within groups of people receiving different lengths of training across wage distribution in 2007

	quantile	The gender wage gap
7 days and below	0.25	0.14
	0.5	0.20
	0.75	0.15
8-30 days	0.25	0.00
	0.5	0.20
	0.75	0.23
31 days and above	0.25	0.00
	0.5	0.20
	0.75	0.20

Notes: I use urban price index to change nominal wages into real wages (take the price in 2002 as 1). The urban price index comes from the website of National Bureau of Statistics in China. The gender wage gap = (males wages – female wages)/male wages.

Table 45 and figure 9 show the gender wage gaps within groups of people receiving different lengths of training across wage distribution in both regions in 2007. In developed region as wage quantile increased the gender wage gap increased first and then decreased among people receiving training for 7 days and below, increased among people receiving training for 8-30 days, decreased first and then increased among people receiving training for 31 days and above. In developing region as wage quantile increased the gender wage gaps decreased first and then increased among people receiving training for 7 days and below, and among people receiving training for 31 days and above, increased among people receiving training for 8-30 days. 8~30 days training had the most obvious effect on reducing the gender wage gap, especially at the quantile below 0.5, which was the same in both developed and developing region; in most cases, the gender wage gap of those who received more than 31 days of training was the largest, and its change pattern was consistent in both developed and developing region. In general, the gender wage gap was the smallest at 0.5 quantile, and the gap was larger at low quantile and high quantile. The changing law of the gender wage gap for receiving training less than 7 days was exactly the opposite

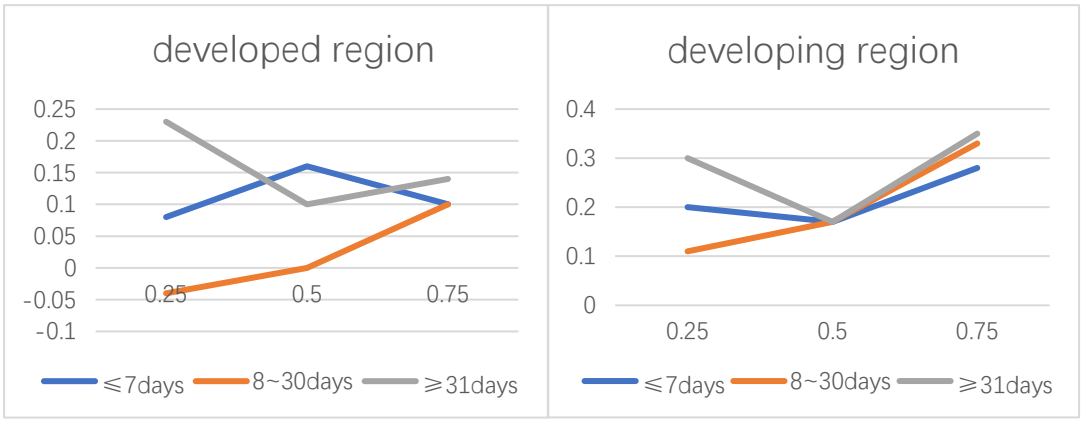
in developed and developing region.

Table 45 The gender wage gaps within groups of people receiving different lengths of training across wage distribution in both region in 2007

	quantile	developed region	developing region
7 days and below	0.25	0.08	0.20
	0.5	0.16	0.17
	0.75	0.10	0.28
8-30 days	0.25	-0.04	0.11
	0.5	0.00	0.17
	0.75	0.10	0.33
31 days and above	0.25	0.23	0.30
	0.5	0.10	0.17
	0.75	0.14	0.35

Notes: I use urban price index to change nominal wages into real wages (take the price in 2002 as 1). The urban price index comes from the website of National Bureau of Statistics in China. The gender wage gap = (males wages – female wages)/male wages.

Figure 9 The gender wage gaps within groups of people receiving different lengths of training across wage distribution in both region in 2007



Notes: I use urban price index to change nominal wages into real wages (take the price in 2002 as 1). The urban price index comes from the website of National Bureau of Statistics in China. The gender wage gap = (males wages – female wages)/male wages.

2.5 Robustness Checks

When analysing the structural effect, I use monthly wage, but it is not precise enough because the gender wage gap may be caused by different working hours

between men and women rather than caused by unobservable factors. Therefore, in this chapter, I use hourly wage to decompose the gender wage gap.

First, I use Oaxaca-Blinder decomposition method to decompose the gender wage gap. The result is shown in table 46. The values of both composition effect and structural effect decreased first and then increased. The percentage of composition effect deceased consistently, which is the same with the case using monthly wage. In general, the result is robust.

Table 46 Oaxaca-Blinder decomposition result (hourly wage)

		2002	2007	2013
composition effect	value	0.1637	0.0388	0.0402
	percentage	55.92%	29.40%	12.69%
structural effect	value	0.1291	0.0932	0.2766
	percentage	44.08%	70.60%	87.31%

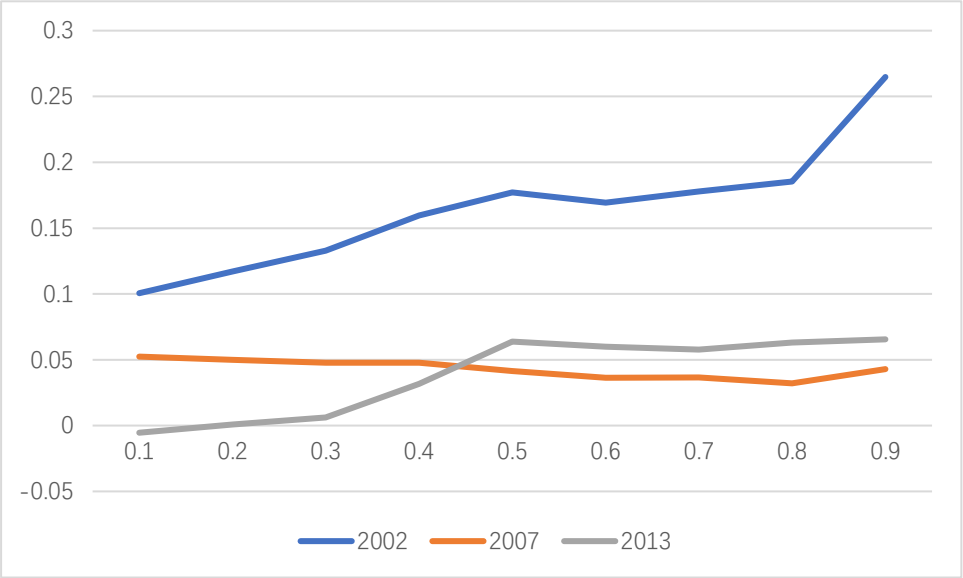
Notes: I use urban price index to change nominal wages into real wages (take the price in 2002 as 1). The urban price index comes from the website of National Bureau of Statistics in China.

Then, I use FFL decomposition method based on RIF regression to decompose the gender wage gap. The result is shown in figure 10 and 11. In 2002 and 2013 the composition effect was higher at high wage quantiles; in 2007 the composition effect fluctuated around 0.05. The result is robust.

In 2002 the structural effect was higher at high wage quantiles, indicating a glass ceiling effect; in 2007 the structural effect fluctuated around 0.1; in 2013 the structural effect was higher at low and high wage quantiles. In 2007 the economic developed fast and the discrimination against females was lower. Many medias talked about the disadvantages of glass ceiling effect. With the efforts of the whole society, the glass ceiling effect vanished in 2007 and 2013. In 2013 the gender discrimination was higher than 2007. Female migrants at low wage quantiles often had low skills and their physical strength was lower than males. When the gender discrimination increased, female migrants at low wage quantiles were the most vulnerable group and were discriminated against most, so the gender discrimination at low wage quantiles was high. Women were discriminated when they got promoted, so the gender discrimination was high at high wage quantiles, which was the reason why structural effect was high at low and high wage quantiles.

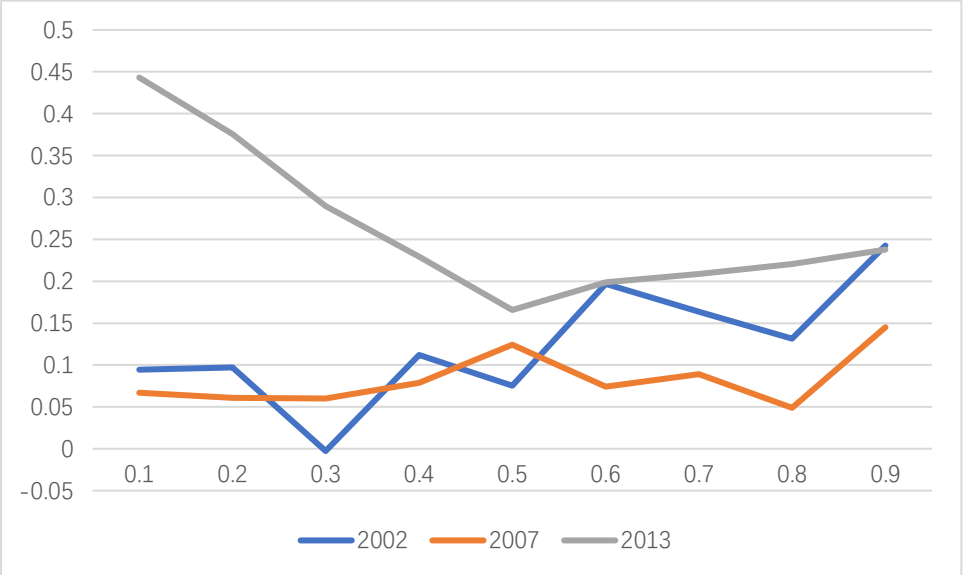
In general, the results are robust.

Figure 10 Composition effect across wage distribution (hourly wage)



Notes: The x-axis is quantile, and the y-axis is the value of composition effect.

Figure 11 Structural effect across wage distribution (hourly wage)



Notes: The x-axis is quantile, and the y-axis is the value of structural effect.

I also use educational qualification to replace educational years to see the result is robust. Educational qualification includes primary school and below, junior school, senior school, bachelor's degree, master's degree and above.

First, I use Oaxaca-Blinder decomposition method to estimate the structural effect. The result is shown in table 47. The value of structural effect decreased first and then increased. The value of composition effect decreased consistently. The percentage of structural effect increased consistently. The results are robust.

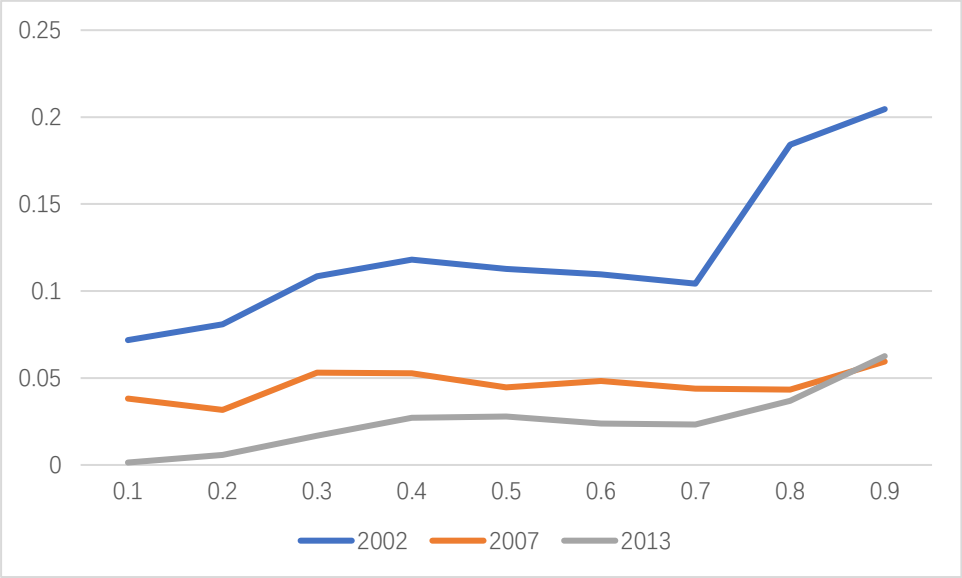
Table 47 Oaxaca-Blinder decomposition result (robustness check)

		2002	2007	2013
composition effect	value	0.1264	0.0451	0.0176
	percentage	45.94%	26.61%	5.02%
structural effect	value	0.1488	0.1244	0.3322
	percentage	54.06%	73.39%	94.98%

Notes: I use urban price index to change nominal wages into real wages (take the price in 2002 as 1). The urban price index comes from the website of National Bureau of Statistics in China.

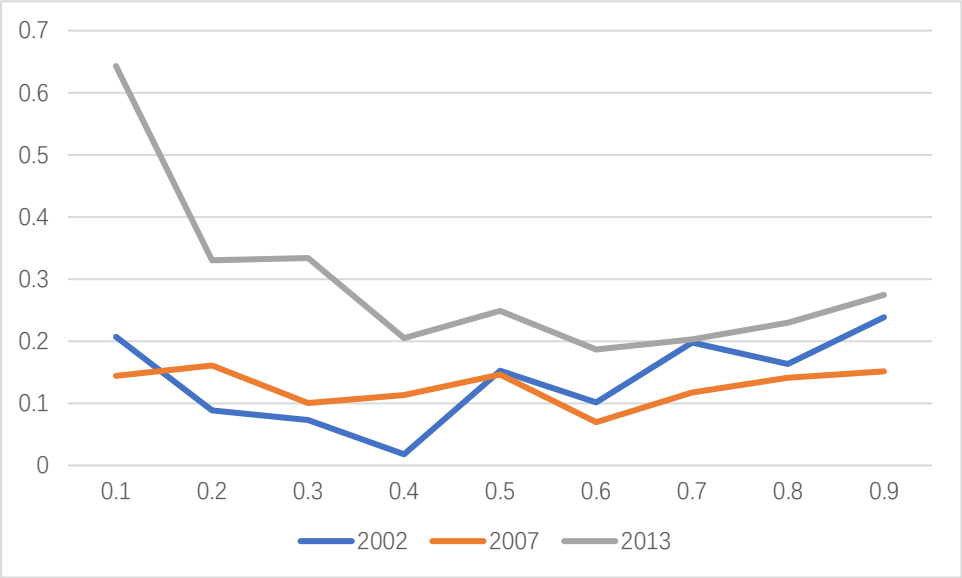
Then I use FFL decomposition method based on RIF-regression to decompose the wage gap at different quantiles. The result is shown in figure 12 and 13. The composition effect was high at high wage quantiles in 2002 and 2013, and fluctuated around 0.05 in 2007. The structural effect was high at low and high wage quantiles in 2002, and fluctuated around 0.13 in 2007, and was high at low wage quantile in 2013. The results are robust.

Figure 12 Composition effect across wage distribution (robustness check)



Notes: The x-axis is quantile, and the y-axis is the value of composition effect.

Figure 13 Structural effect across wage distribution (robustness check)



Notes: The x-axis is quantile, and the y-axis is the value of structural effect.

2.6 Conclusions

On the basis of understanding the status quo of global gender gap and gender wage gap and wage gap theory, I conducted research on the status quo of Chinese female rural-to-urban migrants and the status quo of gender wage gap. In the empirical research, some conclusions were drawn about the gender wage gap and its evolution of rural-to-urban migrants in China. And using previous theories about the wage gap, I discussed the formation and evolution of the gender wage gap.

The gender wage gap has a long history, with complex causes and many influencing factors. This study has studied the gender wage gap and its evolution from multiple perspectives, and reached the following conclusions:

(1) The gender wage gap for rural-to-urban migrants in China is still relatively high. From 34% in 2002, it dropped to 17% in 2007, and then rose to 28% in 2013. In 2002 the gender wage gap was larger at the upper tail of wage distribution, indicating a “glass ceiling effect”. In 2007 the gender wage gap fluctuated around 0.15. In 2013 the gender wage gap fluctuated around 0.25.

(2) Structural effect contributes greatly to the gender wage gap. In 2002, 2007, and 2013 the contribution of structural effect was 53.95%, 74.26% and 94.91% respectively, due to the high level of discrimination against female rural-to-urban migrants. This is also consistent with the author’s view that the female rural-to-urban migrant group is a vulnerable group among the vulnerable groups.

(3) In general, the gender wage gap shows a trend of first decline and then rise. This trend is also shown in most quantiles.

(4) This article divides China into developed region and developing region geographically. Because the economic development processes of these two regions

are different, there is a big gap in the degree of economic development. After the gender wage gap in developed region reaches a certain level, it will decline with the increase in economic growth, and then increase with the decline in economic growth. It shows a trend of first decline and then rise. The economic development of developing region lags behind that of developed region, and the gender wage gap has been rising. In 2002, the gender wage gap in developed region was higher than that in developing region. After 2007, the gender wage gap in developing region surpassed that in developed region, and this is also true in most quantiles.

(5) In 2002 the gender wage gap was the highest in industry A and C and lowest in industry B. In 2007 the gender wage gap was the highest in industry D and lowest in industry A. In 2013 the gender wage gap was the highest in industry A and B and lowest in industry C. From the perspective of evolution, I can see that the gender wage gap in industry A, C and D decreased first and then increased; the gender wage gap in industry B increased consistently.

(6) In 2002 the gender wage gap was the highest among people with senior high school and above degree, lowest among people whose highest educational level was primary school and below; in 2007 the gender wage gap was the highest among people whose highest educational level was primary school and below, lowest among people whose highest educational level was senior high school and above; in 2013 the gender wage gap was the highest among people whose highest educational level was junior high school, lowest among people whose highest educational level was primary school and below. The gender wage gap among people whose highest educational level was primary school and below increased first and then decreased from 2002 to 2013; the gender wage gap among other groups of people decreased first and then increased from 2002 to 2013.

(7) In general, the more individual workers invest in training, the higher their wages and the smaller the gender wage gap. In 2007, the economy of developing region was in a period of rapid growth, and the overall gender wage gap was larger than that in developed region, and the same performance was also seen in different groups of training human capital. Training time has little effect on the gender wage gap.

Chapter 3 The Evolution of the Wage Gap between Female Rural-to-urban Migrants and Female Urban Natives

3.1 Introduction

Female rural-to-urban migrants not only suffer gender discrimination, but also suffer Hukou discrimination. There is not only a gender wage gap between female rural-to-urban migrants and male rural-to-urban migrants, but also a wage gap between female urban natives and female rural-to-urban migrants. But this issue is understudied. What causes the wage gap between female rural-to-urban migrants and female urban natives? According to the author's actual understanding to Chinese society, the human capital gap should be an important reason. Then, how much role does the human capital factor play in it? Besides the human capital gap, is there any reason such as household registration discrimination? How does this wage gap evolve over time? What measures should be taken to reduce and eventually eliminate this gap and realize the basic social justice of equal pay for equal work? This is undoubtedly of great significance to the promotion of China's social development. Researching the evolution of the wage gap between female rural-to-urban migrants and female urban natives can help us understand the impact of Hukou on female wage; researching the wage gap at each quantile can help us understand at which quantile the wage gap was larger, and help us propose targeted policy suggestions to reduce the wage gap. I use CHIPs 2002, 2007 and 2013 data. I use OLS regression, quantile regression, Oaxaca-Blinder decomposition, FFL decomposition methods. I found that the wage gap reached 39% in 2002, 37% in 2007 and 22% in 2013. From an evolutionary perspective, the average wage gap decreased consistently. In general, as wage quantile increased the raw wage gap increased in 2002 and 2007, and decreased in 2013.

3.1.1 Review of related literature

Although there is little research on the wage gap between female rural-to-urban migrants and female urban natives, however, the significant wage gap between rural-to-urban migrants and urban natives has aroused great attention from academic circles and society. We can discover some interesting things in these studies. What these studies have in common is that they measured the wage gap between rural-to-urban migrants and urban natives. Some studies have also observed its evolution. But the academic research conclusions are not exactly the same in the reason analysis. The same is that differences in human capital have brought about wage gaps; the difference is the research on the role of household registration discrimination. Some studies believe that the effect of discrimination is significant, and some believe that the effect of discrimination is not significant. Others believe that with the passage of time, the role of household registration discrimination has changed from significant to

insignificant, and then developed to reverse discrimination. Different research conclusions make us confused about how to formulate reasonable policies and adopt appropriate measures to reduce the wage gap of female rural-to-urban migrants in order to promote social equity. China's labour market still has industry segregation and occupational segregation. Do these also affect the wage gaps between female rural-to-urban migrants and female urban natives? Obviously, it is necessary to conduct further empirical research on these issues based on actual survey data.

The difference in human capital is an important reason for the wage gap between rural-to-urban migrants and urban natives. Chen et al. (2010) used the 2006 *Beijing 1‰ Floating Population Sampling Survey* data and improved Mincer's income model to study and found that the increase in the human capital of the floating population has an important impact on employment income. Among them, the contribution of education is the most significant. Training more than twice has a positive and significant impact, and too short or too long flow time is not conducive to income increase. Qian and Hu (2015) find, for male, 90.21% of enlarged wage gap can be contributed to the endowment return differential among which the enlarged educational return gap with inter-annual variation is the main factor; for female, 85.96% of diminished wage gap can be contributed to the endowment return differential among which the big rise of rural-to-urban migrant's educational return and the big decline of urban worker's educational return are the main factor. Hofer et al. (2017) used Chernozhukov et al. (2013) decomposition method and Oaxaca-Blinder decomposition method to study discrimination against migrants in Austria, and found that migrants' wages are 15% lower than non-migrants, and a large part of the wage gap is caused by differences in human capital and occupation. Zhang et al. (2017) found that the educational return rate of employees in the state-owned sector was higher than that in the non-state-owned sector, and the inter-departmental wage difference was more obvious among highly educated groups. There were still serious labour market segmentation and employment discrimination in the two sectors.

The segmentation of the labour market has created a wage gap between rural-to-urban migrants and urban natives at the beginning of their employment. Zhang and Qian (2011) found that the degree of segmentation has a positive and strong correlation with the level of economic development. It is more serious for rural-to-urban migrants in the inequality of employment opportunities; the urban government's institutional protection policies for local natives has intensified labour market segmentation; equal pay for equal work in low-end employment needs to be focused on. Zhang and Guo (2014) found that there is a relatively serious vertical household registration post segregation in the catering and retail industries. There is horizontal household registration job segregation in manufacturing, construction, and other service industries. There is no horizontal household registration post segregation but vertical household registration post segregation in the finance and transportation industries. In government agencies, post and telecommunications, science, education, culture and health industries, the difference in post wages due to differences in human capital is greater than in other industries. Chen and Xu (2014) found that rural-to-urban migrants not only have low initial relative wages, but also have a slow rate of

assimilation with urban natives' wages.

China's unique household registration discrimination plays an important role in the wage gap between rural-to-urban migrants and urban natives. Cai (2000) found that urban natives, motivated to safeguard their vested interests, helped to form a discriminatory employment policy that excluded rural-to-urban migrants by influencing the local government's policy making process, which intensified the segmentation of the labour market. Han (2004) found that various restrictions on rural-to-urban migrants entering cities for job hunting, examinations, recruitment, and hiring have become an important issue that urgently needs to be resolved whether rural-to-urban migrants can be treated fairly. Zhang and Cai (2007) found that household registration discrimination can explain nearly one-third of the average income gap between rural-to-urban migrants and urban natives, and the discrimination effect increases with the increase at income quantile; when the policy goal is to reduce the income gap of the high-income quantiles, the policy of eliminating household registration discrimination is more effective. When the policy goal is to reduce the income gap at the low-income quantiles, the policy to reduce the endowment gap between the two groups is more effective. Ma and Wan (2010) found that 58.06% of the wage income gap between rural-to-urban migrants and urban natives was caused by differences in individual characteristics, while the gap caused by household registration discrimination reached 41.94%. And compared with economically developed regions, the more backward the economic development level is, the greater the proportion of wage discrimination factors brought by the household registration discrimination in the wage gap. Wang and Zhou (2014) found that the unexplainable part of the household registration wage difference of stable employees is lower than that of non-steady employees, with the former being 35.65% and the latter being 57.52%. The wage gap between rural-to-urban migrants and urban natives is not only due to differences in the individual characteristics of urban and rural labour, but also due to the household registration discrimination against rural-to-urban migrants. This discrimination is mainly manifested in different pay for equal work and uneven employment opportunities. Different pay for equal work is the main manifestation of household registration discrimination. Regarding the inequality of employment opportunities caused by sectoral segregation, the discrimination against rural-to-urban migrants in employment opportunities by ownership is the most obvious. From the perspective of comparison by region, the wage gap between rural-to-urban migrants and urban natives in the eastern region is the highest, and the lowest in the central region. Different pay for equal work is the most serious in the eastern region. The inequality of employment opportunities is the most serious in the central region. And household registration discrimination is the most serious in the western region (Meng, 2014). Zhao (2016) believes that, from the perspective of the whole country and the eastern region, the difference in wages between urban natives and rural-to-urban migrants is mainly due to the difference in endowments between the two groups, and discrimination accounts for a relatively small proportion; in the central region, the difference in coefficients on the low quantiles is greater than the difference in endowments, the endowment difference on the middle and high quantiles is greater

than the coefficient difference, discrimination against rural-to-urban migrants mainly exists at the low end of the wage distribution; in the western region, as the quantile increases, wage differences, coefficient differences, and endowment differences continue to increase, differences in endowments and coefficients make roughly the same contribution to the difference in wages between the two groups. Qu and Zhao (2020) study the levels and changes in wage inequality among Chinese rural-to-urban migrants during 2002-2007. They find that wage inequality among rural-to-urban migrants decreased significantly between 2002 and 2007, a primary cause of declining inequality of rural-to-urban migrants is that the high-wage rural-to-urban migrants experienced slower wage growth than middle-wage and low-wage rural-to-urban migrants. By using distributional decomposition methods based on quantile regression, they find that an overall between-group effect dominates in the whole wage distribution, which means that the change in returns to the characteristics plays a key role, but on the upper tails of the wage distribution, the within group effect dominates, implying that the unobservable factors or institutional barriers do not favor the rural-to-urban migrants at the top tail of the wage distribution. The wage gap between rural-to-urban migrants and urban natives is narrowed, the gap at the upper wage distribution is becoming bigger. Overall, the results suggest that there exists a strong glass ceiling for rural-to-urban migrants in the urban labour market.

China is a populous country. Despite rapid urbanization, there is still a large agricultural population and a large number of surplus rural labourers. However, studies have shown that as more and more rural labourers transferred to cities and towns, the surplus labour force in rural China is no longer in a state of unlimited supply to the urban labour market in China. The Chinese labour market has shown a structural contradiction between supply and demand. This is bound to affect the wage level of rural-to-urban migrants. Therefore, it is more necessary to study the evolution of the wage gap between rural-to-urban migrants and urban natives over time, especially the wage gap between female rural-to-urban migrants and female urban natives. *General Report on Chinese rural-to-urban migrants Status and Their Development Trends* (2009) mentioned that the average monthly wage of rural-to-urban migrants is only about half of that of urban natives, and the hourly wage of rural-to-urban migrants is even lower. The relative income of agriculture has fallen, and if farmers want to increase their income, entering urban employment is still the best choice. However, the supply of rural labour has shifted from "oversupply" to "oversupply in total and short in structure." The supply and demand of rural labour under the age of 30 is obviously tight, and the supply of skilled rural-to-urban migrants is seriously insufficient. The regional contradiction between the supply and demand of rural-to-urban migrants is prominent, and the "rural-to-urban migrants shortage" has appeared in the developed eastern coastal areas and has spread to the inland.

The urban-rural segmentation of the labour market, unequal market access conditions, and inadequate social security constitute discrimination and exclusion to rural labour in cities. The vocational skills of the rural-to-urban migrants are not high, and their employment competitiveness is weak. The adjustment and upgrading of the industrial structure had led to a big difference between the labour supply structure and

the labour demand structure, the supply of unskilled labour exceeds demand, highly qualified personnel required by emerging new industries and technical occupations is in short supply, the structural contradictions in the labour market are prominent (Zhang, 2006).

Li and Wu (2020) found that in recent years, rural-to-urban migrants' employment choices, wage growth, and income gap have improved significantly, and the degree of segmentation of employment and household registration discrimination has gradually weakened. Hu and Ye (2019) found that with the increase of the mobility time, the wages of urban natives and rural-to-urban migrants have converged significantly, but the wages of female labours have converged more slowly than male labours; the improvement of education level will not help increase the rate of convergence of urban natives and rural-to-urban migrants wage; however, non-agricultural skills training and the expanding of social networks will accelerate the convergence of wages of urban natives and rural-to-urban migrants, especially for male labour; moderate job changes will increase the rate of convergence of the male labour force's wages.

Then, what is the wage gap between female rural-to-urban migrants and female urban natives? How does it develop and change? What factors played a major role in it? These are the problems I will solve below.

3.2 Data and Summary Statistics

I use CHIPs data in 2002, 2007 and 2013. The introduction of CHIPs data is shown in chapter 2.

The rural-to-urban migrants are defined as people who live in urban areas but have rural Hukou. The urban natives are defined as people who live in urban area and have urban Hukou.

I only reserve female people whose ages are 16-55 because female people will retire by 55. In 2002 and 2007 the provinces are Guangdong, Henan, Anhui, Chongqing, Jiangsu, Hubei and Sichuan; in 2013 the provinces are Beijing, Shanxi, Liaoning, Jiangsu, Anhui, Henan, Hubei, Hunan, Guangdong, Chongqing, Sichuan, Yunnan, Gansu, and Shandong. I also use sample weights.

Table 48 shows the summary statistics. Female rural-to-urban migrants' average education years and working experience were lower than that of urban natives in 2002, 2007 and 2013. Female rural-to-urban migrants' average education years and female urban natives' average education years both increased over time, and their average working experience both decreased first and then increased over time. In 2007 the economy developed fast, so the labour demand increased, and the income of migrant workers who worked in cities was higher than that of farming in their hometowns, so many young rural people became rural-to-urban migrants, and the average working experience decreased. In 2013 there were not so many young rural people left in rural areas, so fewer young migrant workers are entering the urban labour market, and the average working experience increased.

Table 48 Summary Statistics

		2002		2007		2013	
		education years	experience	education years	experience	education years	experience
female migrants	mean	7.55	6.57	9.02	5.84	9.51	10.01
	standard deviation	2.87	4.44	2.64	5.61	3.15	6.96
	number of observations	906		1883		507	
female urban natives	mean	11.49	21.48	11.69	20.89	12.11	21.04
	standard deviation	2.73	8.90	3.18	10.09	3.26	10.04
	number of observations	1904		1291		3382	

Note: data source: chips data.

3.3 Empirical Analysis

3.3.1 The Raw Wage Gap between Female Rural-to-urban Migrants and Female Urban Natives

Table 49 shows the raw wage gap between female rural-to-urban migrants and female urban natives. From 2002 to 2013 female rural-to-urban migrants' average wage and female urban natives' average wage both increased. The wage gap decreased consistently. It's because the difference of personal characteristics between female migrants and female urban natives decreased, and the structural effect decreased.

Table 49 The raw wage gap between female rural-to-urban migrants and female urban natives

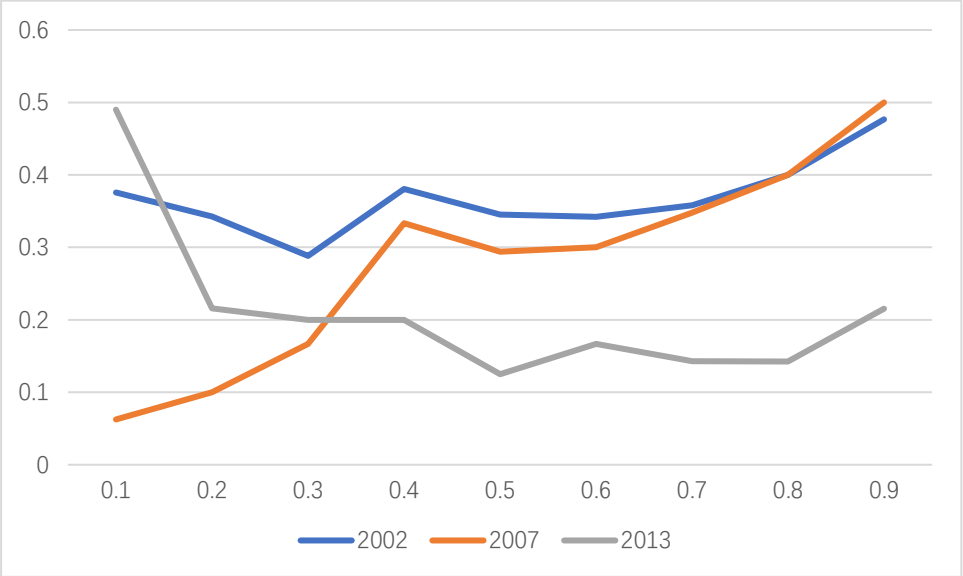
	2002	2007	2013
female migrants' average wage	703.26	1247.63	1910.80
female urban natives' average wage	1145.05	1965.87	2462.96

the wage gap	0.39	0.37	0.22

Notes: I use urban price index to change nominal wages into real wages (take the price in 2002 as 1). The urban price index comes from the website of National Bureau of Statistics in China. The wage gap=(female urban natives' average wage-female migrants' average wage)/ female urban natives' average wage.

Then I calculate the wage gap between female urban natives and female rural-to-urban migrants at different quantiles. The result is shown in figure 14. In general, the wage gap increased as wage quantile increased in 2002 and 2007, and decreased in 2013, because the structural effect increased as wage quantile increased in 2002 and 2007, and decreased in 2013.

Figure 14 The wage gap between female urban natives and female rural-to-urban migrants across wage distribution



Notes: I use urban price index to change nominal wages into real wages (take the price in 2002 as 1). The urban price index comes from the website of National Bureau of Statistics in China. The wage gap=(female urban natives' wage-female migrants' wage)/ female urban natives' wage. The X-axis is wage quantile, and the Y-axis is the wage gap.

3.3.2 Calculate the Wage Gap between Female Rural-to-urban Migrants and Female Urban Natives by regressions

In order to research the wage gap when other variables controlled, I calculate the wage gap by regressions. The OLS regression result was shown in table 50. Migrant dummy was defined as 1 when the observation was a rural-to-urban migrant, and was defined as 0 when the observation was an urban native. The coefficient of migrant dummy was the wage gap between female rural-to-urban migrants and female urban natives when other variables controlled. From 2002 to 2013 the wage gap decreased

consistently with other variables controlled, because discrimination decreased.

Table 50 OLS regression result in each year

	(1) 2002	(2) 2007	(3) 2013
Migrant dummy	-0.189***	-0.159***	-0.122***
	(-8.23)	(-3.86)	(-2.68)
Other control variables	Yes	Yes	Yes
Industry	Yes	Yes	Yes
Region	Yes	Yes	Yes
Occupation	Yes	Yes	Yes
Ownership type	Yes	Yes	Yes
Constant	5.375***	6.831***	5.974***
	(38.29)	(49.45)	(30.89)
N	2809	3136	3889

Notes: t statistics in parentheses. *** represents significance at 0.01 level. The dependent variable is monthly log wages. I use urban price index to change nominal wages into real wages (take the price in 2002 as 1). The urban price index can be found at the website of National Bureau of Statistics in China. Other control variables include education years, experience, experience square. Migrant dummy was defined as 1 when the observation was a rural-to-urban migrant, and was defined as 0 when the observation was an urban native.

I also run quantile regressions to calculate the wage gap at each quantile. The introduction of quantile regression is shown in chapter 2. The result is shown in figure 15 and table 51. The wage gap was larger at low wage quantiles in 2002, 2007 and 2013, because the ability gap between female rural-to-urban migrants and female urban natives was larger at low wage quantile. The wage gap was larger at high wage quantiles in 2007, because the discrimination was larger at high wage quantiles.

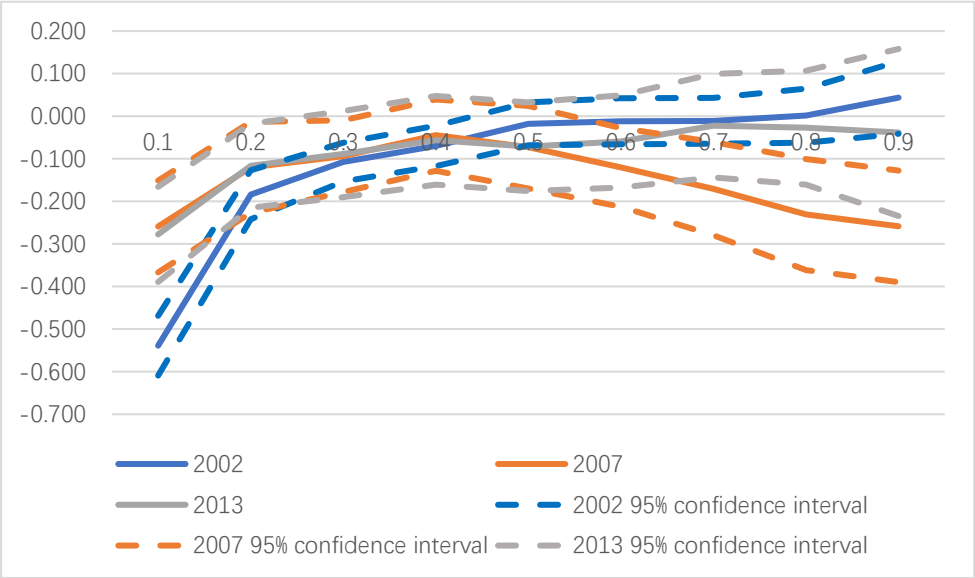
Table 51 The coefficient of migrant dummy at different quantiles

quantile	2002	2007	2013
0.1	-0.539 *	-0.259 ***	-0.278 ***

0.2	-0.184 ***	-0.120 **	-0.116 **
0.3	-0.108 ***	-0.094 **	-0.089 *
0.4	-0.070 ***	-0.044	-0.057 ***
0.5	-0.018 ***	-0.073	-0.072 ***
0.6	-0.012 ***	-0.120 **	-0.059 ***
0.7	-0.011 ***	-0.170 ***	-0.022 ***
0.8	0.001	-0.231 ***	-0.027 ***
0.9	0.044	-0.259 ***	-0.038 ***

Notes: *, ** and *** represent significance at 0.1, 0.05 and 0.01 level respectively. The dependent variable is monthly log wages. I use urban price index to change nominal wages into real wages (take the price in 2002 as 1). The urban price index comes from the website of National Bureau of Statistics in China.

Figure 15 The coefficient of migrant dummy at different quantiles



Notes: Standard error in parentheses. The dependent variable is monthly log wages. I use urban price index to change nominal wages into real wages (take the price in 2002 as 1). The urban price index comes from the website of National Bureau of Statistics in China. The X-axis is wage quantile, and the Y-axis is the value of the coefficient.

3.3.3 Decompose the Wage Gap between Female Rural-to-urban Migrants and Female Urban Natives

I use Oaxaca-Blinder decomposition method to decompose the wage gap. The introduction of the method is shown in chapter 2. The independent variables include education years, working experience, region dummy, ownership type dummy, industry dummy, and occupation dummy. The result is shown in table 52.

As is shown in table 52, the value of composition effect decreased consistently.

With the process of educational expansion, many female migrants' educational years increased. Many female migrants were competent for jobs requiring high skills, so the composition effect decreased.

The value of structural effect decreased consistently, because the contribution of discrimination to the wage gap decreased consistently. Deng and Wang (2005) researched the supply and demand of rural-to-urban migrants in China. They found that in terms of total amount, China's rural-to-urban migrants still had the characteristic of unlimited supply; but there was structural shortage. In 12 Chinese cities including Fujian, Jiangsu, Zhejiang, and Guangdong which were main rural-to-urban migrants inflow areas, labour supply was 704 thousand people, while labour demand was 1087 thousand people. In terms of age structure, rural-to-urban migrants under 30 were in short supply. In terms of gender characteristics, female workers were in short supply. 78% of enterprises which lacked workers said that there was a shortage of female workers. In terms of skills, skilled workers were in short supply. Coupled with the influence of media propaganda and the appeal of scholars, the discrimination against rural-to-urban migrants was getting lower and lower. In 2002, 2007 and 2013 the wage gap was mainly caused by structural effect.

Table 52 Oaxaca-Blinder decomposition

		2002	2007	2013
composition effect	value	0.1575	0.1524	0.1440
	percentage	32.96%	45.09%	44.83%
structural effect	value	0.3204	0.1855	0.1772
	percentage	67.04%	54.91%	55.17%

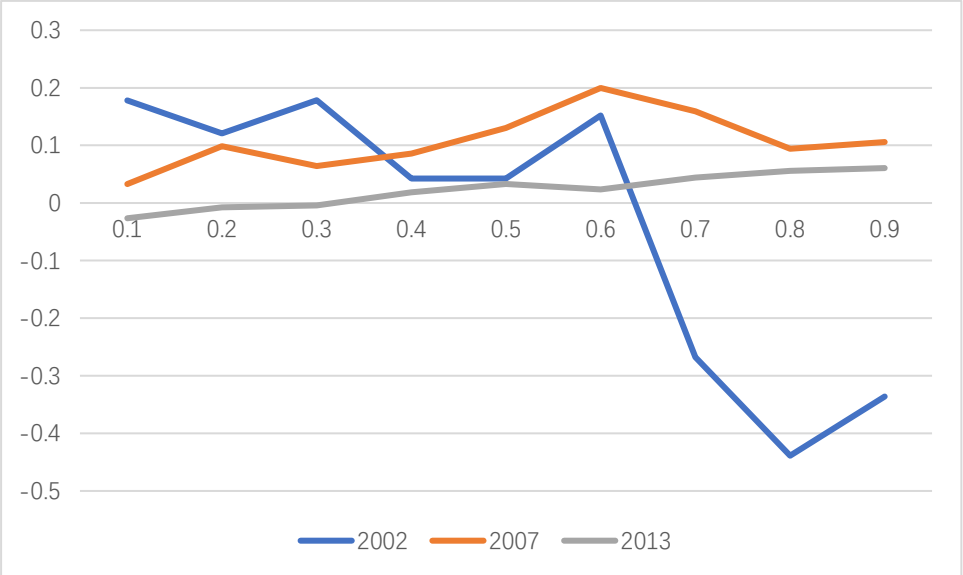
Notes: I use urban price index to change nominal wages into real wages (take the price in 2002 as 1). The urban price index comes from the website of National Bureau of Statistics in China.

Then I use the FFL decomposition method based on RIF-regression to decompose the wage gap at each quantile. The introduction of this method is shown in chapter 2. The independent variables include educational years, working experience, working experience square, industry dummies, region dummies, ownership type dummies, and occupation dummies. The result is shown in figure 16 and 17. In 2002 the composition effect fluctuated at low and middle wage quantiles and was negative at high wage quantiles. Many rural-to-urban migrants with high ability went to areas where average wage was high, so the composition effect was negative at high wage quantiles. In 2007 the composition effect fluctuated between 0 and 0.2. The economy developed well in areas where the average wage was lower, and many rural-to-urban migrants went to those areas, so the wage gap was positive at high quantiles in 2007. In 2013 the composition effect increased with the increase of wage quantiles. In 2013 the number of job opportunities decreased due to the impact of financial crisis in 2008, and some rural-to-urban migrants with low educational level lost their jobs, so female rural-to-urban migrants' personal characteristics were better than female urban natives' at low wage quantiles. Female rural-to-urban migrants' educational level was still

lower than female urban natives' at high wage quantiles, so the composition effect was higher at high quantiles.

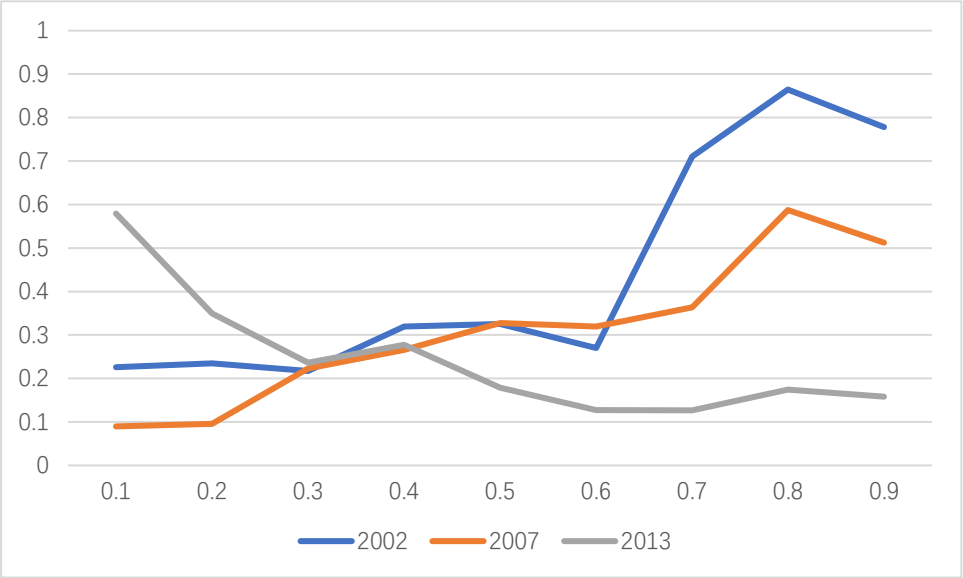
In 2002 the structural effect increased with the increase of wage quantile. At high wage quantiles the structural effect was high because female rural-to-urban migrants worked shorter hours than female urban natives. In 2007 the structural effect increased with the increase of wage quantile. At high wage quantiles the structural effect was high, because the quality of education received by female rural-to-urban migrants was not as good as that of female urban natives. For example, although some female rural-to-urban migrants and female urban natives all have bachelor's degree, but female urban natives' university may be better than female rural-to-urban natives. In the regression used as the basis of decomposition, I only control whether an observation went to college, but I do not control the quality of university due to data limitation. Higher-paying jobs require higher quality of education for employees, so the structural effect was high in 2007. In 2013 the structural effect decreased with the increase of wage quantile. In 2013 the rural-to-urban migrants with low ability cannot find jobs, so female rural-to-urban migrants' average ability increased, and the difference of educational return between female rural-to-urban migrants and female urban natives narrowed at high wage quantiles, so the structural effect was low at high wage quantiles. Most female rural-to-urban migrants at low wage quantiles belonged to vulnerable group and they were more likely to be substituted at work, so they were more likely to be discriminated against, which is the reason why the structural effect was high at low wage quantiles.

Figure 16 Composition effect



Notes: The X-axis is wage quantile, and the Y-axis is the composition effect.

Figure 17 Structural effect



Notes: The X-axis is wage quantile, and the Y-axis is the structural effect.

3.3.4 Within-group Wage Gaps between Female Rural-to-urban Migrants and Female Urban Natives

In order to analyse the wage gap more comprehensively, I study the wage gap within each group. Table 53 shows the wage gap in each region. The wage gap decreased consistently in developed region over time, while increased first and then decreased in developing region over time. After the reform and opening up, urban natives' wage increased rapidly, but rural-to-urban migrants' wage increased slowly, so the wage gap increased. Later, there was a shortage of high-skilled migrant workers. The supply of high-skilled migrant workers fell short of demand, and their wages increased, which led to an increase in the average wage of migrant workers and a narrowing of the wage gap. The developed region developed rapidly and had passed the stage of widening wage gap and had reached the stage of narrowing wage gap. The development of developing region lagged behind, and the wage gap was still in the rising stage from 2002 to 2007, and reached the declining stage from 2007 to 2013.

Table 53 The wage gap between female migrants and female urban natives in each region

	developed region	developing region
2002	0.43	0.35
2007	0.32	0.47
2013	0.29	0.21

Notes: I use urban price index to change nominal wages into real wages (take the price in 2002 as 1). The urban price index comes from the website of National Bureau of Statistics in China. The wage gap = (female urban natives' average wage-female migrants' average wage)/ female urban natives' average wage.

I also run OLS regression to calculate the wage gap in each region when other variables controlled. The result is shown in table 54. In 2002, 2007 and 2013 the wage gap was smaller in developed region than that in developing region, because people's views and values were more advanced in developed region than that in developing region, and Hukou discrimination was more severe in developing region than that in developed region. In developed region the wage gap decreased first and then increased, because Hukou discrimination decreased first and then increased. In developing region, the wage gap increased first and then decreased, because ability gap increased from 2002 to 2007, and Hukou discrimination decreased from 2007 to 2013. In 2013 the economy was affected by financial crisis in 2008 and relative labour demand decreased. The competition in developed region became fiercer, so the discrimination in developed region increased. Developing region had low degree of openness and was not affected as much as developing region, so the discrimination in developing region did not increase.

Table 54 OLS regression in each region

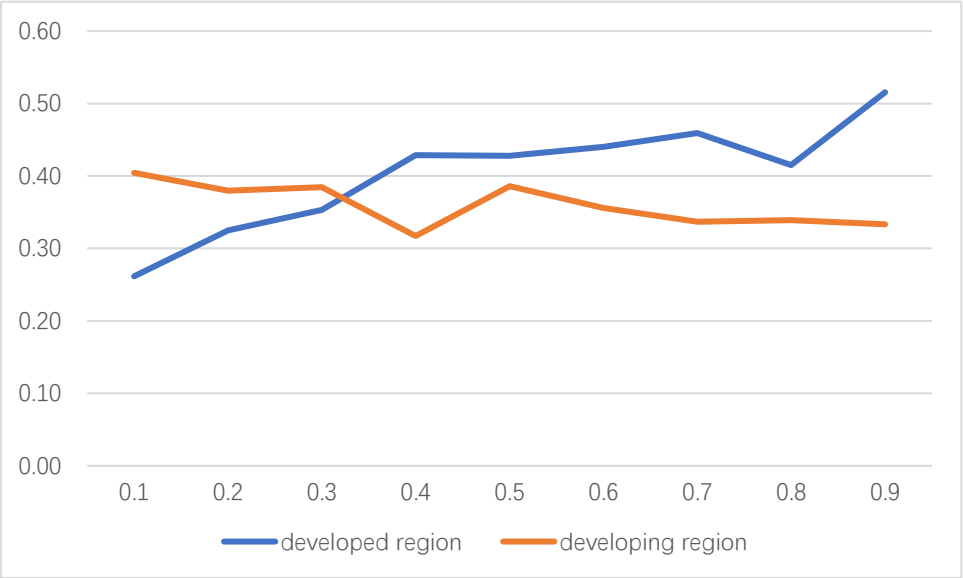
	2002 Developed region	2002 Developing region	2007 Developed region	2007 Developing region	2013 Developed region	2013 Developing region
Migrant dummy	-0.136***	-0.230***	-0.051	-0.424***	-0.128**	-0.132***
	(-4.18)	(-6.94)	(-0.96)	(-6.92)	(-1.95)	(-2.72)
Other control variables	Yes	Yes	Yes	Yes	Yes	Yes
Ownership type	Yes	Yes	Yes	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes	Yes	Yes
Occupation	Yes	Yes	Yes	Yes	Yes	Yes
Constant	5.380***	5.479***	6.580***	7.852***	5.212***	6.250***

	(21.34)	(33.26)	(34.89)	(42.72)	(14.78)	(26.78)
N	1018	1791	1357	1779	1753	2136

Notes: t statistics in parentheses. ** represents significance at 0.05 level. *** represents significance at 0.01 level. The dependent variable is monthly log wages. I use urban price index to change nominal wages into real wages (take the price in 2002 as 1). The urban price index can be found at the website of National Bureau of Statistics in China. Other control variables include educational years, experience, experience square.

Then I calculate the wage gap in each region across wage distribution without any variables controlled. The result is shown in figure 18-20. The wage gap fluctuated between 0.3 and 0.4 in developing region, and increased with the increase in wage quantile in developed region in 2002; increased with the increase in wage quantile in both regions in 2007; decreased and then increased with the increase in wage quantile in developed region, and decreased with the increase in wage quantile in developing region in 2013.

Figure 18 The wage gap between female urban natives and female rural-to-urban migrants across wage distribution in each region in 2002

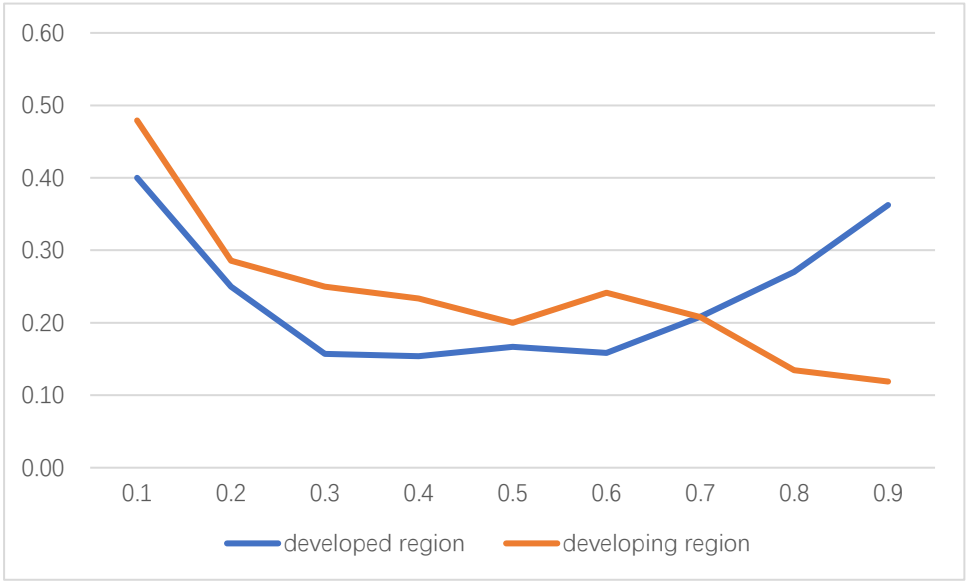


Notes: The X-axis is wage quantile, and the Y-axis is the wage gap.

Figure 19 The wage gap between female urban natives and female rural-to-urban migrants across wage distribution in each region in 2007

Notes: The X-axis is wage quantile, and the Y-axis is the wage gap.

Figure 20 The wage gap between female urban natives and female rural-to-urban migrants across wage distribution in each region in 2013



Notes: The X-axis is wage quantile, and the Y-axis is the wage gap.

Table 55 shows the wage gap between female urban natives and female migrants in each industry. Female migrants suffer Hukou discrimination when they want to enter high-paying industries. Only migrants with high ability can enter into high-paying industries. Comparing to the case where people are randomly assigned into industries, the actual wage gap may be underestimated in some industries. I divide industries into 4 types: type B is low-paying service industry which needs workers with low level of knowledge, including wholesale and retail, accommodation and

catering, social services industry; type C is high-paying service industry which needs workers with high level of knowledge, including finance, insurance, real estate, transportation, communications, scientific research and technology; type D is low-paying service industry which needs workers with high level of knowledge, including education, culture, radio, film and television, health and sports, social welfare, party and government agencies and social organizations; type A is other industry, including manufacturing, mining, construction, hydropower and coal supply industries, water conservancy, environment and public facilities management industries.

The wage gaps in B, C and D industries decreased from 2002 to 2013, because discrimination decreased. The wage gap in industry A increased first and then decreased from 2002 to 2013, because the ability gap in industry A increased from 2002 to 2007, and the discrimination decreased from 2007 to 2013. The wage gap was the highest in industry C in 2002, and was the highest in industry D in 2007 and 2013, because most workers in industry C and D need to have high human capital to be qualified, while migrants had low human capital. The wage gap was smallest in industry A in 2002, and was the smallest in industry B in 2007 and 2013, because workers in industry A and B do not need to have high human capital, the difference of human capital between migrants and urban natives do not play an important role.

Table 55 The wage gap between female urban natives and female migrants in each industry

Industry	2002	2007	2013
A	0.30	0.38	0.20
B	0.31	0.28	0.11
C	0.53	0.39	0.32
D	0.52	0.47	0.38

Notes: I use urban price index to change nominal wages into real wages (take the price in 2002 as 1). The urban price index comes from the website of National Bureau of Statistics in China. The wage gap=(female urban natives' average wage-female migrants' average wage)/ female urban natives' average wage.

Then I calculate the wage gap in each industry with some variables controlled in 2002, 2007 and 2013. The result is shown in table 56-58. In 2002 the wage gap was significant in all 4 industries. In 2007 the wage gap was significant in industry A and D and was not significant in industry B and C. The discrimination decreased in 2007, so the wage gap was not significant in industry B and C. In 2013 the wage gap was significant in industry A and B, and was not significant in industry C and D. The discrimination decreased in industry D, so the wage gap was not significant in industry C and D. Most people in industry B earned low wages, and they were vulnerable group and were easy to be substituted, so discrimination was severe in industry B and the wage gap was significant in industry B. Female rural-to-urban migrants' average skill level was lower than female urban natives' in industry A, so the wage gap was significant in industry A.

Table 56 OLS regression in each industry in 2002

	(1) Industry A	(2) Industry B	(3) Industry C	(4) Industry D
Migrant dummy	-0.089**	-0.139***	-0.224**	-0.437***
	(-1.97)	(-4.46)	(-2.13)	(-6.73)
Other control variables	Yes	Yes	Yes	Yes
Ownership type	Yes	Yes	Yes	Yes
Region	Yes	Yes	Yes	Yes
Occupation	Yes	Yes	Yes	Yes
Constant	5.552***	5.688***	4.904***	4.584***
	(25.46)	(41.87)	(12.15)	(17.89)
N	752	1168	233	556

Notes: t statistics in parentheses. ** represents significance at 0.05 level. *** represents significance at 0.01 level. The dependent variable is monthly log wages. I use urban price index to change nominal wages into real wages (take the price in 2002 as 1). The urban price index can be found at the website of National Bureau of Statistics in China. Other control variables include educational years, experience, experience square.

Table 57 OLS regression in each industry in 2007

	(1) Industry A	(2) Industry B	(3) Industry C	(4) Industry D
Migrant dummy	-0.181**	-0.051	-0.246	-0.427***
	(-2.39)	(-0.97)	(-1.19)	(-2.85)
Other control variables	Yes	Yes	Yes	Yes
Ownership type	Yes	Yes	Yes	Yes

Region	Yes	Yes	Yes	Yes
Occupation	Yes	Yes	Yes	Yes
Constant	7.032***	5.975***	6.906***	6.969***
	(22.83)	(41.98)	(29.61)	(27.88)
N	802	1587	310	352

Notes: t statistics in parentheses. *** represents significance at 0.01 level. The dependent variable is monthly log wages. I use urban price index to change nominal wages into real wages (take the price in 2002 as 1). The urban price index can be found at the website of National Bureau of Statistics in China. Other control variables include educational years, experience, experience square.

Table 58 OLS regression in each industry in 2013

	(1) Industry A	(2) Industry B	(3) Industry C	(4) Industry D
Migrant dummy	-0.262***	-0.131**	-0.211	-0.175
	(-3.2)	(-2.24)	(-1.03)	(-1.53)
Other control variables	Yes	Yes	Yes	Yes
Ownership type	Yes	Yes	Yes	Yes
Region	Yes	Yes	Yes	Yes
Occupation	Yes	Yes	Yes	Yes
Constant	6.583***	6.853***	5.103***	6.123***
	(11.78)	(43.93)	(7.68)	(17.50)
N	795	1567	362	994

Notes: t statistics in parentheses. *** represents significance at 0.01 level. ** represents significance at 0.05 level. The dependent variable is monthly log wages. I use urban price index to change nominal wages into real wages (take the price in 2002 as 1). The urban price index can be found at the website of National Bureau of Statistics in China. Other control variables include educational years, experience, experience square.

Table 59 shows the wage gap between female urban natives and female migrants in each occupation. Female migrants suffer Hukou discrimination when they want to

get high-paying jobs. Only migrants with high ability can get high-paying jobs. Comparing to the case where people are randomly assigned into jobs, the actual wage gap may be underestimated in some jobs. Leaders and "other"' s sample sizes are too small, so I do not analyse them. The wage gaps of professionals, equipment operators and related personnel, and clerks and related personnel decreased consistently from 2002 to 2013, because discrimination decreased. The wage gap among business and service workers increased first and then decreased. The economy developed fast in 2007 and the labour demand increased. Many female rural residents with low human capital became business and service workers in urban areas and became rural-to-urban migrants. The gap of human capital between female rural-to-urban migrants and female urban natives among business and service workers became larger in 2007, so the wage gap increased. In 2013 the discrimination decreased, so the wage gap among business and service workers decreased. The wage gap was the highest among professionals in 2002 and 2007, and was the highest among clerks and related personnel in 2013, because professionals and clerks and related personnel need to have high human capital, while the difference of human capital between migrants and urban natives was large. The wage gaps among business and service workers, and equipment operators and related personnel were the lowest, because business and service workers and equipment operators and related personnel do not need to have high human capital.

Table 59 The wage gap between female urban natives and female migrants in each occupation

occupation	2002	2007	2013
professionals	0.45	0.41	0.21
clerks and related personnel	0.41	0.34	0.25
business and service workers	0.30	0.34	0.15
equipment operators and related personnel	0.38	0.09	0.05

Notes: I use urban price index to change nominal wages into real wages (take the price in 2002 as 1). The urban price index comes from the website of National Bureau of Statistics in China. The wage gap=(female urban natives' average wage-female migrants' average wage)/ female urban natives' average wage.

Then I calculate the wage gap in each occupation with some variables controlled. The result is shown in table 60-62. In these tables, column (1) shows the result of professionals; column (2) shows the result of clerks and related personnel; column (3) shows the result of business and service workers; column (4) shows the result of equipment operators and related personnel. In 2002 the wage gap was significant among business and service workers and equipment operators and related personnel, and was not significant among professionals and clerks and related personnel. Female

rural-to-urban migrants as business and service workers and equipment operators and related personnel had low educational levels and their bargaining power was low, so the discrimination was higher among these workers, and the wage gap was significant. Female rural-to-urban migrants as professionals and clerks and related personnel had higher educational levels, so the discrimination was not so severe and the wage gap was not significant. In 2007 and 2013 the wage gap among equipment operators and related personnel was not significant, and the wage gap among other occupations was significant. In 2007 and 2013 the discrimination decreased, so the wage gap among equipment operators and related personnel was not significant. The ability gap increased so the wage gap among other occupations was significant.

Table 60 OLS regression in each occupation in 2002

	(1)	(2)	(3)	(4)
Migrant dummy	-0.046	-0.120	-0.204***	-0.428***
	(-0.39)	(-0.83)	(-2.62)	(-4.33)
Other control variables	Yes	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes
Region	Yes	Yes	Yes	Yes
Ownership type	Yes	Yes	Yes	Yes
Constant	5.026***	5.416***	5.325***	5.445***
	(14.03)	(19.80)	(11.58)	(18.22)
N	544	529	484	473

Notes: t statistics in parentheses. *** represents significance at 0.01 level. The dependent variable is monthly log wages. I use urban price index to change nominal wages into real wages (take the price in 2002 as 1). The urban price index can be found at the website of National Bureau of Statistics in China. Other control variables include education years, experience, experience square.

Table 61 OLS regression in each occupation in 2007

	(1)	(2)	(3)	(4)
Migrant dummy	-0.621***	-0.301***	-0.091*	0.047

	(-3.75)	(-2.87)	(-1.87)	(0.67)
Other control variables	Yes	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes
Region	Yes	Yes	Yes	Yes
Ownership type	Yes	Yes	Yes	Yes
Constant	7.819***	8.064***	5.960***	6.807***
	(16.19)	(14.31)	(17.05)	(21.35)
N	327	411	1333	583

Notes: t statistics in parentheses. * represents significance at 0.1 level. *** represents significance at 0.01 level. The dependent variable is monthly log wages. I use urban price index to change nominal wages into real wages (take the price in 2002 as 1). The urban price index can be found at the website of National Bureau of Statistics in China. Other control variables include education years, experience, experience square.

Table 62 OLS regression in each occupation in 2013

	(1)	(2)	(3)	(4)
Migrant dummy	-0.137**	-0.137*	-0.176***	-0.031
	(-2.12)	(-1.79)	(-4.8)	(-0.67)
Other control variables	Yes	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes
Region	Yes	Yes	Yes	Yes
Ownership type	Yes	Yes	Yes	Yes
Constant	6.150***	5.803***	8.483***	6.582***
	(10.00)	(10.68)	(12.36)	(12.35)
N	816	657	1097	500

Notes: t statistics in parentheses. *** represents significance at 0.01 level. **

represents significance at 0.05 level. * represents significance at 0.1 level. The dependent variable is monthly log wages. I use urban price index to change nominal wages into real wages (take the price in 2002 as 1). The urban price index can be found at the website of National Bureau of Statistics in China. Other control variables include education years, experience, experience square.

3.4 Robustness Checks

When decompose the wage gap between rural-to-urban migrants and urban natives, I use monthly wage, but it is not precise enough because the wage gap may be caused by different working hours between the two groups. Therefore, in this section, I use hourly wage to calculate the structural effect.

Table 63 shows the result of Oaxaca-Blinder decomposition using hourly wage. The trends of the value of composition effect and structural effect are the same with the result using monthly wage.

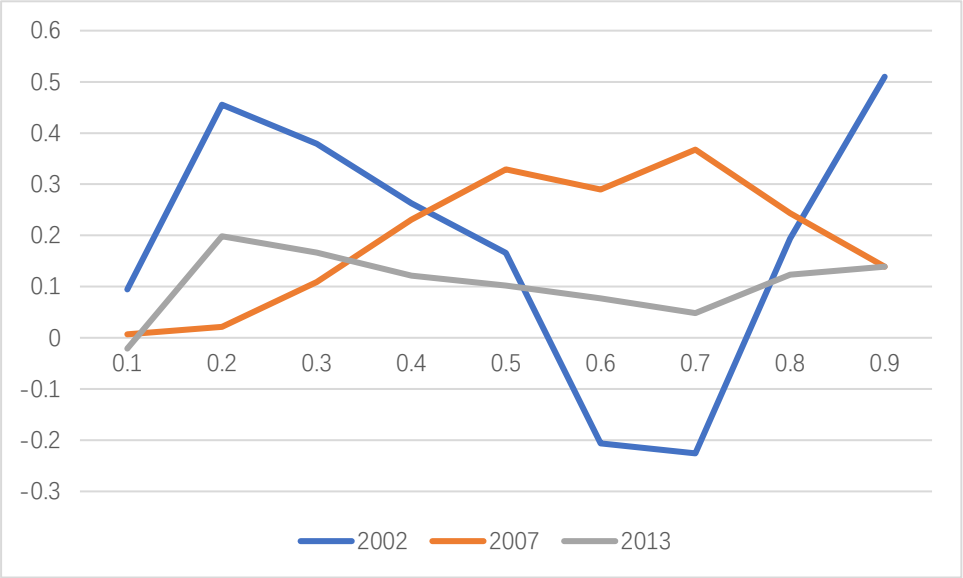
Table 63 Oaxaca-Blinder decomposition using hourly wage

		2002	2007	2013
composition effect	value	0.3573	0.2558	0.1494
	percentage	37.83%	40.73%	42.37%
structural effect	value	0.5871	0.3722	0.2032
	percentage	62.17%	59.27%	57.63%

Notes: I use urban price index to change nominal wages into real wages (take the price in 2002 as 1). The urban price index comes from the website of National Bureau of Statistics in China.

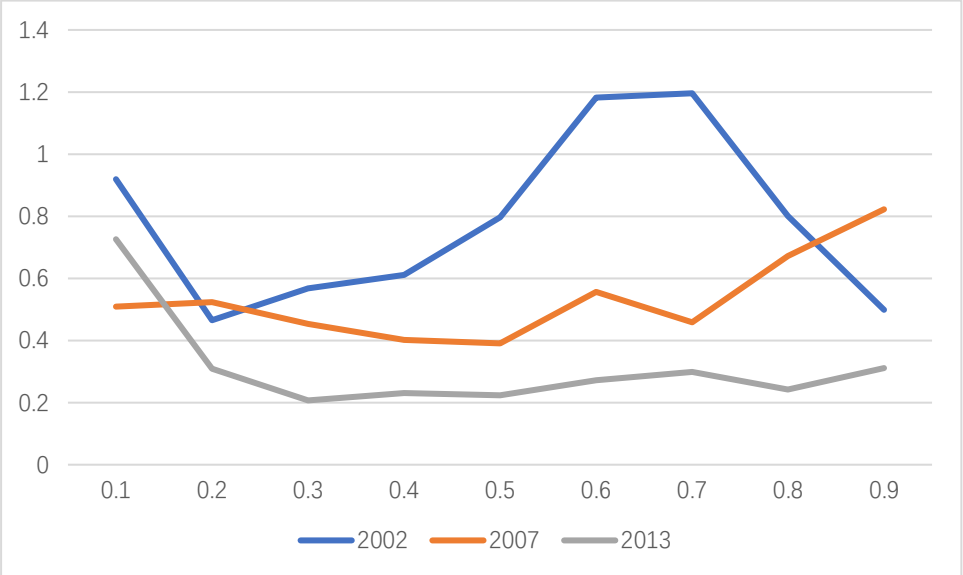
Then I use FFL decomposition method based on RIF regression to decompose the wage gap at each quantile. The result is shown in figure 21-22. As wage quantile increased, composition effect fluctuated in 2002, 2007 and 2013; structural effect fluctuated in 2002, increased in 2007 and decreased in 2013. In general, the result is robust.

Figure 21 Composition effect using hourly wage



Notes: The X-axis is wage quantile, and the Y-axis is the composition effect.

Figure 22 Structural effect using hourly wage



Notes: The X-axis is wage quantile, and the Y-axis is the structural effect.

Then I use educational qualification dummies to replace educational years and run Oaxaca-Blinder decomposition. The results area shown in table 64. The value of composition effect decreased, and the value of structural effect decreased consistently. The trends of the value of composition effect and structural effect are robust.

Table 64 Oaxaca-Blinder decomposition (robustness check)

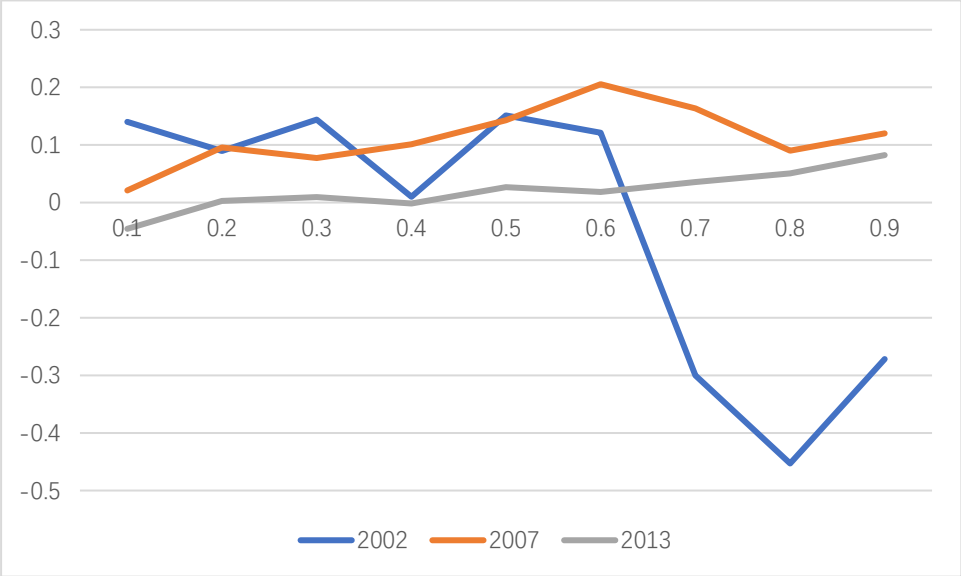
		2002	2007	2013
composition	value	0.1523	0.1448	0.1297

effect	percentage	31.87%	42.85%	40.38%
structural effect	value	0.3256	0.1931	0.1915
	percentage	68.13%	57.15%	59.62%

Notes: I use urban price index to change nominal wages into real wages (take the price in 2002 as 1). The urban price index comes from the website of National Bureau of Statistics in China.

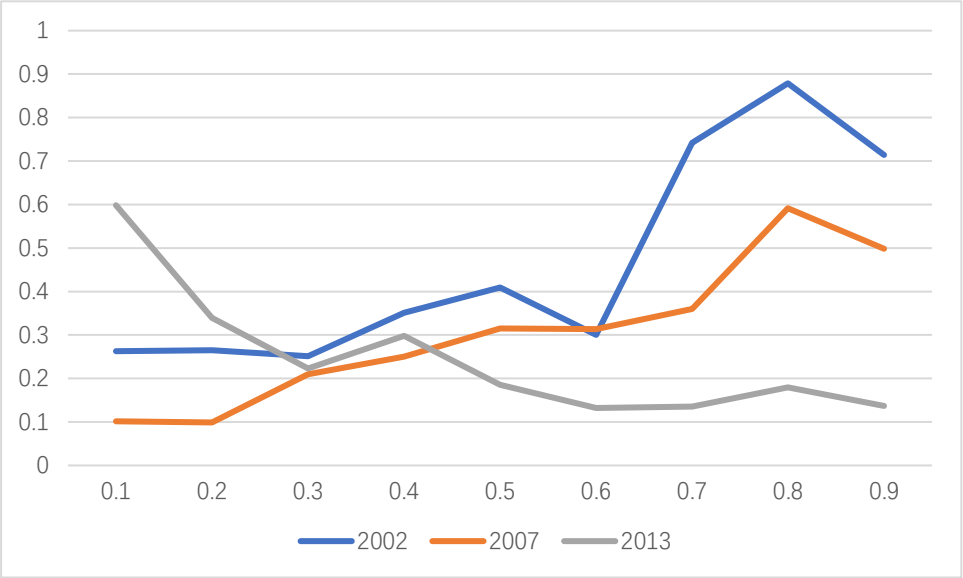
Then I use FFL decomposition method based on RIF regression to decompose the wage gap at each quantile. The result is shown in figure 23-24. As wage quantile increased, the composition effect first fluctuated and then decreased in 2002, fluctuated in 2007, and increased in 2013; the structural effect increased in 2002 and 2007 and decreased in 2013. The result is robust.

Figure 23 Composition effect (robustness checks)



Notes: The X-axis is wage quantile, and the Y-axis is the composition effect.

Figure 24 Structural effect (robustness checks)



Notes: The X-axis is wage quantile, and the Y-axis is the structural effect.

3.5 Conclusions

The wage gap between female rural-to-urban migrants and female urban natives cannot be ignored. The wage gap reached 39% in 2002, 37% in 2007 and 22% in 2013. From an evolutionary perspective, the average wage gap decreased consistently. In general, the raw wage gap increased as wage quantile increased in 2002 and 2007, and decreased in 2013.

With some variables controlled, the wage gap was larger at low wage quantiles in 2002, 2007 and 2013.

Different regions have different levels of economic development. From the perspective of region, the wage gap decreased consistently in developed region over time, decline from 43% to 29%; while the wage gap increased first from 35% to 47%, and then decreased to 21% in developing region over time.

The wage gaps in B, C and D industries decreased from 2002 to 2013. The wage gap in industry A increased first and then decreased from 2002 to 2013. The wage gap was the highest in industry C in 2002, reaching 53%, and was the highest in industry D in 2007 and 2013, reaching 47% and 38% respectively. The wage gap was smallest in industry A in 2002, reaching 30%, and was the smallest in industry B in 2007 and 2013, reaching 28% and 11% respectively.

From the perspective of occupation, the wage gaps of professionals, equipment operators and related personnel, and clerks and related personnel decreased consistently from 2002 to 2013, because discrimination decreased. The wage gap among business and service workers increased first and then decreased. The highest wage gap appeared in occupation of professionals at 2002, reaching 45%; the lowest wage gap appeared in occupations of equipment operators and related personnel at 2013, which was 5%.

In 2002, 2007 and 2013 the wage gap was mainly caused by structural effect. The contribution of structural effect was 67.04%, 54.91% and 55.17% in 2002, 2007 and 2013 respectively. This is because discrimination is gradually decreasing. The value of composition effect decreased consistently. With the process of educational expansion, many female migrants' educational years increased. Many female migrants were competent for jobs requiring high skills, so the composition effect decreased. The value of structural effect decreased consistently, because the contribution of discrimination to the wage gap decreased consistently. In 2004, there was a shortage of rural-to-urban migrants in developed areas. With the continuous expansion of the structural shortage of rural-to-urban migrants, the substantial increase in the human capital of female rural-to-urban migrants, and the combined effects of media propaganda, the discrimination against female rural-to-urban migrants was getting lower and lower.

In 2002 the composition effect fluctuated at low and middle quantiles and was negative at high wage quantiles. In 2007 the composition effect fluctuated between 0 and 0.2. In 2013 the composition effect increased with the increase of wage quantiles. In 2002 the structural effect increased with the increase of wage quantile. In 2007 the structural effect increased with the increase of wage quantile. In 2013 the structural effect decreased with the increase of wage quantile.

Chapter 4 Conclusions, discussion, and policy implications

4.1 Conclusions

There was a gender wage gap of more than 15% between female rural-to-urban migrants and male rural-to-urban migrants. The wage gap between female rural-to-urban migrants and female urban natives was more than 20%.

During the period from 2002 to 2013, the gender wage gap evolved in a U-shape; From the perspective of quantiles, at each wage quantile, the change of the gender wage gap also presented a U-shape. From a regional perspective, the gender wage gap in developed regions had evolved in a U-shape over time, while the gender wage gap in developing regions had shown an increasing trend. From an industry perspective, the gender wage gap in industry A, C and D decreased first and then increased; the gender wage gap in industry B increased consistently. From an education perspective, the gender wage gap among people whose highest educational level was primary school and below increased first and then decreased from 2002 to 2013; the gender wage gap among other groups of people decreased first and then increased from 2002 to 2013. From a training perspective, the more individual workers invest in training, the higher their wages and the smaller the gender wage gap.

The wage gap between female rural-to-urban migrants and female urban natives decreased from 2002 to 2013; in terms of different regions, the wage gap in developed regions had continued to decline, while in developing regions, it had evolved in an inverted U-shape. In terms of industries, the wage gap in industry A increased first and then decreased from 2002 to 2013; the wage gaps in B, C and D industries decreased from 2002 to 2013. Among them, the wage gap was the highest in industry C in 2002, and was the highest in industry D in 2007 and 2013. The wage gap was smallest in industry A in 2002, and was the smallest in industry B in 2007 and 2013. In terms of occupation, the wage gaps of professionals, equipment operators and related personnel, and clerks and related personnel decreased consistently from 2002 to 2013, because discrimination decreased. The wage gap among business and service workers increased first and then decreased.

Through decomposition analysis, it was found that the structural effect was the main component for the gender wage gap, and its contribution exceeded the sum of other factors. The difference of personal characteristics also had an important impact on the gender wage gap.

In the wage gap between female rural-to-urban migrants and female urban residents, in 2002, 2007 and 2013 the wage gap was mainly caused by structural effect. The structural effect mainly included household registration discrimination (Hukou discrimination), and it decreased because China's household registration discrimination had gradually decreased.

From the perspective of evolution, the gender wage gap was difficult to eliminate in a short period of time, while the wage gap between female rural-to-urban migrants

and female urban natives had narrowed relatively quickly and was expected to be eliminated within a short period of time, especially the structural effect.

4.2 Discussion and policy implications

When estimate the structural effect, I use Oaxaca-Blinder decomposition method and FFL decomposition method based on RIF regression. These methods have a drawback: the value of structural effect depends on which covariates are included in regression. If I choose different covariates in regression, the value of structural effect is different. In fact, all methods used to estimate the structural effect have this drawback. This is a problem that needs to be solved in the future. In addition, I do not use recent data, so the results have some limitations.

These wage gaps above are mainly caused by human capital gaps and structure effect. The structure effect includes discrimination. The difference in human capital is mainly reflected in education and skills. Discrimination is mainly manifested in gender discrimination and household registration discrimination. And gender discrimination includes former labour market discrimination against women, which is mainly manifested in education discrimination. This has also led to insufficient human capital for women. Discrimination has also led to unequal employment opportunities. These factors put female rural-to-urban migrants at a disadvantage, leading to a gender wage gap for rural-to-urban migrants and a wage gap between female urban natives and female rural-to-urban migrants. These circumstances indicate that there is still a long way to go to eliminate the gender wage gap between female rural-to-urban migrants and male rural-to-urban migrants and the wage gap between female urban natives and female rural-to-urban migrants.

4.2.1 Increase the human capital of female rural-to-urban migrants

(1) Improve the education level of female rural-to-urban migrants through education with record of formal schooling

First, try to make more rural women have the opportunity to receive a complete nine-year compulsory education.

Second, take the nine-year compulsory education rate of rural women as an indicator for assessing the work of local governments to encourage local governments to take the initiative and give full play to the role in it.

Third, strengthen the propaganda that more education for women can increase their wages and thus improve the living standards of the whole society, prompting families to invest more in women's education.

(2) Improve the professional ability of female rural-to-urban migrants by

strengthening training

First, strengthen the vocational skills training of rural-to-urban migrants, focus on cultivating migrant workers so that they can acquire the skills needed by society, and narrow the wage gap by improving their human capital. The government should increase investment in the training of female rural-to-urban migrants, increase training subsidy standards, expand training coverage, rely on schools and training institutions to improve the skills of female rural-to-urban migrants, and enhance the employability of female rural-to-urban migrants. Promote the national vocational qualification certificate system among rural-to-urban migrants. Through financial subsidies, reduce the cost of rural-to-urban migrants participating in vocational skills appraisal, and encourage rural-to-urban migrants especially female rural-to-urban migrants participating in training to obtain training qualification certificates, vocational competence certificates or vocational qualification certificates through assessment and appraisal.

Second, speed up the development of rural vocational education and improve the employability of the new generation of female rural-to-urban migrants. Implement the existing national stipend and tuition exemption policies for secondary vocational education. Focus on the development of rural secondary vocational education, increase the government's investment in the construction of rural secondary vocational schools and training bases, and expand the enrolment scale of vocational education. Implement free rural secondary vocational education in some places where the local governments can afford it. Actively develop higher vocational education, recruit rural high school and secondary vocational graduates, and train workers to be high-level skilled that meet market needs, subsidies to female peasant students among them so that female rural-to-urban migrants can better meet the needs of the labour market. In this way, not only can their skill level and employability be improved, but also their wages can be increased, which is conducive to narrowing the wage gap.

4.2.2 Gradually eliminate gender discrimination as much as possible

(1) Improving the social status of women

Discrimination is rooted in people’s ideology. Comprehensively improving women’s social status will help eliminate discrimination and narrow the gender wage gap. Increase the proportion and quality of women’s participation in decision-making and management. It is necessary to elect a certain number of female rural-to-urban migrants’ representatives to speak out on issues concerning state management and the rights and interests of female rural-to-urban migrants. At present, there is still much room for Chinese women to improve.

(2) Protect the equal rights of female rural-to-urban migrants through laws and policy

First, legislate and strengthen law enforcement and punish illegal acts in accordance with the law. The government must increase enforcement of existing laws that protect female rural-to-urban migrants’ rights and interests, and make laws the

most powerful weapon to protect female rural-to-urban migrants' interests. For example, those international conventions and declarations that China has signed to protect women and prohibit gender discrimination, the related United Nations General Assembly resolutions, China's domestic laws, such as the *Constitution*, the *Labour Law,* and the *Law on the Protection of Women's Rights and Interests*, *The Employment Promotion Law of the People's Republic of China*, *Anti-Domestic Violence Law of the People's Republic of China*, etc. These laws all contain provisions prohibiting gender discrimination and protecting women's rights and interests. But the implementation of these laws is not satisfactory, there are many violations of these laws that go unpunished. Because these laws are all in principle and lack penalties for violations of the law. Therefore, it is necessary to supplement the detailed rules for penalties for violations.

Second, provide policy guarantee. Because the legislative process is long and the formulation of policies is relatively quick, therefore, national policies should also be formulated to protect the rights and interests of women. For existing related policies and plans, such as the "*Notice on Further Regulating Recruitment Behaviour and Promoting Women's Employment*", "*China Women's Development Program (2011-2020)*", "*National Human Rights Action Plan (2016-2020)*", etc. A good job of implementation must be done. Such special policies must be formulated to protect female rural-to-urban migrants, the largest vulnerable group.

4.2.3 Accelerate the reform of the household registration system and eliminate household registration discrimination

Accelerate the reform of the household registration system, no longer distinguish between rural and urban household registration, and eliminate the root causes of household registration discrimination. Now, many small towns have carried out this reform, but its scope and extent are not enough, and it needs to be expanded to medium and large cities. This problem can be solved fundamentally by completely abolishing the distinction between urban and rural household registration.

Appendix

Appendix A Gender pay gap

Table A1 Gender pay gap

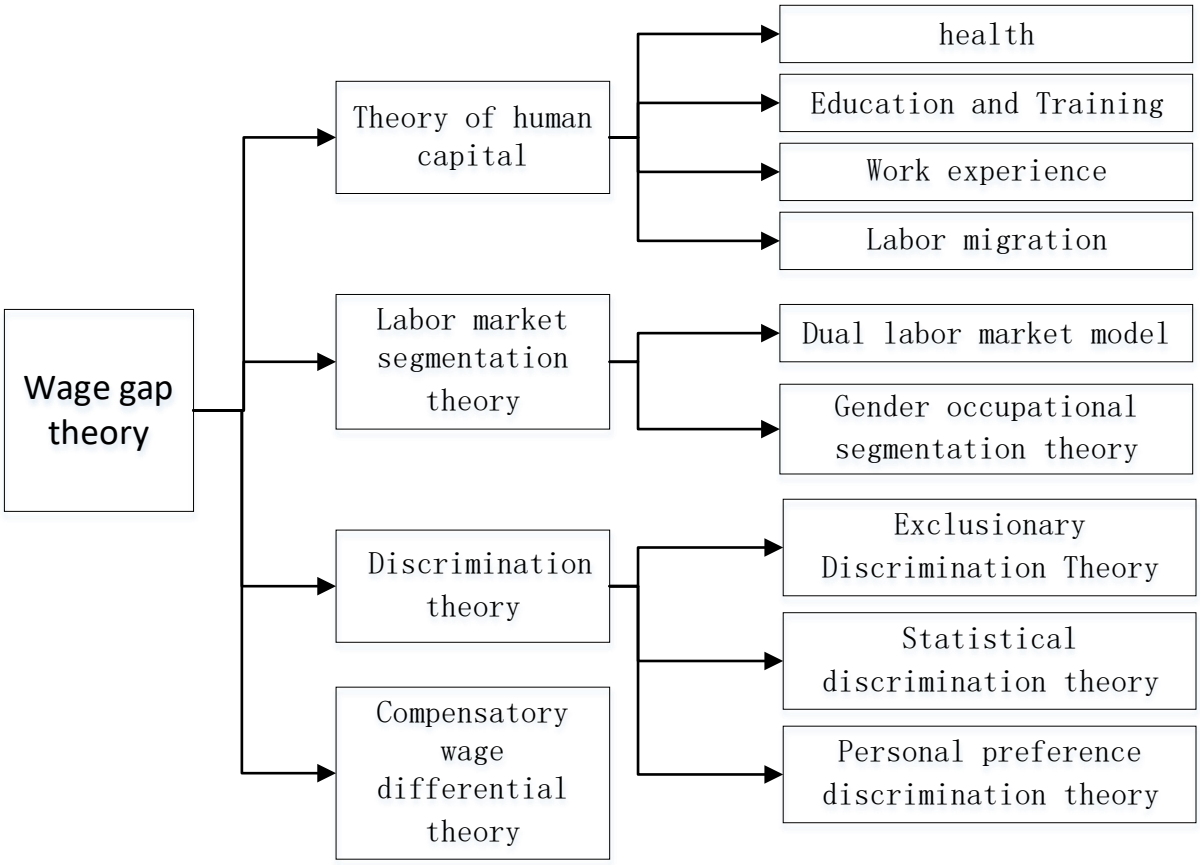
Country category	Country	Average gender wage gap (%)	Country category	Country	Gender median wage gap (%)
High-income	Netherlands	39.7	High-income	Netherlands	40.3
	South Korea	36.7		Switzerland	37.5
	United Kingdom	36.3		South Korea	36.0
	Switzerland	36.1		United Kingdom	35.2
	Australia	31.5		Australia	30.2
	Estonia	29.5		Estonia	29.6
	Norway	28.7		Canada	27.0
	Canada	25.6		America	25.7
	Argentina	25.0		Argentina	24.1
	Italy	24.5		Uruguay	23.9
	America	23.5		Spain	21.9
	France	23.4		Norway	21.3
	Spain	23.2		Chile	21.2
	Uruguay	23.0		Finland	20.2
	Czech Republic	22.8		Portugal	19.9
	Sweden	22.6		Belgium	18.4
	Finland	22.4		Czech Republic	18.0
	Belgium	22.4		France	17.6
	Slovakia	22.0		Slovakia	17.5
	Chile	21.6		Sweden	17.5
	Luxembourg	19.9		Italy	16.9
	Portugal	19.3		Cyprus	15.4
	Poland	18.9		Latvia	15.0
	Malta	18.6		Luxembourg	14.4
	Cyprus	17.7		Malta	14.2
	Lithuania	17.0		Poland	13.0
	Latvia	16.8		Lithuania	9.7
	Hungary	15.1		Hungary	6.5
	Slovenia	7.6		Slovenia	5.1
	Panama	-0.7		Panama	0
	High income	25.6		High income	24.9
	Armenia	34.1		Armenia	35.0

Upper middle income	South Africa	28.6	Upper middle income	South Africa	30.8
	Russia	27.6		Russia	30.6
	Peru	21.2		Peru	21.8
	Mexico	20.2		Brazil	20.8
	Brazil	20.1		China	20.0
	China	19.0		Turkey	19.2
	Bulgaria	14.6		Mexico	16.7
	Paraguay	12.3		Albania	13.3
	Turkey	9.3		Costa Rica	11.9
	Albania	8.3		Namibia	10.7
	Costa Rica	7.8		Paraguay	10.6
	Romania	5.5		Ecuador	4.6
	Namibia	1.9		Bulgaria	2.1
	Jordan	1.9		Romania	1.8
	Ecuador	1.8		Jordan	0
	Thailand	0		Thailand	-2.5
	Upper middle income	19.2		Upper middle income	20.2
lower middle income	Pakistan	42.9	lower middle income	Pakistan	62.5
	Ukraine	25.4		Indonesia	28.6
	Sri Lanka	18.4		Ukraine	25.6
	Indonesia	17.8		Sri Lanka	23.5
	Mongolia	14.0		Tunisia	18.4
	Egypt	13.5		Mongolia	16.7
	Vietnam	10.5		Egypt	11.1
	Tunisia	8.6		Vietnam	8.9
	Bangladesh	7.2		Salvador	6.1
	Salvador	4.6		Bangladesh	4.7
	Cape Verde	4.1		Philippines	2.6
	Philippines	-6.6		Cape Verde	0
	lower middle income	15.8		lower middle income	22.3
Low income	Sierra Leone	46.6	Low income	Nepal	44.7
	Gambia	44.3		Malawi	31.9
	Nepal	37.1		Gambia	28.0
	Malawi	36.2		Tanzania	25.0
	Madagascar	28.0		Madagascar	25.0
	Tanzania	12.2		Sierra Leone	-5.5
	Low income	28.2		Low income	31.7
worldwide		20.5	worldwide		21.8

Data source: International Labour Organization: *2018/2019 Global Wage Report*.
Note: It is based on monthly wages.

Appendix B Existing wage gap theory

Figure B1 Existing wage gap theory



Note: drawn by the author.

Appendix C The average wage within industry

Table C1 The average wage within industry

	2002		2007		2013	
	males	females	males	females	males	females
A	1562.92	714.03	1481.11	1252.30	2759.65	2000.98
B	845.26	713.20	1537.65	1261.47	2613.32	1901.71
C	1385.78	639.85	1448.18	1201.41	2600.16	2053.07
D	918.24	638.27	1360.37	1077.04	2165.87	1616.39

Notes: I use urban price index to change nominal wages into real wages (take the price in 2002 as 1). The urban price index comes from the website of National Bureau of Statistics in China. The sample size is 2056 in 2002, 4796 in 2007 and 600 in 2013.

Appendix D The gender wage gap in each occupation

Table D1 shows the gender wage gap within occupations. The number of observations of leaders is too small, so I do not analyse it. In 2002 the gender wage gap was the highest among equipment operators and related personnel, and lowest among clerks and related personnel, and business and service workers. In 2007 the gender wage gap was the highest among professionals, and lowest among equipment operators and related personnel. In 2013 the gender wage gap was the highest among “others”, and lowest among clerks and related personnel. The gender wage gaps decreased consistently among professionals, clerks and related personnel, and business and service workers from 2002 to 2013; the gender wage gaps among equipment operators and related personnel, and “others” decreased first and then increased from 2002 to 2013. Workers whose occupations are classified as "others" have great differences in their occupational nature. Both the investigator and the respondent consider it inappropriate to belong to a certain occupation, so they are classified as "others"; Due to the lack of an analysis basis, this article will not make a specific analysis of "other" occupations. Professionals, clerks and related personnel have many similarities. For some people employed in the public economy, under the influence of policies, the gender wage gap was getting lower and lower; With the development of Chinese society, the degree of social informatization is getting higher and higher, and the statistical discrimination caused by incomplete information is getting lower and lower. Workers have more and more information about the wages of related positions, and their wage bargaining power increases. Under the influence of these two factors, the gender wage gap among non-public economic workers was also getting lower and lower. Therefore, these two occupations show a trend of declining gender wage gap over time. In Business and service workers, women have advantages, and the gender wage gap was the smallest, which had been declining year after year. Among equipment operators and related personnel, the human capital of women is lower than that of men. Under the combined effect of gender discrimination and human capital, the gender wage gap in this occupation was relatively large. Due to the impact of the overall development of the Chinese economy, the gender wage gap dropped rapidly from a high level in 2002 to a low level in 2007, and then due to public emergencies (the world financial crisis, changes in China’s family planning policy) and the cumulation effects of social changes (With the continuous expansion of college enrolment for many years) and the conduction effect of competition, the gender wage gap rose to a relatively high level in 2013.

Table D1 The gender wage gap within occupations

occupation	2002	2007	2013
professionals	0.38	0.34	0.23
clerks and related personnel	0.21	0.19	0.06

business and service workers	0.21	0.17	0.16
equipment operators and related personnel	0.39	0.15	0.27
others	0.36	0.20	0.38

Notes: I use urban price index to change nominal wages into real wages (take the price in 2002 as 1). The urban price index comes from the website of National Bureau of Statistics in China. The gender wage gap = (males wages – female wages)/male wages.

Table D2 shows the gender wage gap among each occupation in each region in 2002. The gender wage gap was the highest among professionals, and lowest among clerks and related personnel, and business and service workers in developed region. This is because developed region have attracted many excellent professionals from all over the country. These professionals are mostly men and have a large gap in human capital between the sexes. Women have advantages in clerks and related personnel, and business and service workers, so the gender wage gap was the lowest. The gender wage gap was the highest among equipment operators and related personnel, and lowest among clerks and related personnel in developing region. After a large number of outstanding professionals in developing region left, the difference in human capital between male and female professionals in developing region declined, which was much lower than that in developed region. Therefore, the gender wage gap was much smaller than in developed region. At the same time, the equipment operators and related personnel in developing region had a large difference in human capital between the sexes. Coupled with the effect of gender discrimination, it formed the largest gender wage gap in developing region. Clerks and related personnel and business and service workers are greatly affected by the degree of marketization in developed region, and marketization in developed region was basically completed, so the gender wage gap in these occupations was larger than that in developing region; however, the degree of marketization in developing region was not high. In these occupations where women had advantages, the gender wage gap was very small. Female rural-to-urban migrants as clerks and related personnel occupations in developing region had even higher wages than male rural-to-urban migrants.

The gender wage gap in developed region was lower than that in developing region among equipment operators and related personnel, while the gender wage gap in developed region was higher than that in developing region among other occupations. The cost of living in developed region is high, and most of China's labour-intensive industries are concentrated there. Rural-to-urban migrants who are equipment operators and related personnel are mainly employed in these industries. Their wages are not high. If the gender wage gap is too large, it will be difficult for female rural-to-urban migrants to maintain basic survival, or they can only meet their survival needs, but they cannot meet their desire to accumulate some capital for future work and life; In developing region, the cost of living is not high. Although the gender wage gap between rural-to-urban migrants as equipment operators and related personnel is too large, their life needs and aspirations to accumulate some capital can be met. Therefore, in developing region the gender wage gap of rural-to-urban

migrants was the largest among equipment operators and related personnel.

Table D2 The gender wage gap among each occupation in each region in 2002

occupation	developed region	developing region
professionals	0.44	0.19
clerks and related personnel	0.25	-0.09
business and service workers	0.25	0.10
equipment operators and related personnel	0.37	0.52
others	0.40	0.21

Notes: I use urban price index to change nominal wages into real wages (take the price in 2002 as 1). The urban price index comes from the website of National Bureau of Statistics in China. The gender wage gap = (males wages – female wages)/male wages.

Table D3 shows the gender wage gap among each occupation in each region in 2007. The number of observations of professionals and leaders in each region is too small, so I do not analyse professionals and leaders.

As mentioned above, rural-to-urban migrants engaged in "others" occupations are not analysed (the same below). The gender wage gap was the highest among “clerks and related personnel”, and lowest among business and service workers in developed region. The gender wage gap was the highest among clerks and related personnel, and lowest among equipment operators and related personnel in developing region. The gender wage gap in developed region was lower than that in developing region among all occupations. Marketization in developed region was basically completed in 2007, gender discrimination fell to the lowest level, gender wage gap also fell to the lowest level, and gender wage gaps in all occupations were basically the same; In 2007, developing region were still in the stage of marketization, and the level of gender discrimination was on the rise. The gender wage gap in developing region exceeded that in developed region in all occupations. This is the typical difference in gender wage gap caused by geospatial factors.

Table D3 The gender wage gap among each occupation in each region in 2007

occupation	developed region	developing region
clerks and related personnel	0.17	0.27
business and service workers	0.12	0.25

equipment operators and related personnel	0.15	0.21
others	0.18	0.27

Notes: I use urban price index to change nominal wages into real wages (take the price in 2002 as 1). The urban price index comes from the website of National Bureau of Statistics in China. The gender wage gap = (males wages – female wages)/male wages.

Table D4 shows the gender wage gap among each occupation in each region in 2013. The number of observations of professionals and leaders in each region is too small, so I do not analyse professionals and leaders.

The gender wage gap was the highest among "equipment operators and related personnel", and lowest among clerks and related personnel in developed region and developing region. The gender wage gap in developed region was lower than that in developing region among clerks and related personnel, and business and service workers; the gender wage gap in developed region was higher than that in developing region among equipment operators and related personnel. In 2013, developing region have basically completed marketization, and gender discrimination in various occupations has also reached a high level due to the three factors mentioned above. The gender wage gap in clerks and related personnel and business and service workers was higher than that in developed region; Although the gender wage gap for equipment operators and related personnel in developing region was lower than that in developed region, the two were relatively close, and both were at the peak of the gender wage gap in various occupations in the region (except for others).

Table D4 The gender wage gap among each occupation in 2013

occupation	developed region	developing region
clerks and related personnel	0.04	0.08
business and service workers	0.08	0.26
equipment operators and related personnel	0.30	0.27
others	0.40	0.30

Notes: I use urban price index to change nominal wages into real wages (take the price in 2002 as 1). The urban price index comes from the website of National Bureau of Statistics in China. The gender wage gap = (males wages – female wages)/male wages.

Table D5 shows the gender wage gap among clerks and related personnel across wage distribution. The gender wage gap decreased and then increased as quantile increased in 2002, 2007 and 2013. In 2013 male wages were lower than female wages at 0.25, 0.5 and 0.75 quantile, while male wages were higher than female wages at quantiles lower than 0.25 and higher than 0.75. Women's human capital in this occupation had increased rapidly, and the gender wage gap had been narrowing. By

2013, women's human capital surpassed men's, so the gender wage gap for women at all quantiles had become a negative number.

Table D5 The gender wage gap among clerks and related personnel across wage distribution

Quantile	2002	2007	2013
0.25	0.29	0.17	-0.08
0.5	0.13	0.13	-0.37
0.75	0.18	0.23	-0.09

Notes: I use urban price index to change nominal wages into real wages (take the price in 2002 as 1). The urban price index comes from the website of National Bureau of Statistics in China. The gender wage gap = (males wages – female wages)/male wages.

Table D6 shows the gender wage gap among business and service workers across wage distribution. As quantile increased the gender wage gap increased consistently in 2002, while increased first and then decreased in 2007 and 2013. In this occupation, the human capital of men had always been higher than that of women. In 2013, the human capital gap widened, which led to the expansion of the gender wage gap.

Table D6 The gender wage gap among business and service workers across wage distribution

Quantile	2002	2007	2013
0.25	0.13	0.15	0.17
0.5	0.17	0.23	0.3
0.75	0.3	0.17	0.23

Notes: I use urban price index to change nominal wages into real wages (take the price in 2002 as 1). The urban price index comes from the website of National Bureau of Statistics in China. The gender wage gap = (males wages – female wages)/male wages.

Table D7 shows the gender wage gap among equipment operators and related personnel across wage distribution. As quantile increased the gender wage gap decreased first and then increased in 2007, while increased first and then decreased in 2002 and 2013. This occupation requires not only good education and experience human capital, but also good physical fitness. The gender wage gap includes both the gap caused by human capital and the gap caused by discrimination. In the occupational stratum, it belongs to the middle-income stratum, and the influence of competition from other upper strata is very small. In the low-wage quantile, human capital had a large impact. With the growth of female human capital over time, the gender wage gap at low-wage quantiles had gradually decreased. In the high-income quantile, there was also a compensatory gender wage gap. Men got more

compensatory wages due to their physical advantages. Under the combined effect of this factor and gender discrimination, the gender wage gap had widened. However, due to the increase in women's human capital, the gender wage gap had decreased. However, in general, gender wage gap was still high. At 0.5 quantile, discrimination and human capital gap together created the highest gender wage gap in 2002; In 2007, discrimination was drastically reduced, and the gender wage gap was minimized; In 2013, employment competition intensified, gender discrimination rose again, and the gender wage gap also widened.

Table D7 The gender wage gap among equipment operators and related personnel across wage distribution

Quantile	2002	2007	2013
0.25	0.25	0.17	0.08
0.50	0.38	0.13	0.23
0.75	0.36	0.25	0.20

Notes: I use urban price index to change nominal wages into real wages (take the price in 2002 as 1). The urban price index comes from the website of National Bureau of Statistics in China. The gender wage gap = (males wages – female wages)/male wages.

Table D8 shows the gender wage gap across wage distribution among clerks and related personnel in each region. In developed region as the wage quantile increased the gender wage gap decreased first and then increased in 2002 and 2013, and increased first and then decreased in 2007. In developing region as the wage quantile increased the gender wage gap increased in 2002 and 2007, and increased first and then decreased in 2013. In 2002, the marketization of developed region was basically completed, and gender discrimination was at a high level, resulting in a large gender wage gap; In the developing region, due to the insufficient development of the market economy, in the occupation of clerks and related personnel, women's wages were higher than men's due to the advantages of women in human capital. In 2007, discrimination in developed region generally declined, especially at the low and high ends of wage, and the gender wage gap dropped significantly; however, since the developing region was in the stage of market economy development, discrimination had increased, and relatively large gender wage discrimination had appeared. Women's human capital had increased rapidly. Relying on their advantages in human capital, women in this occupation in developed region earned more than men's wages in 2013, and the gender wage gap became negative; In developing region, women relied on their human capital advantages to narrow the gender wage gap.

Table D8 The gender wage gap across wage distribution among clerks and related personnel in each region

	quantile	developed region	developing region
2002	0.25	0.24	-0.43
	0.5	0.21	-0.11
	0.75	0.25	0
2007	0.25	0.14	0.11
	0.5	0.26	0.17
	0.75	0.15	0.33
2013	0.25	-0.08	0.07
	0.5	-0.36	0.17
	0.75	-0.27	0.09

Notes: I use urban price index to change nominal wages into real wages (take the price in 2002 as 1). The urban price index comes from the website of National Bureau of Statistics in China. The gender wage gap = (males wages – female wages)/male wages.

Table D9 shows the gender wage gap across wage distribution among business and service workers in each region. In developed region as the wage quantile increased the gender wage gap increased in 2002 and 2007, and increased first and then decreased in 2013. In developing region as the wage quantile increased the gender wage gap decreased in 2002, decreased first and then increased in 2007, and increased first and then decreased in 2013. In this occupation women have advantages. In developed region, discrimination in this occupation resulted in a high gender wage gap in 2002; Discrimination declined in 2007, and the gender wage gap declined to varying degrees at all quantiles; In 2013, due to the conduction effect of competition, the gender wage gap increased in the middle and low quantiles of this occupation, but not in the high quantiles, and the gender wage gap further decreased. In developing region, the human capital gap in 2002 led to a large gender wage gap, especially at low wage quantiles; In 2007, discrimination at low and middle wage quantiles in the developing region declined, and the gender wage gap narrowed, and at high wage quantiles, gender wage gap expanded due to human capital gap; In 2013, due to the conduction effect of competition, the gender wage gap in developing region generally widened. This shows that the conduction effect not only occurs from the high end of the wage to the low end, but also can be conducted from the developed region to the developing region.

Table D9 The gender wage gap across wage distribution among business and service workers in each region

	quantile	developed region	developing region
2002	0.25	0.10	0.25
	0.5	0.26	0.20
	0.75	0.30	0.14
2007	0.25	0.09	0.22
	0.5	0.13	0.10
	0.75	0.20	0.23
2013	0.25	0.14	0.20
	0.5	0.16	0.33
	0.75	0.06	0.29

Notes: I use urban price index to change nominal wages into real wages (take the price in 2002 as 1). The urban price index comes from the website of National Bureau of Statistics in China. The gender wage gap = (males wages – female wages)/male wages.

Table D10 shows the gender wage gap across wage distribution among equipment operators and related personnel in each region. In developed region as the wage quantile increased the gender wage gap increased in 2002, decreased first and then increased in 2007, and increased first and then decreased in 2013. In developing region as the wage quantile increased the gender wage gap increased in 2002, increased first and then decreased in 2007, and decreased first and then increased in 2013. Equipment operators and related personnel is an occupation that requires a certain amount of educational human capital, work experience and physical fitness. In developed region, there was a high gender wage gap in 2002 due to discrimination and human capital gap; Discrimination weakened in 2007, more women became skilled workers, and the gender wage gap in all quantiles was significantly reduced; In 2013, there was a shortage of skilled workers in developed region. In order to recruit new equipment operators and related personnel, employers narrowed the gender wage gap among rural-to-urban migrants at low wage quantile; at high wage quantile, in order to retain employees, the gender wage gap had also been narrowed; due to the relative stability of employees in the middle-income group, the gender wage gap in the middle-income group was still relatively large, which compensated for the employer's loss to a certain extent. In developing region, this occupation is a male-dominated occupation, and the gender wage gap has always been large. In 2002, due to human capital gap and discrimination in developing region, this occupation had a very high gender wage gap; In 2007, discrimination generally declined, and the gender wage gap in this occupation was also generally narrowed; In 2013, the conduction of competition had produced a cross-regional effect. In order to compete with developed region and recruit more new male employees, employers gave them higher wages, which widened the gender wage gap at low wage quantiles; In order to retain high-

paid skilled workers, employers also gave them higher wages, widening the gender wage gap at high wage quantiles; Female skilled workers were mainly in the middle-income group due to discrimination. In order to retain these female employees, employers had also increased their wages, resulting in a narrowing of the gender wage gap at middle wage quantiles. On the whole, the difference in geographic space between developing region and developed region affects the gender wage gap between the two regions.

Table D10 The gender wage gap across wage distribution among equipment operators and related personnel in each region

	quantile	developed region	developing region
2002	0.25	0.17	0.40
	0.5	0.34	0.43
	0.75	0.42	0.50
2007	0.25	0.15	0.20
	0.5	0.07	0.29
	0.75	0.23	0.22
2013	0.25	0.12	0.27
	0.5	0.24	0.13
	0.75	0.14	0.35

Notes: I use urban price index to change nominal wages into real wages (take the price in 2002 as 1). The urban price index comes from the website of National Bureau of Statistics in China. The gender wage gap = (males wages – female wages)/male wages.

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