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Research Article

Has Internet Usage Really Narrowed the Gender Wage Gap?: Evidence from Chinese General Social Survey Data

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Based on the data from a sample of 4832 from the Chinese General Social Survey in 2018, this study examines the impact of Internet usage on the wage equation for males and females by using the robust least squares regression method, the threshold regression method, and the quantile regression method and decomposes the gender wage gap on this basis by using the RIF regression decomposition method. The findings show that, firstly, in either linear or nonlinear effects, Internet usage has a significant wage premium effect on the male wage equation, and this premium effect increases as male wage income rises, but Internet usage consistently does not have a significant effect on the female wage equation. Secondly, 26.73% of the overall gender wage gap is due to Internet usage, and the presence of gender discrimination in the cyberspace is a significant contributor to this result. Thirdly, Internet usage causes the gender wage gaps at different wage levels to be further widened to different degrees. Specifically, Internet usage has the strongest effect on the gender wage gap at lower wage levels, the second strongest effect on the gender wage gap at higher wage levels, and the weakest effect on the gender wage gap at middle wage levels. The different levels of gender discrimination experienced by females in the cyberspace are an important cause of the differential widening effect of Internet usage on gender wage gaps at different wage levels. Therefore, this study proposes policy recommendations in terms of regulating gender discrimination and introducing relevant female protection policies.

1. Introduction

An important issue that needs to be addressed in China's current labor market is the unequal wage between the males and females, which always manifests itself in a significantly lower wage level for females than for males. Despite the increasing importance of females in the labor market in recent years, the average wage level of females is still only about 75% to 85% of males' wages [1]. Even considering the differences in production characteristics, the average wage level of females is still much lower than that of males, and the wage gap is growing with the continuous development of the market economy, even gradually showing the "glass ceiling" effect and the "sticky floor" effect of the coexistence of the two phenomena [2–4]. In this context, narrowing the gender wage gap is not only related to the effective implementation of China's basic national policy of gender equality but also closely related to China's overall social harmony and sustainable economic development [5].

At the same time, with the continuous development of the digital economy, China's digital economy has reached 45.5 trillion yuan (RMB) in 2021, accounting for 39.8% of GDP, and the digital economy has become an important force in driving sustainable economic growth. Along with the continuous advancement of digitalization, the Internet, as the underlying technology of various digital technologies such as artificial intelligence, blockchain, and big data [6], it is bound to have a profound impact on China's economic and social development [7]. On the one hand, the Internet has a positive impact on the production and operation mode of enterprises, effectively improving the operational efficiency of enterprises [8]. On the other hand, the Internet has changed the way people live and work to a great extent [9]. People's use of the Internet not only reduces information asymmetry, improves communication efficiency,

enriches information resources, improves employment search methods, accelerates human capital accumulation, and thus has a premium effect on people's wage levels [10–13], it also weakens the physical requirements of traditional labor and frees people from traditional labor, allowing them to engage in more creative work and more diversified forms of work, thus having a considerable impact on the labor market [9, 11].

So, will the Internet have an impact on the gender wage gap? If the Internet does have an impact on the gender wage gap, how will the Internet affect the gender wage gap? The above questions deserve in-depth study. To this end, based on the Chinese General Social Survey data in 2018, this study examines the linear effect of Internet usage on the gender wage equation using the method of robust least squares regression, constructs a threshold regression model to test whether there is a nonlinear threshold effect of Internet usage on the gender wage equation, and decomposes the gender wage equation using the method of RIF mean regression decomposition on this basis to examine the impact of Internet usage on the gender wage gap and the extent of its contribution. In addition, in order to avoid endogeneity of the empirical results due to differences in the distribution of the dependent variable, this study further constructs quantile regression models to examine how Internet usage differentially affects the gender wage equation at different wage levels and accordingly conducts a decomposition analysis of the gender wage gap at different quantile points to examine the impact of Internet usage on the gender wage gap at different wage levels and its contribution.

2. Literature Review

In recent years, the gender wage gap, a topic that integrates macroeconomy and culture, mesoorganization and institution, and microfamily and individual issues, has received extensive attention from Chinese academics [14]. A large number of Chinese social scientists have explored the factors and mechanisms that influence the gender wage gap in terms of education level, marital behavior, and intergenerational support.

In terms of education level, Chinese academics generally agree that education level is an important reason for widening the gender wage gap. Based on data from the College Graduate Employment Survey in 2009, Yang and Cheng found that the gender wage gap exists to varying degrees in all industries and that the gap increases as the education level of the workforce increases [15]. Based on data from the 2007-2008 Chinese Household Income Survey, Chen and Zhao found that the higher education level of the female force, the larger the wage gap with the male labor force [16]. Based on data from the 2011 China Health and Nutrition Survey, Yuan and Zhou found that higher education further widens the gender wage gap [17]. Dong et al. composed mixed cross-sectional data from the Chinese General Social Survey for nine periods from 2003-2017 and found that compared to males, females are not only at a persistent disadvantage in terms of personal income, but their standard of living also changes from advantage to disadvantage. Males gain much more than females by improving their education level, which is an important reason for the gender wage gap [5]. However, some Chinese scholars believe that education level can reduce the gender wage gap. Based on data from the 1% Population Sample Survey in 2005 and the China Labor Force Dynamics Survey in 2011, Xing et al. found that an increase in the education level of the female labor force can significantly reduce the wage gap with the male [18]. Based on data from the 2013 China Household Income Survey, Han and Hou found that compared to males, females' years of education only yield higher wage returns when they meet the job requirements, which in turn reduces the gender wage gap [1].

In terms of marital behavior, Chinese academics generally agree that marital behavior has substantially widened the gender wage gap. Based on data from Chinese General Social Survey in 2015, Wang and Wang found that marital and childbearing behavior significantly widens the gender wage gap, and the contribution of marital and childbearing behavior to this gap strengthens as the wage level of the labor force increases [19]. Based on data from the China Women's Status Survey in 2010, He et al. found that the wage gap between females and males tends to increase as wages increase, mainly due to the stronger wage penalty effect of marital behavior on the female labor force at higher wage levels [14]. Based on data from the China Family Panel Survey in 2016, Zhang and He found that marital behavior significantly boosts females' household work time and has a significant penalty effect on females' wages, which in turn widens the gender wage gap [20].

In terms of intergenerational support, Chinese academics have reached more consistent conclusions about the relationship between intergenerational support and the gender wage gap. That is, intergenerational support significantly reduces the gender wage gap. Based on data from the China Family Panel Survey in 2012, Kang et al. found that the time and economic intergenerational support provided by parents relaxes the time constraint on the labor supply of females and significantly increases the labor supply and wage income of females but does not have a significant effect on males, thereby reducing the gender wage gap [21].

In summary, the relationship between education level, marital behavior, intergenerational support, and the gender wage gap has been sufficiently studied in Chinese academia, but the Internet, the underlying technology for all types of digital technologies in the context of the digital age, has rarely been examined for its impact on the gender wage gap, and there are no more consistent findings on the relationship between Internet usage and the gender wage gap. Based on data from the China Women's Status Survey in 2010, Zhuang et al. found that although Internet usage significantly increases the overall wage level of the labor force, the premium effect of Internet usage on females' wages is only 90.6% of males' wages, leading to a further widening of the gender wage gap [12]. Based on provincial panel data in China from 2004-2015, He and Xu found that although the penetration of Internet helps to reduce the job search costs of the labor force and improve its search efficiency, which in turn raises their wage level, the effect of the

penetration of Internet on the wage increase of the male labor force is significantly stronger than that of the female labor force, thus causing a further widening of the gender wage gap [22]. Based on data from the Chinese General Social Survey in 2010, 2013, and 2015, Qi and Liu found that Internet usage not only significantly increases the overall wage level of the labor force but also reduced the gender wage gap. However, the extent of the impact of Internet usage on the overall wage level of the labor force as well as the gender wage gap tends to decrease continuously as the years progresses [6]. Based on data from the China Labor Force Dynamics Survey in 2014 and 2016, Feng et al. found that Internet usage significantly increases migrant workers' wage income and reduces the gender wage gap among migrant workers [4]. In this regard, this study argues that the reason for the large differences in the findings of different scholars are likely to be that most of the current Chinese academic studies on the relationship between Internet usage and gender wage equation are based on linear studies, few scholars have examined the threshold effect of Internet usage, ignoring the nonlinear effect of Internet usage on gender wage equation, and existing studies rarely consider the endogeneity caused by the differences in the distribution of the dependent variable when conducting empirical analysis. In addition, the data used in the existing studies are mostly from 2010 to 2015, which is slightly outdated. In view of this, based on the data from the newly published Chinese General Social Survey in 2018, this study not only examines the linear and nonlinear effects of Internet usage on the gender wage equation but also controls for quantile conditions to avoid endogeneity due to the differences in the distribution of the gender wage and, on this basis, decomposes the gender wage gap in the overall mean condition as well as in different quantile conditions to examine the impact of Internet usage on the gender wage gap at different levels of wage and the extent of its contribution.

The possible marginal contributions of this study are mainly in the following four areas: Firstly, there are relatively few existing studies on the impact of Internet usage on the gender wage gap, and the conclusions reached have a large difference. In addition, the survey data used in the existing studies are relatively outdated. To this end, this study provides an in-depth examination of the impact of Internet usage on the gender wage gap based on the data from the newly published Chinese General Social Survey in 2018. Secondly, in empirically analyzing the effect of Internet usage on the gender wage equation, most existing studies have only tested the linear effect of Internet usage on the gender wage equation by using the ordinary least squares regression method and have rarely considered its nonlinear effect. To this end, this study further constructs the threshold regression model to test the nonlinear effects of Internet usage on the gender wage equation, based on the linear effects of Internet usage on the gender wage equation tested by using the robust least squares regression method. Thirdly, most of the existing studies use the traditional Oaxaca-Blinder decomposition method when decomposing the gender wage gap, and the accuracy of the results obtained by this decomposition method is relatively low. To this end, this study adopts the RIF regression decomposition method based on the improved Oaxaca-Blinder decomposition method. The RIF regression decomposition method can decompose the gender wage gap more accurately by introducing the recentering influence function. Fourthly, most of the existing studies ignore the endogeneity problems caused by the differences in the distribution of wage. To this end, this study further constructs quantile models to examine the different effects of Internet usage on gender wage equations at different levels of wage and decomposes the gender wage gap at different levels of wage to avoid endogeneity problems caused by the differences in the distribution of gender wage.

3. Theoretical Analysis

According to job search theory, both job seekers and firms need to spend time and cost to discover and judge the price signals in the labor market, and both parties need to find the optimal wage price under the constraint of optimal search cost [23]. In terms of job seekers, they need to consider not only the expected benefits of the job search behavior but also the real and potential costs of the job search [24]. For this reason, job seekers need to weigh the expected benefits and costs to judge and adjust their search behavior. Generally speaking, the higher the search cost, the lower the optimal retention wage for job seekers, the lower the search cost, the greater the marginal benefit from the search behavior, and the greater the chance for job seekers to earn higher wages [22]. Then, theoretically, the Internet as a more convenient, lower cost, and more efficient means of information transfer, people can easily access massive information resources, reduce information processing costs, improve the efficiency of job search, and thus improve their wage and income levels by using this technology [25].

However, it is important to note that the Internet itself does not automatically produce a gender-equal environment, and although the Internet offers new opportunities for both males and females, stereotypical gender biases do not appear to have improved in the cyberspace, nor has power been redistributed between males and females. Males remain dominant in the cyberspace, while females remain disadvantaged [26]. Therefore, although the Internet can bring many of these conveniences, it does not follow that using the Internet brings a consistent wage premium to males and females. Specifically, the dominance of males in the cyberspace gives them more convenience and the greater intensity of the externality coefficient, which makes the information resources accessible to the male labor force more adequate and of higher quality, and Internet usage is likely to have a stronger wage premium effect on the male labor force, while the disadvantageous position of females in the cyberspace makes the information resources obtained by the female labor force relatively scarce and of lower quality, resulting in the marginal search cost of the female labor force being greater than that of the male

labor force, which leads to the optimal wage price of the female labor force being lower than that of the male labor force [7, 12, 27, 28]. On the other hand, employers, customers, and peers with a preference for gender discrimination can more easily and accurately identify the characteristic signals of females with the powerful information search function of the Internet and thus more effectively impose gender discrimination on the female labor force. That is, Internet usage is not only likely to have a lower wage premium effect on the female labor force but may even have a depressive effect on the wage income of the female labor force.

In addition, some studies have shown that females are more likely to use the social functions of the Internet than the study and work functions compared to males. Jackson et al. and Zhuang et al. noted that compared to male Internet users, female Internet users use email functions more likely to do so for private communication purposes, while male Internet users use email more for work. Female Internet users have more negative and anxious attitudes when learning Internet skills, and this gender stereotype influences their attitudes and willingness to learn Internet skills through their parents and friends [12, 29]. Based on the above analysis, the following hypotheses are proposed in this study.

Hypothesis 1. Internet usage has a strong premium effect on males' wage income, while it has a smaller effect on females' wage income.

Hypothesis 2. Internet usage widens the gender wage gap and the presence of gender discrimination in the cyberspace is a significant contributor to this effect.

4. Methodology

4.1. Data Source. 4The data for this study were obtained from the newly published Chinese General Social Survey (CGSS) in 2018 which was released by the China Survey and Data Center of Renmin University of China. CGSS is the earliest national, comprehensive and continuous academic survey project in China. CGSS uses a multilayer probability sampling method to interview more than 10000 households in all provinces, municipalities, and autonomous regions in the mainland of China, and the data obtained have considerable credibility. In addition, more than 1000 academic studies based on CGSS data have been published in Chinese academia, which also argues the credibility of CGSS data to a certain extent.

4.2. Variables Settings

4.2.1. Dependent Variable. The dependent variable in this study is wage income (wi). Wage income (wi) is measured by the corresponding question "What is your personal annual labor income?" in the questionnaire.

4.2.2. Independent Variable. The independent variable in this study is Internet usage (Iu). Internet usage (Iu) is measured by the corresponding question "How often do you use the Internet?" in the questionnaire; the question options include "never," "rarely," "sometimes," "frequently," and "very frequently." To better measure the nonlinear effect of Internet usage (Iu) on the gender wage equation, "never" is assigned to 0, "rarely" is assigned to 1, "sometimes" is assigned to 2, "frequently" is assigned to 3, and "very frequently" is assigned to 4.

4.2.3. Control Variables. Referring to existing studies [4, 6, 12, 14, 22, 30], taking into account the actual design of the questionnaire, this study incorporates a series of control variables in the empirical process, including gender, nonagricultural work experience (nawe), years of education (yoe), age, household registration status (hrs), marital status (ms), mother's years of education (myoe), and annual household income (ahi). In addition, to examine whether there is an inverted "U"-shaped effect of age on the wage equation, this study also introduces the age-squared term (age2) into the control variables. Gender is measured by the corresponding question "What's your gender?" in the questionnaire; the question options include "Male" and "Female." "Male" is assigned to 1, and "Female" is assigned to 0. Nonagricultural work experience (nawe) is measured by the corresponding question "How many years have you worked in nonagricultural industry?" in the questionnaire. Years of education (yoe) is measured by the corresponding question "What is your highest level of education?" in the questionnaire; the question options include "No education," "Elementary school," "Middle school," "High school," "Junior college," "Bachelor," and "Master." "No education" is assigned to 0, "Elementary school" is assigned to 6, "Middle school" is assigned to 9, "High school" is assigned to 12, "Junior college" is assigned to 15, "Bachelor" is assigned to 16, and "Master" is assigned to 19. Age is measured by the corresponding question "What is your actual age?" in the questionnaire. Household registration status (hrs) is measured by the corresponding question "What's your household registration status?" in the questionnaire; the question options include "Rural household registration" and "Urban household registration." "Rural household registration" is assigned to 1, and "Urban household registration" is assigned to 0. Marital status (ms) is measured by the corresponding question "What's your marital status?" in the questionnaire, the question options include "Married," "Unmarried," "Divorced," and "Widowed." "Married" is assigned to 1, "Unmarried," "Divorced," and "Widowed" are assigned to 0. Mother's years of education (myoe) is measured by the corresponding question "What is your mother's highest level of education?" in the questionnaire; the question options include "No education," "Elementary school," "Middle school," "High school," "Junior college," "Bachelor," and "Master." "No education" is assigned to 0, "Elementary school" is assigned to 6, "Middle school" is assigned to 9, "High school" is assigned to 12, "Junior college" is assigned to 15, "Bachelor" is assigned to 16, and "Master" is assigned to 19. Annual household income (ahi) is measured by the corresponding question "What is the annual income of your household?" in the questionnaire.

Table 1: Descriptive statistics of each variable.

Variable	Sample size	Mean value	Standard deviation	Minimum value	Maximum value
wi	4832	44770.473	55284.122	0	400000
Iu	4832	2.784	1.367	0	4
Gender	4832	0.520	0.500	0	1
nawe	4832	9.447	10.334	0	36
yoe	4832	10.438	4.368	0	19
Age	4832	38.970	9.430	19	60
hrs	4832	0.584	0.493	0	1
ms	4832	0.808	0.394	0	1
myoe	4832	4.745	4.507	0	16
ahi	4832	93328.436	98828.580	0	700000

Note: The data in the table are collated from based on the Chinese General Social Survey (CGSS) in 2018.

4.3. Model Setting

4.3.1. Wage Equation. With reference to the Krueger wage equation [10], the wage equation is set in this study as follows.

$$wi_i = C_1 + \alpha_1 \times Iu_i + \beta \times X_i + \mu_i. \quad (1)$$

In Equation (1), wi_i, Iu_i, and X_i, respectively, represent the i-th respondent's wage income (wi), Internet use (Iu), and a set of control variables including gender, nonagricultural work experience (nawe), years of education (yoe), age, household registration status (hrs), marital status (ms), mother's years of education (myoe), and annual household income (ahi). α_1 represents the regression coefficient of Internet usage (Iu). β represents the regression coefficients of the group of control variables. C_1 and μ_i, respectively, represent the constant term and the random disturbance term.

4.3.2. Gap Decomposition. Based on the set form of the wage equation in Equation (1), this study calculates the gender wage gap as follows.

$$\begin{aligned}\Delta_{Wage} &= E(Wage_m | X_i = X_m) - E(Wage_w \lfloor X_i = X_w) \\ &= \beta_m X_m - \beta_w X_w = \beta_m X_m - \beta_w X_m + \beta_w X_m - \beta_w X_w.\end{aligned} \quad (2)$$

In Equation (2), Δ_{Wage} represents the gender wage gap. X_m and X_w, respectively, represent the male and female's independent variable and control variables, β_m and β_w represent the vector sets of coefficients to be estimated.

The common factorization of Equation (2) is extracted as follows.

$$\Delta_{Wage} = (\beta_m - \beta_w)X_m + \beta_w(X_m - X_w). \quad (3)$$

In Equation (3), the first term on the right side of the equation, $(\beta_m - \beta_w)X_m$, is the coefficient gap in the gender wage gap, representing the gender wage gap caused by gender discrimination. The second term on the right side of the equation, $\beta_w(X_m - X_w)$, is the characteristic gap in the gender wage gap, representing the gender wage gap caused by the difference in the characteristic variables between the male and female labor force. On this basis, the recentered influence function (RIF) method is introduced, using which the effect of the K-th regression variable on the characteristic gap and the coefficient gap in the gender wage gap and its contribution can be studied specifically under the mean condition and the quantile condition.

5. Empirical Analysis

5.1. Descriptive Statistics. To avoid the estimation results being influenced by the extreme values of the variables, this study conducts a 1% shrinkage of the sample to obtain a valid sample of 4832, and the descriptive statistics of each variable are presented in Table 1.

However, considering that there may be some differences in the characteristics of males and females, the samples are processed in groups according to gender, and the descriptive statistics of each variable after grouping are presented in Table 2.

Observing Table 2, it can be seen that in terms of the dependent variable, the mean values of wage income (wi) of males and females are 54896.289 yuan (RMB) and 33797.564 yuan (RMB), respectively, and the overall level of wage income of females is significantly much lower than that of males, and there is a large wage gap between females and males. In terms of the independent variable, the mean values of Internet usage (Iu) of males and females are 2.743 and 2.828, respectively, although the level of Internet usage of females is slightly higher than that of males, the overall level of Internet usage of males and females is both lower. In terms of the control variables, the mean values of nonagricultural work experience (nawe) of males and females are 10.849 years and 7.928 years, respectively, with females having significantly shorter years of nonagricultural work than males. The mean values of years of education (yoe) of males and females are 10.692 years and 10.163 years, respectively, indicating that there is no significant difference between males and females. Both males and females have predominantly received middle school education and high school education. The mean values of age of males and

Table 2: Descriptive statistics for each variable for males and females.

Male	Sample size	Mean value (standard deviation)	Female	Sample size	Mean value (standard deviation)
wi	2513	54896.289 (61482.012)	wi	2319	33797.564 (45185.863)
Iu	2513	2.743 (1.405)	Iu	2319	2.828 (1.323)
nawe	2513	10.849 (10.804)	nawe	2319	7.928 (9.572)
yoe	2513	10.692 (4.178)	yoe	2319	10.163 (4.550)
Age	2513	40.010 (10.047)	Age	2319	37.844 (8.574)
hrs	2513	0.574 (0.495)	hrs	2319	0.594 (0.491)
ms	2513	0.772 (0.419)	ms	2319	0.846 (0.361)
myoe	2513	4.654 (4.498)	myoe	2319	4.844 (4.516)
ahi	2513	95379.430 (102306.426)	ahi	2319	91105.862 (94888.093)

Note: The data in the table are collated from based on the Chinese General Social Survey (CGSS) in 2018.

females are 40.010 years and 37.844 years, respectively, with females being significantly younger than males, which is likely to account for the significantly lower nonagricultural work experience (nawe) of females compared to males. The mean values of household registration status (hrs) of males and females reaches 57.4% and 59.4%, respectively, indicating that the majority of males and females are from rural areas, and there is no significant gap between them. The mean values of marital status (ms) of males and females are 77.2% and 84.6%, respectively, with a higher rate of married females compared to males. The mean values of mother's years of education (myoe) of males and females are 4.654 years and 4.844 years, respectively, indicating that there is no significant difference between males' mother's years of education and females' mother's years of education, whose mothers both have predominantly received elementary school only. The mean values of annual household income (ahi) of males and females are 95379.430 yuan (RMB) and 91105.862 yuan (RMB), respectively, and males have slightly better household economic status than females, but there is no significant difference between them.

In summary, there is no significant difference between females and males in most characteristics, except for nonagricultural work experience (nawe) and age, but the level of females' wage income is significantly lower than males' wage income, and there is a more serious phenomenon of "different pay for the same work" between females and males. So, will the Internet, the underlying technology of various digital technologies in the context of the digital age, have a positive or negative impact on this phenomenon of "different pay for the same work"? This question requires a more in-depth study.

5.2. Benchmark Regression Analysis. Column 2 of Table 3 reports the estimated results of the full samples' wage equation by using the robust least squares regression method, which shows that the marginal coefficient of Internet usage (Iu) is 1085.44 and significant at the 1% level, indicating that Internet usage (Iu) significantly increases the overall wage income of the labor force, and that each unit increase in the frequency of Internet usage (Iu) will increase the overall wage income of the labor force by 1085.44 yuan (RMB). However, it is important to note that the marginal coefficient of gender is as high as 19393.15 and significant at the 1% level, indicating that there is a considerable and statistically significant gap in wage income between the female labor force and the male labor force. To this end, this study conducts the robust least squares regression analysis after grouping the sample according to gender differences to examine whether there is a significant differential effect of each characteristic variable on the male and female samples' wage equation.

Table 3: Benchmark regression results of Internet usage on the wage equation.

Variable	Full samples' wage equation	Male samples' wage equation	Female samples' wage equation
Iu	1085.44*** (413.40)	2108.83*** (621.65)	56.82 (501.64)
Gender	19393.15*** (1080.94)	—	—
nawe	582.24*** (55.44)	438.66*** (72.70)	706.24*** (79.04)
yoe	1361.22*** (189.43)	1592.34*** (327.37)	1166.54*** (216.68)
Age	6652.56*** (491.03)	6972.47*** (678.23)	6819.47*** (736.93)
Age2	-85.08*** (6.29)	-86.64*** (8.42)	-89.16*** (9.80)
hrs	2078.36 (1290.46)	5610.49*** (1883.26)	-929.51 (1646.20)
ms	-2779.54* (1570.17)	2077.22 (2079.86)	-10581.37*** (2322.07)
myoe	41.63 (158.55)	96.13 (244.29)	165.49 (183.69)
ahi	0.35*** (0.02)	0.42*** (0.03)	0.26*** (0.02)
Constant	-142252.3*** (9496.61)	-149225.7*** (13635.43)	-122991.5*** (13245.06)
R^2	57.11%	61.67%	49.52%
Sample size	4832	2513	2319

Note: *** represents $p < 0.01$ and * represents $p < 0.1$. Numbers in parentheses are robust standard errors.

Column 3 of Table 3 reports the estimated results of the male samples' wage equation by using the robust least squares regression method, which shows that in terms of the independent variable, the marginal coefficient of Internet usage (Iu) is 2108.83 and is significant at the 1% level, indicating that Internet usage (Iu) significantly increases the wage income of the male labor force and that each unit increase in the frequency of Internet usage (Iu) will increase the wage income of the male labor force by 2108.83 yuan (RMB). In terms of the control variables, nonagricultural work experience (nawe), years of education (yoe), household registration status (hrs), marital status (ms), mother's years of education (myoe), and annual household income (ahi) all have positive effects on the wage income of the male labor force, but the effects of marital status (ms) and mother's years of education (myoe) are not significant. In addition, age has an inverted "U"-shaped effect on the wage income of the male labor force, and based on the regression results, it can be calculated that the wage income of the male labor force will enter a declining trend after reaching the age of 40.24 years.

Column 4 of Table 3 reports the estimated results of the female samples' wage equation by using the robust least squares regression method, which shows that in terms of the independent variable, although Internet usage (Iu) has a positive effect on the wage earnings of the female labor force, it is not significant and its marginal coefficient is only 56.82. In terms of the control variables, nonagricultural work experience (nawe), years of education (yoe), mother's years of education (myoe), and annual household income (ahi) all have a positive effect on the wage income of female labor force, but the effect produced by mother's years of education (myoe) is not significant. It should be noted that the marginal coefficient of years of education (yoe) of the female labor force is 1166.54, which is significantly lower than that of the male labor force, indicating that the premium effect of education on the wage income of the male labor force is stronger than that of the female labor force, which is consistent with the findings of Yang and Cheng, Chen and Zhao, Yuan and Zhou, and Dong et al. [5, 15–17]. Both household registration status (hrs) and marital status (ms) have a negative effect on the wage income of the female labor force; especially, marital status (ms) significantly reduces the wage income of the female labor force by 10581.37 yuan (RMB) at 1% level of significance, and marital status (ms) has a strong punitive effect on the wage income of the female labor force, which is consistent with the findings of He et al. and Zhang and He [14, 20]. In addition, age also has an inverted "U"-shaped effect on the wage income of the female labor force, and the wage income of the female labor force will enter a declining trend after reaching 38.24 years of age, with the female labor force entering a declining trend earlier than the male labor force.

In summary, Internet usage significantly increases the overall wage income level of the labor force, but mainly by increasing the wage income of the male labor force, while there is no significant effect on the wage income of the female labor force. However, it should be noted that the above benchmark regression analysis examines the linear effect of Internet usage on wage income, while the nonlinear effect is to be verified by further constructing a threshold regression model.

Table 4: Threshold regression results of Internet usage on gender wage equations.

Variable	Male samples' wage equation	Variable	Female samples' wage equation
Iu ($q = 1$)	-1998.52 (2697.59)	Iu ($q < 4$)	-1047.16 (615.75)
Iu ($q = 2$)	-149.44 (991.31)		
Iu ($q = 3$)	1506.01** (749.89)	Iu ($q = 4$)	-27.00 (494.15)
Iu ($q = 4$)	1771.47*** (615.44)		
nawe	448.68*** (73.12)	nawe	715.63*** (79.32)
yoe	1600.14*** (326.88)	yoe	1175.33*** (216.52)
Age	7025.78*** (681.29)	Age	6886.82*** (735.96)
Age2	-87.36*** (8.45)	Age2	-90.16*** (9.79)
hrs	5725.83*** (1882.87)	hrs	-1018.15 (1651.84)
ms	2247.24 (2097.13)	ms	-10371.88*** (2317.58)
myoe	86.94 (243.85)	myoe	159.21 (183.38)
ahi	0.42*** (0.03)	ahi	0.26*** (0.02)
Constant	-148598.9*** (13675.06)	Constant	-122697.4*** (13214.83)
R^2	61.71%	R^2	49.62%
Sample size	2513	Sample size	2319

Note: *** represents $p < 0.01$ and ** represents $p < 0.05$. Numbers in parentheses are robust standard errors.

5.3. Threshold Regression Analysis. Column 2 of Table 4 reports the estimated results of the male samples' wage equation by using the threshold regression model, which shows that in terms of the independent variable, Internet usage (Iu) negatively but insignificantly affects the male wage equation when the male labor force rarely or sometimes uses the Internet. Internet usage (Iu) has a significant positive effect on the male wage equation only when the male labor force frequently or very frequently uses the Internet. Specifically, when the male labor force frequently uses the Internet, the marginal coefficient of Internet usage is 1506.01 and significant at the 5% level, indicating that frequent Internet usage significantly increases the wage income of the male labor force with an enhancement effect of 1506.01 yuan (RMB). When the male labor force very frequently uses the Internet, the marginal coefficient of Internet usage is 1771.47 and significant at the 1% level, indicating that compared to the frequent Internet usage, the very frequent

Internet usage has a stronger boosting effect on the male wage equation, with a boosting effect of 1771.47 yuan (RMB). In terms of the control variables, similar to the estimated results of the benchmark regression, nonagricultural work experience (nawe), years of education (yoe), household registration status (hrs), marital status (ms), mother's years of education (myoe), and annual household income (ahi) all have positive effects on the wage income of the male labor force, and the effects of marital status (ms) and mother's years of education (myoe) remain insignificant. The effect of age on the wage income of the male labor force continues to show an inverted "U" shape, and based on the regression results, it can be calculated that the wage income of the male labor force will enter a declining trend after reaching the age of 40.21 years, which is very close to the benchmark regression results.

Column 4 of Table 4 reports the estimated results of the female samples' wage equation by using the threshold regression model, which shows that in terms of the independent variable, Internet usage has a large but insignificant negative effect on the female wage equation when the female labor force does not very frequently use the Internet. While when the female labor force very frequently uses the Internet, the negative effect is substantially reduced but remains insignificant. In terms of the control variables, similar to the results of the benchmark regression, nonagricultural work experience (nawe), years of education (yoe), mother's years of education (myoe), and annual household income (ahi) all have a positive effect on the wage income of the female labor force, and the effect of mother's years of education (myoe) remains insignificant, and the premium effect of years of education (yoe) on the wage income of the female labor force remains significantly lower than that of the male labor force. Both household registration status (hrs) and marital status (ms) continue to have a negative effect on the wage income of the female labor force, and in particular, marital status (ms) continues to have a strong penalizing effect on the wage income of the female labor force. Age also continues to have an inverted "U"-shaped effect on the wage income of the female labor force, and the wage income of the female labor force will enter a declining trend after reaching 38.19 years of age, similar to the benchmark regression results, and the wage income of the female labor force will continue to enter a declining trend earlier than the wage income of the male labor force.

In summary, when both the male and female labor force rarely or sometimes use the Internet, Internet usage does not have a significant effect on the wage income of both, but when the male labor force reaches frequent Internet usage, Internet usage will have a significant wage premium effect on the wage equation of the male labor force, and this wage premium effect becomes stronger as the increase of Internet usage of the male labor force. In contrast, the wage income of the female labor force does not increase substantially with the frequency of Internet usage, and Internet usage continues to have no significant impact on the wage income of the female labor force. That is, combined with the results of the above benchmark regression analysis, it is clear that no matter the linear effect or the nonlinear effect, Internet usage has a strong premium effect on the wage income of the male labor force, and a smaller effect on the wage income of the female labor force, which verifies Hypothesis 1.

5.4. Means Decomposition Analysis. Table 5 reports the results of the decomposition of the gender wage gap on condition of the mean wage level, which shows that the overall wage gap between the female labor force and the male labor force is 21098.72 yuan (RMB) and significant at the 1% level. Of this, the characteristic gap is 3392.07 yuan (RMB) and contributes 16.08% to the overall gender wage gap at the 1% level of significance, indicating that 16.08% of the overall gender wage gap is caused by the characteristic gap between the female labor force and the male labor force. The coefficient gap is 17706.65 yuan (RMB) and contributes 83.92% of the overall wage gap at the 1% level of significance, indicating that 83.92% of the overall gender wage gap is caused by gender discrimination imposed on the female labor force from the labor market. This means that while there is a gap between the female labor force and the male labor force in terms of their characteristic endowments, it is the gender discrimination experienced by the female labor force that is the main reason for such a significant gender wage gap. So, what role does Internet usage play in this process? This is subject to further decomposition analysis of the characteristic gap and the coefficient gap.

In terms of the characteristic gap, the coefficient of Internet usage (Iu) is 243.19 and significant at the 5% level, accounting for -7.26% of the characteristic gap (246.19/-3392.07) and -1.17% of the overall gender wage gap (246.19/-21098.72), which indicates that, conditional on controlling for the coefficient gap, although the Internet usage of the female labor force is only slightly higher than that of the male labor force, it can also reduce the gender wage gap to some extent. In terms of the coefficient gap, the coefficient of Internet use (Iu) is -5887.14 and significant at the 1% level, accounting for 33.25% of the coefficient gap (-5887.14/-17706.65) and 27.90% of the overall gender wage gap (-5887.14/-21098.72), implying that even though the characteristics of the female labor force are consistent with those of the male labor force, the strong wage premium effect of Internet usage on the male labor force also leads to the gender wage gap being further widened, and gender discrimination is an important factor that causes Internet usage to have such a significant differential impact on the wage income of the male labor force and the female labor force.

In summary, although Internet usage can reduce the gender wage gap by suppressing the characteristic gap effect and thus narrowing it slightly to some extent, because the Internet does not autonomously generate a gender-equal cyberspace [26], there is still serious gender discrimination in the cyberspace, which also leads to a strong coefficient gap effect of Internet usage, and thus widens the overall gender wage gap by 26.73%. That is, Internet usage widens the gender wage gap, and the presence of gender discrimination in the cyberspace is a significant contributor to this effect, which verifies Hypothesis 2.

Table 5: The decomposition results of the gender wage gap on the condition of the mean wage level.

The mean wage level	Variable	Coefficient	Contribution	Robust standard error	Z value	p value
Wage	Females' wage	33797.56***	—	939.17	35.99	$p \leq 0.001$
	Males' wage	54896.29***	—	1227.24	44.73	$p \leq 0.001$
	Total wage gap	-21098.72***	100.00%	1545.36	-13.65	$p \leq 0.001$
	Characteristic gap	-3392.07***	16.08%	1382.45	-2.45	0.01
	Coefficient gap	-17706.65***	83.92%	1117.37	-15.85	$p \leq 0.001$
Characteristic gap	Iu	243.19**	-1.15%	124.26	1.96	0.05
	nawe	-1561.29***	7.40%	269.97	-5.78	$p \leq 0.001$
	yoe	-740.36***	3.51%	247.19	-3.00	$p \leq 0.001$
	Age	-363.10*	1.72%	214.83	-1.69	0.09
	hrs	100.04	-0.47%	81.65	1.23	0.22
	ms	689.13***	-3.27%	187.47	3.68	$p \leq 0.001$
	myoe	20.05	-0.10%	48.98	0.41	0.68
	ahi	-1779.74	8.44%	1186.51	-1.50	0.13
	Total	-3392.07***	16.08%	1382.45	-2.45	0.01
Coefficient gap	Iu	-5887.14***	27.90%	2267.37	-2.60	0.01
	nawe	1676.22*	-7.94%	872.25	1.92	0.06
	yoe	-2527.12	11.98%	3992.55	-0.63	0.53
	Age	2760.29	-13.08%	5193.14	0.53	0.60
	hrs	-4045.17***	19.17%	1505.72	-2.69	0.01
	ms	-10767.87***	51.04%	2563.89	-4.20	$p \leq 0.001$
	myoe	284.97	-1.35%	1504.95	0.19	0.85
	ahi	-13753.92***	65.19%	2992.30	-4.60	$p \leq 0.001$
	Constant	14553.08*	-68.98%	8235.13	1.77	0.08
	Total	-17706.65***	83.92%	1117.37	-15.85	$p \leq 0.001$

Note: *** represents $p < 0.01$, ** represents $p < 0.05$, and * represents $p < 0.1$.

5.5. Quantile Regression Analysis. Columns 2, 3, and 4 of Table 6, respectively, report the estimated results of the impacts of Internet usage (Iu) on the gender wage equations on the conditions of the lower wage level (25th quantile), the middle wage level (50th quantile), and the higher wage level (75th quantile). The results show that Internet usage (Iu), respectively, has a significant positive effect on the male wage equation at 10%, 1%, and 1% levels of significance at the lower wage level, the middle wage level, and the higher wage level, and the premium effect of Internet use (Iu) on the male wage equation tends to increase as wage income rises. Specifically, each unit increase in the frequency of Internet usage will raise the wage income of the male labor force in the lower wage level condition by 874.59 yuan (RMB), raise the wage income of the male labor force in the middle wage level condition by 976.49 yuan (RMB), and raise the wage income of the male labor force in the higher wage level condition by 1303.11 yuan (RMB). However, for the female wage equation, Internet usage (Iu) does not have a significant effect on the female wage equation, whether it is at the lower wage level, the middle wage level, or the higher wage level. So, will Internet usage have a differential impact on the gender wage gap at different wage levels? This is subject to further decomposition analysis of the gender wage gap by quantile conditions.

5.6. Quantile Decomposition Analysis. Table 7 reports the results of the decomposition of the gender wage gap on condition of the lower wage level, which shows that the gender wage gap at the lower wage level is 15567.05 yuan (RMB) and significant at the 1% level of significance. Of this, the characteristic gap is 1279.68 yuan (RMB) and contributes 8.22% to the gender wage gap at the lower wage level at the 5% level of significance, indicating that 8.22% of the gender wage gap at the lower wage level is caused by the characteristic gap between the female labor force and the male labor force. The coefficient gap is 14287.37 yuan (RMB) and contributes 91.78% of the gender wage gap at the lower wage level at the 1% level of significance, indicating that 91.78% of the gender wage gap at the lower wage level is due to the gender discrimination and that gender discrimination has a stronger effect on the gender wage gap at the lower wage level compared to the overall gender wage gap, with those female labor force at the lower wage level suffer from very high level of gender discrimination.

Table 6: Results of quantile regressions of Internet usage on the gender wage equation.

Male samples' wage equation	25th quantile	50th quantile	75th quantile	Female samples' wage equation	25th quantile	50th quantile	75th quantile
Iu	874.59* (458.69)	976.49*** (335.70)	1303.11*** (372.87)	Iu	-456.39 (357.10)	58.38 (285.59)	-23.72 (297.49)
Control variables	Controlled	Controlled	Controlled	Control variables	Controlled	Controlled	Controlled
R^2	31.24%	44.15%	54.77%	R^2	17.67%	34.20%	44.92%

Note: *** represents $p < 0.01$ and * represents $p < 0.1$. Numbers in parentheses are robust standard errors.

Table 7: The decomposition results of the gender wage gap on the condition of the lower wage level.

The lower wage level	Variable	Coefficient	Contribution	Robust standard error	z value	p value
Wage	Females' wage	1085.63**	—	475.91	2.28	0.02
	Males' wage	16652.68***	—	756.71	22.01	$p \leq 0.001$
	Total wage gap	-15567.05***	100.00%	893.93	-17.41	$p \leq 0.001$
	Characteristic gap	-1279.68**	8.22%	613.77	-2.08	0.04
	Coefficient gap	-14287.37***	91.78%	899.99	-15.87	$p \leq 0.001$
Characteristic gap	Iu	419.46**	-2.69%	201.53	2.08	0.04
	Control variables	Controlled	Controlled	Controlled	Controlled	Controlled
	Total	-1279.68**	8.22%	613.77	-2.08	0.04
Coefficient gap	Iu	-11723.35***	75.31%	2221.62	-5.28	$p \leq 0.001$
	Control variables	Controlled	Controlled	Controlled	Controlled	Controlled
	Total	-14287.37***	91.78%	899.99	-15.87	$p \leq 0.001$

Note: *** represents $p < 0.01$ and ** represents $p < 0.05$.

Further observing at the decomposition of the characteristic gap and the coefficient gap, we could find that in terms of the characteristic gap, the coefficient of Internet usage (Iu) is 419.46 and significant at the 5% level of significance, accounting for -32.78% of the characteristic gap (419.46/-1279.68) and -2.69% of the gender wage gap at the lower wage level (419.46/-15567.08). In terms of the coefficient gap, the coefficient of Internet usage (Iu) is -11723.35 and significant at the 1% level of significance, accounting for 82.05% of the coefficient gap (-11723.35/-14287.37) and 75.31% of the gender wage gap at the lower wage level (-11723.35/-15567.05). This means that on the one hand, although Internet usage reduces the gender wage gap at the lower wage level by suppressing the characteristic gap effect and thus narrowing it slightly, on the other hand, Internet usage widens the gender wage gap at the lower wage level significantly by generating a strong coefficient gap effect. The combined effect is that Internet usage widens the gender wage gap at the lower wage level by 72.62%, an effect that far exceeds the widening effect of Internet usage on the overall gender wage gap, and Internet usage is an important reason why the female labor force at the lower wage level suffers from such severe gender wage inequality.

Table 8 reports the results of the decomposition of the gender wage gap on condition of the middle wage level, which shows that the gender wage gap at the middle wage level is 16662.04 yuan (RMB) and significant at the 1% level of significance. Of this, the characteristics gap is 2608.34 yuan (RMB) and contributes 15.65% of the gender wage gap at the middle wage level at the 1% level of significance, indicating that 15.65% of the gender wage gap at the middle wage level is caused by the characteristics gap between the female labor force and the male labor force. The coefficient gap is 14053.70 yuan (RMB) and contributes 84.35% to the gender wage gap at the middle wage level at the 1% level of significance, indicating that 84.35% of the gender wage gap at the middle wage level is caused by gender discrimination, and although the strength of the effect of gender discrimination on the gender wage gap at the middle wage level is lower than that of the gender wage gap at the lower wage level, it is still higher than the effect on the overall gender wage gap. The female labor force at the middle wage level continues to suffer from the obvious gender discrimination.

Further observing at the decomposition of the characteristic gap and the coefficient gap, we could find that in terms of the characteristic gap, the coefficient of Internet usage (Iu) is 430.43 and significant at the 5% level of significance, accounting for -16.50% (430.43/-2608.34) of the characteristic gap and -2.58% (430.43/-16662.04) of the gender wage gap at the middle wage level. In terms of the coefficient gap, the coefficient of Internet usage (Iu) is -6143.21 and significant at the 5% level of significance, accounting for 43.71% (-6143.21/-14053.70) of the coefficient gap and 36.87% of the gender wage gap at the middle wage level (-6143.21/-16662.04). This means that on the one hand, although Internet usage reduces the gender wage gap at the

Table 8: The decomposition results of the gender wage gap on the condition of the middle wage level.

The middle wage level	Variable	Coefficient	Contribution	Robust standard error	z value	p value
Wage	Females' wage	23400.48***	—	846.65	27.64	$p \leq 0.001$
	Males' wage	40062.52***	—	1045.91	38.30	$p \leq 0.001$
	Total wage gap	-16662.04***	100.00%	1345.64	-12.38	$p \leq 0.001$
	Characteristic gap	-2608.34***	15.65%	1000.33	-2.61	0.01
	Coefficient gap	-14053.70***	84.35%	1186.76	-11.84	$p \leq 0.001$
Characteristic gap	Iu	430.43**	-2.58%	208.96	2.06	0.04
	Control variables	Controlled	Controlled	Controlled	Controlled	Controlled
	Total	-2608.34***	15.65%	1000.33	-2.61	0.01
Coefficient gap	Iu	-6143.21**	36.87%	2860.77	-2.15	0.03
	Control variables	Controlled	Controlled	Controlled	Controlled	Controlled
	Total	-14053.70***	84.35%	1186.76	-11.84	$p \leq 0.001$

Note: *** represents $p < 0.01$ and ** represents $p < 0.05$.

middle wage level by suppressing the characteristic gap effect and thus narrowing it slightly, on the other hand, Internet usage widens the gender wage gap at the middle wage level more substantially by generating a stronger coefficient gap effect. The combined effect is that Internet usage widens the gender wage gap at the middle wage level by 34.29%, and although this effect is significantly lower than the widening effect of Internet usage on the gender wage gap at the lower wage level, it is still higher than the widening effect of Internet usage on the overall gender wage gap. Internet usage continues to be an important cause of significant gender wage inequality at the middle wage level.

Table 9 reports the results of the decomposition of the gender wage gap on condition of the higher wage level, which shows that the gender wage gap at the higher wage level is 21376.57 yuan (RMB) and significant at the 1% level of significance. Of this, the characteristic gap is 5999.88 yuan (RMB) and contributes 28.07% of the gender wage gap at the higher wage level at the 1% level of significance, indicating that 28.07% of the gender wage gap at the higher wage level is caused by the characteristic gap between the female labor force and the male labor force. The coefficient gap is 15376.69 yuan (RMB) and contributes 71.93% of the gender wage gap at the higher wage level at the 1% level of significance, indicating that 71.93% of the gender wage gap at the higher wage level is caused by gender discrimination. Although the gender discrimination remains the main cause of the gender wage gap at the higher wage level, the contribution of gender discrimination to the gender wage gap at the higher wage level decreases significantly compared to the lower wage level, the middle wage level, and the overall wage level. Gender discrimination against the female labor force at the higher wage level has been moderated, but the situation remains bleak.

Further observing at the decomposition of the characteristic gap and the coefficient gap, we could find that in terms of the characteristic gap, the coefficient of Internet usage (Iu) is 393.87 and significant at the 10% level of significance, accounting for -6.56% (393.87/-5999.88) of the characteristic gap and -1.84% (393.87/-21376.57) of the gender wage gap at the higher wage level. In terms of the coefficient gap, the coefficient of Internet usage (Iu) is -8849.64 and significant at the 5% level of significance, accounting for 57.55%% (-8849.64/-15376.69) of the coefficient gap and 41.40% of the gender wage gap at the higher wage level (-8849.64/-21376.57). This means that on the one hand, although Internet usage reduces the gender wage gap at the higher wage level by suppressing the characteristic gap effect and thus narrowing it slightly, on the other hand, Internet usage widens the gender wage gap at the higher wage level more substantially by generating a stronger coefficient gap effect. The combined effect is that Internet usage widens the gender wage gap at the higher wage level by 39.56%, and although this effect is significantly lower than the widening effect of Internet usage on the gender wage gap at the lower wage level, compared to the widening effect of Internet usage on the gender wage gap at the middle wage level, the effect of Internet usage on the gender wage gap at the higher wage level is still not promising.

The above decomposition analysis shows that Internet usage does have a differential impact on the gender wage gap at different wage levels, which is summarized in Table 10 and plotted in Figure 1 based on the results in Table 10.

Observing at Table 10 and Figure 1, it can be found that in terms of the characteristic gap, the coefficient of the characteristic gap of Internet usage tends to increase and then decrease as the wage level increases, but the changes are small, indicating that whether the wage level is at the lower level, the middle level, or the higher level, Internet usage reduces the gender wage gap to some extent by suppressing the characteristic gap effect, but the impact is very limited. In terms of the coefficient gap, the effect of Internet usage on the gender wage gap tends to decrease and then increase as the wage level increases, implying that Internet usage largely widens the gender wage gap at the lower wage level and the higher wage level by producing a strong coefficient gap effect. However, it is important to note that although the

Table 9: The decomposition results of the gender wage gap on the condition of the higher wage level.

The higher wage level	Variable	Coefficient	Contribution	Robust standard error	z value	p value
Wage	Females' wage	52868.35***	—	1300.12	40.66	$p \leq 0.001$
	Males' wage	74244.91***	—	2019.85	36.76	$p \leq 0.001$
	Total wage gap	-21376.57***	100.00%	2402.10	-8.90	$p \leq 0.001$
	Characteristic gap	-5999.88***	28.07%	1984.49	-3.02	$p \leq 0.001$
	Coefficient gap	-15376.69***	71.93%	2091.72	-7.35	$p \leq 0.001$
Characteristic gap	Iu	393.87*	-1.84%	213.33	1.85	0.07
	Control variables	Controlled	Controlled	Controlled	Controlled	Controlled
	Total	-5999.88***	28.07%	1984.49	-3.02	$p \leq 0.001$
Coefficient gap	Iu	-8849.64**	41.40%	4387.08	-2.02	0.04
	Control variables	Controlled	Controlled	Controlled	Controlled	Controlled
	Total	-15376.69***	71.93%	2091.72	-7.35	$p \leq 0.001$

Note: *** represents $p < 0.01$, ** represents $p < 0.05$, and * represents $p < 0.1$.

Table 10: The impact of Internet usage on the gender wage gap at different wage levels.

Internet usage (Iu)	The lower wage level	The middle wage level	The higher wage level
Coefficient of characteristic gap	419.46** (201.53)	430.43** (208.96)	393.87* (213.33)
Coefficient of coefficient gap	-11723.35*** (2221.62)	-6143.21** (2860.77)	-8849.64** (4387.08)
Total contribution	72.62%	34.29%	39.56%

Note: *** represents $p < 0.01$, ** represents $p < 0.05$, and * represents $p < 0.1$. Numbers in parentheses are robust standard errors.

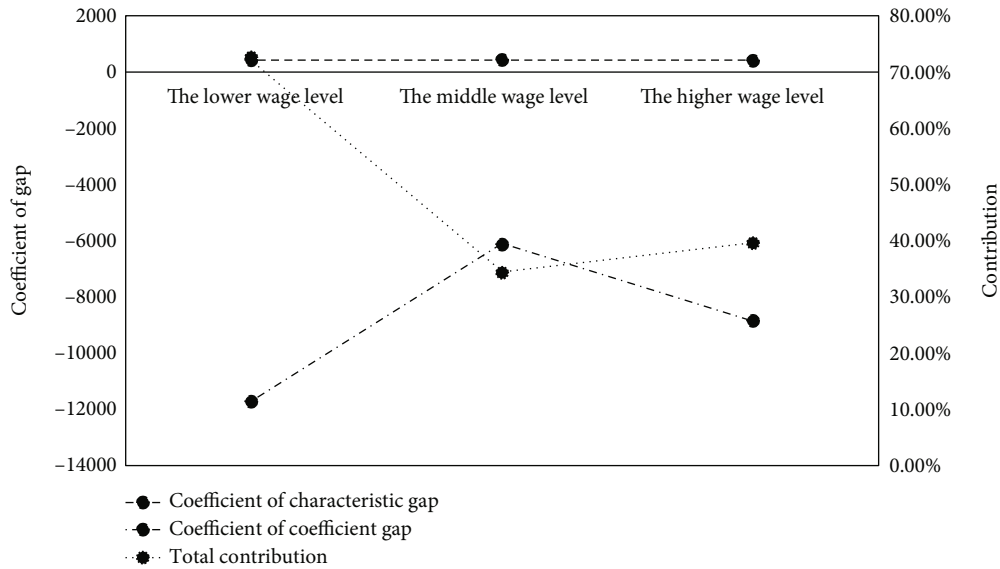

Figure 1: Differential impact of Internet usage on the gender wage gap at different wage levels.

impact of Internet usage on the gender wage gap at the middle wage level is reduced compared to the lower wage level and the higher wage level, it still causes the gender wage gap at the middle wage level to be widened further and with significant intensity.

In summary, Internet usage not only causes a further widening of the overall gender wage gap but also has a differential effect on the gender wage gap at different wage levels. Specifically, Internet usage has the strongest effect on the widening of the gender wage gap at the lower wage level,

the second strongest effect on the widening of the gender wage gap at the higher wage level, and the weakest effect on the gender wage gap at the middle wage level. The different degrees of gender discrimination that females experience in the cyberspace are the important reasons why Internet usage widens the gender wage gap at overall and different wage levels to different degrees.

6. Conclusions and Recommendations

In the context of the digital era, based on the data from Chinese General Social Survey in 2018, this study examines the linear and nonlinear effects of Internet usage on the male and female wage equations by the using robust least squares regression method and the threshold regression method, and based on this, the overall gender wage gap is decomposed and analyzed by using the RIF regression decomposition method. In addition, to prevent the findings from being endogenously influenced by differences in the distribution of gender wage, this study further examines whether Internet usage has a different effect on the wage equations of males and females at different levels of wage by using the quantile regression method, and on this basis, the gender wage gaps at different levels of wage are decomposed by using the RIF regression decomposition method. The findings are as follows.

Firstly, both linear effects and nonlinear effects show that Internet usage has a significant wage premium effect on the male wage equation, and this premium effect increases as male wage income rises, but Internet usage consistently has no significant effect on the female wage equation.

Secondly, Internet usage widens the overall gender wage gap by 26.73%, and the presence of gender discrimination in the cyberspace is a significant contributor to this result.

Thirdly, Internet usage has led to a further widening of the gender wage gap at different levels of wage to varying degrees. Specifically, Internet usage has the strongest impact on the gender wage gap at the level of the lower wage, widening the gender wage gap at the level of the lower wage by 72.62%, the next strongest impact on the gender wage gap at the level of the higher wage, widening the gender wage gap at the level of the higher wage by 39.56%, and the weakest impact on the gender wage gap at the level of the middle wage, widening the gender wage gap at the level of the middle wage by 34.29%. The varying degrees of gender discrimination experienced by females in the cyberspace are an important cause of the varying degrees to which Internet usage widens the gender wage gap for those at different levels of wage.

The above findings suggest that although the Internet is a technology that makes it easier, cheaper, and more efficient to deliver information, effectively reducing the real and opportunity costs of job search behavior and increasing the desired benefits of job search behavior [22, 25], the Internet itself could not autonomously generate a gender-equal environment [26] and currently exhibits a strong masculinity, with males in a strong dominant position and females in a weak subordinate position in the current cyberspace [31]. The strong dominant position of males in the cyberspace gives them more advantageous conditions, which makes the information resources obtained by male labor force more adequate and of higher quality, while the weak subordinate position of females in the cyberspace makes the information resources obtained by female labor force relatively scarce and of lower quality, which leads to the fact that male labor force's use of the Internet will have a significant premium effect on their wage income, while females' use of the Internet will not have a significant premium effect on their wage income [7, 12, 27, 28], which widens the gender wage gap to some extent. In addition, with the powerful information search function of the Internet, employers, customers, and peers with gender discrimination preferences can also more easily and accurately identify the characteristic signals of female labor force and thus more effectively impose gender discrimination on female labor force, which also leads to the further widening of the gender wage gap.

The findings of this study have important policy implications for narrowing the gender wage gap and achieving gender equality in the context of the current digital age and propose the following recommendations.

Firstly, regulating gender discrimination and promoting gender equality. Guiding people to form a correct concept of gender equality is an important prerequisite for eliminating gender discrimination. On the one hand, government departments should regulate the phenomenon of gender discrimination in the labor market, strengthen the monitoring of gender discrimination in the labor market, regulate employers who discriminate against females in the recruitment and employment process according to the law, optimize the employment structure and employment rules, and create a fairer competition environment, gradually eliminate employment discrimination and wage discrimination against the female labor force, so as to narrow the gender wage gap. On the other hand, government departments should also regulate the phenomenon of gender discrimination in the cyberspace. As Castells and Cardoso point out, in the digital age, being connected to the Internet means value [32]. This has also been verified by the strong wage premium effect of Internet usage on the male wage equation. However, because the cyberspace cannot autonomously generate a gender-equal environment, gender discrimination is still serious, which results in the female labor force not receiving a significant wage premium for using the Internet, and thus, the gender wage gap is further widened. Therefore, government departments should regulate the phenomenon of gender discrimination in the cyberspace, strengthen the guidance and supervision of Internet media, and not only prevent the breeding of gender discrimination but also take the initiative to push public service advertisements and promotional software of gender equality concept, increase the publicity of gender equality concept, and strengthen the recognition of gender equality concept in the cyberspace. It could be believed that if gender discrimination in the labor market and cyberspace is eliminated and a more gender-equal environment is created, the Internet, a digital technology, will certainly be able to significantly increase the wage income of the female labor force and reduce the gender wage gap.

Secondly, introducing relevant policies, rewarding and punishing in parallel, the introduction of relevant female protection policies is an important guarantee to achieve effective regulation of gender discrimination. On the one hand, government departments should introduce incentive policies to give tax breaks and subsidies to employers with reasonable gender structure and gender pay equality and encourage employers to take the initiative to eliminate gender discrimination in employment. On the other hand, government departments should also introduce punitive policies to fine and inform the employers who have different pay for the same work and different promotion for the same job and exempt them from a series of tax incentives they currently enjoy. At the same time, the government should also design and provide a specialized skills training system for the female labor force to lay the foundation for a fairer and more efficient competitive environment. Especially when the behavior of marriage and childbirth has an obvious punitive effect on the wage income of the female labor force, government departments should not only encourage employers to provide more flexible working hours for females who have married and childbirth, so as to reduce the career interruption of females due to marriage and childbirth, but also punish employers who impose implicit gender discrimination and employment restrictions on females who have married and childbirth, so as to avoid the marginalization of females after marriage and childbirth. The females who are married and have childbirth should also be provided with targeted skills training to help them successfully reenter the labor market.

Data Availability

The data used to support the findings of this study are available from the corresponding author upon request (phs.gaoC@bsu.by).

Conflicts of Interest

The authors declare that they have no conflicts of interest.

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