

Research Article

The Influence of Internet Usage on Gender Division of Labour Bias: Evidence from Chinese General Social Survey Data

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Based on data from 18,741 respondents in the 2010 and 2017 Chinese General Social Survey, this paper empirically analyzes the influence of Internet usage on gender division of labour bias by using the propensity score matching model and tests the sensitivity of the estimated results. The results show that firstly, a series of personal characteristics such as gender, age, years of education, ethnicity, political status, health status, marital status, household registration status, labour income, mother's years of education, and family economic status will have a significant impact on whether they frequently use the Internet. Secondly, frequent internet usage can significantly reduce respondents' agreement of gender division of labour bias, indicating that frequent internet usage can significantly improve respondents' gender division of labour bias, and the results of Rosenbaum's bound test and H-L confidence interval test both support the above conclusions. Thirdly, frequent internet usage can significantly reduce the recognition degree of women respondents and men respondents to gender division of labour bias, which indicates that frequent internet usage can not only strengthen women's self-identity to a great extent but also improve men's exclusion bias to a certain extent. Therefore, this paper puts forward some suggestions from two aspects: improving the accessibility of internet usage and guiding and controlling the content and behavior of various online media.

1. Introduction

The gender division of labour bias of “male dominating the outside and female dominating the inside” has long been rooted in Chinese traditional culture and has always been emphasized. This bias meant that men should do more social work for pay, while women should do more unpaid family work, and that women should focus their lives on the family, ultimately results in most women losing their space and possibilities for free development, and women's social status is always lower than that of men. Theoretically, with the rapid development of China's economy and society, this kind of prejudice should be improved to a great extent. The reason is that, on the one hand, the rapid economic and social development has given birth to a large number of labour demands, which has a high-intensity attraction for women to go out of their homes and join in jobs, and women's economic status has been strengthened. On the other hand, influenced by Marxist women's liberation

thought, people's cognition of gender roles has been sublimated [1, 2], which can greatly promote women's development and promote gender equality. However, the reality is not so satisfactory. Even in recent years, the concept of gender division of labour has shown a trend of returning to the traditional gender division of labour bias in China, and the phenomenon of “male dominating the outside and female dominating the inside” has regained its popularity [2–4].

To explore the reasons for the resurgence of the concept of gender division of labour, a large number of Chinese social scientists have explored the influencing factors and mechanism of people's concept of gender division of labour from the aspects of education, age, marriage and childbearing behavior, economic development, economic dependence, and intergenerational influence. In terms of education, Tingting [5], Jianzhong and Huilin [6], Peng and Yuxiao [7], and Lanhua and Yao [8], respectively, based on the Chinese General Social Survey in 2006, 2010, and 2015, found that the improvement of women's and their

mothers' education level will have a positive impact on women's concept of gender division of labour, which will significantly reduce women's identity with the traditional concept of gender division of labour. In terms of age, Yunzhu and Dongling [9], Wenfen [10], and Yidi [1], respectively, based on Chinese Women's Social Status Survey in 1990, 2000, and 2010 and Chinese General Social Survey in 2006 and 2016, found that as age increases, women's perceptions of gender division of labour gradually return to the traditional view. In terms of marriage and childbearing behavior, Qi [11] and Le [3], respectively, based on Chinese Women's Social Status Survey in 2000 and 2010 and Chinese General Social Survey in 2012, found that marriage and childbearing behavior is an important factor leading to a rapid return to traditional gender division of labour perceptions among younger generations, and the higher the educational level of women who marry, the faster their gender division of labour perceptions return to tradition. In terms of economic development, Juhua et al., [12] based on Chinese Women's Social Status Survey in 1990, 2000, and 2010, found that the traditional concept of gender division of labour "male dominating the outside and female dominating the inside" has a tendency to return, and economic development has not had a significant impact on this traditional concept of gender division of labour. On the other hand, Dongyang and Yuxiao [13], based on Chinese General Social Survey in 2010, found that the higher the level of economic development, the more modern the concept of gender division of labour among rural women, and the economic development can significantly improve the outdated concept of gender division of labour among rural women. In terms of economic dependence, Aiyu and Xin [14], Xiaodong [15], and Liu Aiyu [16], respectively, based on Chinese Women's Social Status Survey in 1990, 2000, and 2010 and Chinese General Social Survey in 2012, found that the higher the economic status of the wife's family before marriage and the greater the economic contribution of the family after marriage, the higher the wife's premarital household economic status, and the greater the postmarital household economic contribution, the more modern the gender division of labour concept of the wife's would be. On the contrary, the lower the economic status of the family before marriage and the stronger the economic dependence of the wife on the husband after marriage, the more traditional the gender division of labour concept of the wife's would be. In terms of intergenerational influence, Zhimin and Wenming [17] and Yaojun and Jie [2], respectively, based on Chinese General Social Survey in 2010, 2012, 2013, and 2015, found that although intergenerational upward mobility can significantly improve women's perceptions of gender division of labour and raise women's awareness of gender equality, parents' perceptions of gender division of labour still drive their children's perceptions of gender division of labour to some extent, and parents' perceptions of gender division of labour are not affected by the gender composition of their children.

In summary, the relationship between education, age, marriage and childbearing behavior, economic development, economic dependence, and intergenerational influence and gender division of labour bias has been well studied in the

academic community. However, it should be noted that Chinese society has now entered the digital era, and the rapid development of digitization and informatization has had a profound impact on the economic and social development of China. In this process, as the underlying technology of various digital information technologies in the digital era, the Internet has profoundly changed people's attitudes and ways of living and working [18]. Theoretically, the online space created by the Internet can greatly disseminate massive amounts of information, impacting on the traditional-established social environment and overturning the traditional-established social relations. The organic combination of the two is likely to improve the traditional gender division of labour bias to a great extent [19, 20]. For example, Ping [19] pointed out that although the Internet embodies the basic spirit of gender division of labour equality and promotes the benign development of gender division of labour equality, the Internet also poses a potential threat that hinders gender division of labour equality, and its conclusion is rather vague. The findings are vague, and no conclusion has been drawn on how the Internet has influenced the concept of gender division of labour nor has the relationship between the two been quantitatively analyzed. In contrast, although Jiacheng [21] established a ranking selection model for quantitative analysis, his study focused on the impact of Internet usage on gender ability perceptions and concluded that Internet usage could significantly reduce the acceptance of the view that "men are inherently more capable than women", but he did not investigate the relationship between Internet usage and gender division of labour bias, and the data used are only cross-sectional data for a single year, which does not reflect any time factor, and the method used does not take into account sample self-selection bias, which is likely to misestimate the effect of Internet usage. To this end, this paper examines how Internet usage affects gender division of labour bias at the micro-household level based on the 2010 and 2017 Chinese General Social Survey data, which are assembled as mixed cross-sectional data, and uses a propensity score matching model to eliminate the effect of sample self-selection bias on the estimation results.

2. Theoretical Analysis

The Internet links geographically-dispersed people through network lines in a cyberspace that both inputs and outputs information, which is instantaneous, open, interactive, and diffuse, and these characteristics embody the basic spirit of gender equality and can create more opportunities for empowerment of marginalized groups and minorities [22–24]. One of the major impacts is to empower women, promote gender equality, and improve the traditional gender division of labour bias [19].

On the one hand, gender biological differences are greatly eliminated in cyberspace, individual physical characteristics are no longer important, and women gradually have access to more internal and external resources in cyberspace, which enables women to be more explicit about their needs [25]. According to resource theory and social learning

theory, when some women are exposed to more internal and external resources, this part of women will be empowered, and other women will actively or passively learn from the behavior of this part of women, and in turn, more and more women will be exposed to more internal and external resources, and more and more women will be empowered, which eventually makes women's discourse as a whole significantly [20, 26]. This has largely impacted the pyramidal power structure of traditional patriarchal society, gradually flattened the gender power structure, and gradually developed the cyberspace to a centerless structure, which in turn promotes the gradual decentering of the real society as well, lays the foundation for women to get rid of the negative influence of gender identity, participate in society in an all-round way, and improve the gender division of labour bias.

On the other hand, in the background of the digital era, relying on the Internet as an underlying digital technology, information is not only more diversified in form but also its dissemination efficiency has been significantly improved, and knowledge and education can be better popularized and disseminated, which makes the Internet have the property of educational function while providing massive information. The reality is also true, and more and more emphases on social justice, gender equality film and television works, news reports, and other types of media in the cyberspace are widely promoted, coupled with the Internet instantaneous, open, interactive, diffuse, and other characteristics of the role of its educational dissemination function will be more efficient and low-cost; modern ideas will be spread to the greatest extent, which can have a strong demonstration effect on people. According to external contextual determinism, the transformation of specific online contexts and usage experiences will lead to changes in people's gender perspectives [27]. In particular, under the government's gate-keeping, Chinese mainstream online media firmly insists on spreading the value of gender equality, firmly oppose gender discrimination, firmly uphold respect for human rights, and firmly guard the moral bottom line, which will prompt people to be directly or indirectly exposed to the modern concept of gender division of labour, so that people's concept of gender division of labour gradually tends to modernize and eventually improves people's traditional gender division of labour bias [20].

However, it should be noted that, influenced by the information cocoon, although the Internet offers the possibility for women's self-empowerment and improvement of gender division of labour bias, the combination of microindividuals and the Internet is inherently a multidimensional and complex process [20], and the Internet may not have a positive impact on individuals' gender division of labour bias and may even disguisedly strengthen male power position, weaken female power position, and return the concept of gender division of labour to the traditional view. Qidi [28] points out that although the Internet has enhanced women's discourse to a certain extent, women's discourse is still missing in cyberspace as a whole, while patriarchal culture and patriarchal consciousness are still frequently active in online media. Jinnian [29] points out that although women can learn various coding techniques if they want to, men are still

the main force in the Internet industry, and the gender ratio of "gatekeepers" in the new online media is also seriously imbalanced, with men serving as the proportion of men as "gatekeepers" is much higher than that of women, and men are not only in the dominant position in public issues but also more often act as "opinion leaders".

Overall, it is undeniable that the development and usage of the Internet, a digital information technology, will definitely have an impact on the concept of gender division of labour [20], but whether it intensifies or improves the gender division of labour bias remains to be further examined through data analysis. Therefore, in order to enrich the existing research results and break through the status quo of studies that are mainly qualitative in nature and lack the support of data analysis, this paper adopts a propensity score matching model based on Chinese General Social Survey in 2010 and 2017 to examine how Internet usage actually affects gender division of labour bias, in order to provide effective suggestions for improving gender division of labour bias and promoting gender equality.

3. Research Methods

3.1. Data Source. The data used in this paper come from the Chinese General Social Survey (CGSS), which is conducted by the China Survey and Data Center of Renmin University of China and uses a multilayer probability sampling method to collect cross-sectional data from more than 10,000 households in all provinces and autonomous regions of mainland China. It has been widely used in scientific research in various humanities and social sciences, such as sociology, demography, psychology, and economics, and the CGSS conducted the first survey on respondents' Internet usage in 2010. To this end, this paper selects Chinese General Social Survey in 2010 and 2017 and forms them into mixed cross-sectional data to investigate the relationship between Internet usage and gender division of labour bias. The advantage of forming mixed cross-sectional data is that it can compensate to a certain extent for the shortcoming that ordinary cross-sectional data cannot reflect the time factor and control the influence of the time factor.

3.2. Variable Setting. According to the purpose of the study, the variables were set as dependent, independent, and control variables in this paper. The assigned values for each variable are as follows.

3.2.1. Dependent Variable. The dependent variable of this paper is gender division of labour bias (GDLB). GDLB was measured by the corresponding question in the questionnaire "Do you agree that men put their careers first and women put their families first?", and the question options include "Agree" and "Disagree". In this paper, "Agree" is assigned to 1, and "Disagree" is assigned to 0.

3.2.2. Independent Variable. The independent variable of this paper is Internet usage (IU). IU was measured by the corresponding question in the questionnaire "How often do you use the Internet?", and the question options include

“Frequent” and “Infrequent”. In this paper, “Frequent” is assigned to 1, and “Infrequent” is assigned to 0.

3.2.3. Control Variables. With reference to the existing studies [3–6, 8, 11], the control variables in this paper include gender, age, years of education (YoE), ethnicity, political status (PS), religious belief (RB), health status (HS), marital status (MS), household registration status (HRS), labour income (LI), mother’s years of education (MYoE), and family economic status (FES). Gender is measured by the corresponding question in the questionnaire “What is your gender?”, and the question options include “Men” and “Women”. In this paper, “Women” is assigned to 1, and “Men” is assigned to 0. Age is measured by the corresponding question in the questionnaire “What is your actual age?”. Years of education (YoE) is measured by the corresponding question in the questionnaire “What is your highest level of education?”, and the options for this question include “No education,” “Elementary school,” “Middle school,” “High school,” “College,” “Bachelor,” and “Master”. In this paper, “No education” is assigned as 0, “Elementary school” is assigned as 6, “Middle school” is assigned as 9, “high school” is assigned as 12, “College” is assigned as 15, “Bachelor” is assigned as 16, and “Master” is assigned as 19. Ethnicity is measured by the corresponding question in the questionnaire “What is your ethnicity?”, and the options for this question include “Han Chinese,” “Mongolian,” “Manchu,” “Hui,” “Tibetan,” “Zhuang,” “Uighur,” and “Other ethnic minority”. In this paper, “Han Chinese” is assigned to 1, “Mongolian,” “Manchu,” “Hui,” “Tibetan,” “Zhuang,” “Uyghur,” and “other minorities” are assigned to 0. Political Status (PS) is measured by the corresponding question in the survey “What is your political status?”, and the question options include “Party member” and “Mass.” In this paper, “Party member” is assigned to 1, and “Mass” is assigned to 0. Religious belief (RB) is measured by the corresponding question in the questionnaire “Do you have religious beliefs?”, and the options for this question include “Yes” and “No.” In this paper, “Yes” is assigned to 1, and “No” is assigned to 0. Health status (HS) is measured by the corresponding question in the questionnaire “What is your health status?”, and the question options include “Very unhealthy,” “Relatively unhealthy,” “Average,” “Relatively healthy,” and “Very healthy.” In this paper, “Very unhealthy” is assigned to 1, “Relatively unhealthy” is assigned to 2, “Average” is assigned to 3, “Relatively healthy” is assigned to 4, and “Very healthy” is assigned to 5. Marital status (MS) is measured by the corresponding question in the questionnaire “What is your marital status?”, and the question options include “Married,” “Unmarried,” “Divorced,” and “Widowed.” In this paper, “Married” is assigned to 1, “Unmarried,” “Divorced,” and “Widowed” are assigned to 0. Household registration status (HRS) is measured by the corresponding question in the questionnaire “What is your household registration status?”, and the question options include “Rural household” and “Urban household.” In this paper, “Rural household” is assigned to 1, and “Urban household” is assigned to 0. Labour income (LI) is measured by the corresponding question in the questionnaire “What is your

annual income from work?”. Mother’s years of education (MYoE) is measured by the corresponding question in the questionnaire “Your mother’s highest level of education,” and the options for this question include “No education,” “Elementary school,” “Middle school,” “High school,” “College,” “Bachelor,” and “Master.” In this paper, “No education” is assigned as 0, “Elementary school” is assigned as 6, “Middle school” is assigned as 9, “High school” is assigned as 12, “College” is assigned as 15, “Bachelor” is assigned as 16, and “Master” is assigned as 19. Family economic status (FES) is measured by the corresponding question in the survey “What is your family’s economic status?”, and the question options include “Well below average,” “Below average,” “Average,” “Above average,” and “Well above average”. In this paper, “Well below average” is assigned to 1, “Below average” is assigned to 2, “Average” is assigned to 3, the “Above average” is assigned to 4, and the “Well above average” is assigned to 5.

3.3. Model Selection. In this paper, the propensity score matching model is chosen as the model for empirical analysis, and the five matching strategies of nearest neighbor matching (1:1), neighbor matching (1:4), Kernel matching, local linear matching, and Martingale matching strategy are used in the propensity score matching model to estimate the average treatment effect of Internet usage on gender division of labour bias more accurately. The propensity score matching model is deemed appropriate for this study because the model could largely eliminate the problem of possible self-selection bias between samples, control for the interference of other variables on the estimation results, and thus estimate the average treatment effect of Internet usage on gender division of labour bias more accurately.

4. Empirical Analysis

4.1. Descriptive Statistics. Descriptive statistics for each of the above variables are shown in Table 1. In terms of dependent variable, the average value of gender division of labour bias (GDLB) is 0.588, which indicates that 58.8% of the respondents agree with gender division of labour bias and think that men should put their careers first, while women should put their families first. The concept of gender division of labour does have the possibility of returning to the traditional bias. In terms of independent variable, the average value of Internet usage (IU) is 0.348, indicating that 34.8% of the respondents regularly use the Internet, and the overall Internet usage rate is relatively low.

In terms of control variables, the average value of gender is 0.508, indicating that 50.8% of the respondents are female and 49.2% are male, and the ratio of male to female is basically equal. The average value of age is 48.910, indicating that the respondents are mainly middle-aged. The average value of years of education (YoE) is 9.088, indicating that the overall education level of the respondents is low, mainly junior high school. The average value of ethnicity is 0.921, indicating that 92.1% of the respondents are Han Chinese, 7.9% are ethnic minorities, and the respondents are mainly Han Chinese. The average value of political status (PS) is

TABLE 1: Descriptive statistics of the variables.

Variables	Sample size	Mean value	Standard deviation	Minimum value	Maximum value
GDLB	18741	0.588	0.492	0	1
IU	18741	0.348	0.476	0	1
Gender	18741	0.508	0.500	0	1
Age	18741	48.910	15.836	17	103
YoE	18741	9.088	4.593	0	19
Ethnicity	18741	0.921	0.270	0	1
PS	18741	0.125	0.331	0	1
RB	18741	0.109	0.312	0	1
HS	18741	3.567	1.095	1	5
MS	18741	0.807	0.395	0	1
HRS	18741	0.532	0.499	0	1
LI	18741	2.546	14.378	0	9980000
MYoE	18741	3.182	4.232	0	19
FES	18741	2.586	0.750	1	5

0.125, indicating that 12.5% of the respondents are party members, 87.5% are masses, and the respondents are mainly masses. The average value of religious belief (RB) is 0.109, indicating that 10.9% of the respondents have religious belief, 89.1% have no religious belief, and most of the respondents have no religious belief. The average value of health status (HS) is 3.567, indicating that the overall health status of the respondents is between average and relatively healthy. The average value of marital status (MS) is 0.807, indicating that 80.7% of the respondents are married, 19.3% are unmarried, and most of the respondents have formed families. The average value of household registration status (HRS) is 0.532, indicating that 53.2% of the respondents are from rural areas and 46.8% are from urban areas. The average value of labour income (LI) is 2.546, indicating that the overall annual labour income of the respondents is about 25.46 million yuan, and the overall labour income level of the respondents is low. The average value of mother's years of education (MYoE) is 3.182, indicating that respondents' mothers' years of education were overall low, mainly elementary school and uneducated. The average value of family economic status (FES) was 2.586, indicating that respondents' family economic status was overall between below average and average.

4.2. Influencing Factors of Internet Usage. Before estimating the effect of Internet usage on gender division of labour bias using a propensity score matching model, this paper constructs a logit model for the analysis of factors influencing Internet usage and discusses the probability values of Internet Usage. The specific model was constructed as follows.

$$\text{Internet Usage}_j = \alpha + \sum_{i=1}^k \sum_{j=1}^n \beta_i X_{i,j} + \mu_j. \quad (1)$$

In the above equation, Internet Usage_j represents the binary dummy variable of whether the j th sample frequently uses the Internet, $\sum_{i=1}^k X_i$ represents a series of influencing

factors of Internet usage for the j th sample, and μ_j represents the residual term for the j th sample. Given that the propensity score matching model is subject to the conditional independence assumption, this paper selects covariates $\sum_{i=1}^k X_i$ that both affect Internet usage and interfere with gender division of labour bias, such as gender, age, years of education (YoE), ethnicity, political status (PS), religious belief (RB), health status (HS), marital status (MS), household registration status (HRS), labour income (LI), mother's years of education (MYoE), and family economic status (FES), and these variables will not be intervened inversely by gender division of labour bias. In addition, to examine whether there is an inverted "U" effect of age on Internet usage, the squared term of age is introduced in a series of influences $\sum_{i=1}^k X_i$. The estimation results are shown in Table 2.

The estimation results showed that, overall, the Pseudo R^2 of the model of influencing factors of Internet usage reached 34.91%, indicating that the model was well fitted, and the influencing factor $\sum_{i=1}^k X_i$ could provide a more comprehensive explanation of whether the sample used the Internet frequently or not. Specifically, gender had a positive effect on Internet usage at the 5% significance level, and calculating its Odds Ratio showed that women were 9.2% more likely to use the Internet regularly than men. Age and age² have positive and negative effects on Internet usage at 1% and 0.1% significance levels, respectively, indicating that there is an inverted "U" effect of respondents' age on their Internet usage, and the probability of using the internet frequently tends to increase and then decrease with the increase of respondents' age. YoE has a positive effect on Internet usage at the 0.1% significance level, and calculating its odds ratio shows that the probability of using the internet frequently increases by 4.082 times for each year of education of the respondents. Ethnicity had a positive effect on Internet usage at the 0.1% significance level, and its Odds Ratio was calculated to show that Han Chinese were 60.1% more likely to use the Internet regularly than ethnic minorities. PS had a positive effect on Internet usage at the 0.1%

TABLE 2: Estimated results of the effect of covariates on Internet usage.

Internet usage	Coefficient	Z value	Odds ratio
Gender	0.088* (0.042)	2.095	1.092
Age	3.912** (1.325)	2.952	49.987
Age ²	-0.841*** (0.179)	-4.698	0.431
YoE	1.626*** (0.071)	22.901	5.082
Ethnicity	0.471*** (0.079)	5.962	1.601
PS	0.221*** (0.062)	3.565	1.247
RB	-0.073 (0.068)	1.074	0.929
HS	0.292*** (0.067)	4.358	1.338
MS	-0.215*** (0.061)	3.525	0.806
HRS	-0.705*** (0.047)	-15.000	0.494
LI	0.047*** (0.005)	9.400	1.048
MYoE	0.346*** (0.022)	15.727	1.413
FES	0.335*** (0.066)	5.076	1.399
Constant	-8.303*** (2.427)	-3.421	0.000
Pseudo R ²		34.91%	
Sample size		18741	

Note: *** represents $p < 0.001$; ** represents $p < 0.01$; * represents $p < 0.05$. Numbers in parentheses are standard errors.

significance level, and calculating its Odds Ratio showed that the probability of party members using the internet frequently was 24.7% higher than that of the masses. RB, despite its negative effect on Internet usage, was not significant. HS had a positive effect on Internet usage at the 0.1% significance level, and calculating its odds ratio shows that for each unit improvement in the respondents' health status, their probability of using the internet frequently will increase by 33.8%. MS had a negative effect on Internet Usage at the 0.1% significance level, and the odds ratio was calculated to show that the probability of using the internet frequently among married people was only 80.6% of that among unmarried people. HRS had a negative effect on Internet usage at the 0.1% significance level, and its odds ratio was calculated to show that the probability of using the internet frequently in rural areas was only 49.4% of that in urban areas. LI had a positive effect on Internet usage at the 0.1% significance level, and calculating its odds ratio showed that for every 10,000 yuan increase in respondents' labour income, their probability of using the internet frequently would increase by 4.8%. MYoE had a positive effect on Internet usage at the 0.1% significance level, and calculating its odds ratio showed that for every 1 year increase in a respondent's mother's education, the probability that the respondent frequently using the Internet would increase by 41.3%. FES had a positive effect on Internet usage at the 0.1% significance level, and calculating its odds ratio shows that for every 1 unit increase in the respondent's household economic status, the probability of the respondent using the internet frequently will increase by 39.9%.

In summary, all of the above covariates, except RB, had significant effects on Internet usage, which implies that direct least square regression models to estimate the effect of Internet usage on gender division of labour bias would be largely influenced by sample self-selection bias and thus misestimate the effect of Internet usage. For this reason, this paper further employs a

propensity score matching model to estimate the average treatment effects of Internet usage on gender division of labour bias based on the estimation results of the logit model.

4.3. Balance Test of Covariates. Based on the previous discussion of whether the sample used the Internet frequently using a logit model, this paper uses a propensity score matching model to estimate the average treatment effect of Internet usage on gender division of labour bias. However, before estimating this effect, this paper tested the balance of covariates to satisfy the hypothesis of conditional independence and joint support. The results of the tests are presented in Table 3 and Figure 1.

The test results show that the standard deviations of the observable covariates introduced in this paper were reduced to different degrees after the data matching was completed. Among them, the standard deviation of FES was reduced to the largest extent by 99.5%, while the smallest was gender, which was also reduced by 71.6%. Overall, except for a few covariates such as age and YoE, which still had some differences after data matching, all other observable covariates showed a significant decrease in t value after data matching and were no longer statistically significant, indicating that the realistic differences in observable characteristic variables between the treatment and control groups were better eliminated. Thus, the Internet usage is randomized and satisfies the conditional independence assumption.

In addition, the range of common values of propensity scores depicted in Figure 2 indicates that the data used in this paper satisfy the realistic requirement of propensity score matching for common support assumptions.

4.4. Estimation of Average Treatment Effects. Based on the probability analysis of whether the sample used the Internet frequently based on the logit model and the balance test of each covariates, this paper used five matching strategies,

TABLE 3: Balance test of covariates.

Variables	Matching state	Mean		Bias (%)	Reduced bias (%)	t value
		Treated	Control			
Gender	Unmatched	0.490	0.518	-5.7	71.6	-3.69***
	Matched	0.490	0.498	-1.6		-0.91
Age	Unmatched	3.604	3.954	-110.5	93.4	-73.62***
	Matched	3.604	3.581	7.2		3.79***
Age ²	Unmatched	13.101	15.719	-111.3	94.1	-73.46***
	Matched	13.101	12.946	6.6		3.58***
YoE	Unmatched	2.462	1.774	105.3	89.8	62.77***
	Matched	2.462	2.392	10.8		11.05***
Ethnicity	Unmatched	0.939	0.911	10.5	81.9	6.66***
	Matched	0.939	0.934	1.9		1.17
PS	Unmatched	0.169	0.102	19.8	93.6	13.35***
	Matched	0.169	0.165	1.3		0.66
RB	Unmatched	0.915	0.878	12.2	74.7	7.77***
	Matched	0.915	0.905	3.1		1.88
HS	Unmatched	1.344	1.140	59.1	95.8	36.60***
	Matched	1.344	1.353	-2.5		-1.74
MS	Unmatched	0.750	0.837	-21.6	88.0	-14.43***
	Matched	0.750	0.761	-2.6		-1.38
HRS	Unmatched	0.355	0.626	-56.4	91.2	-36.70***
	Matched	0.355	0.331	5.0		2.89***
LI	Unmatched	8.223	5.791	54.6	88.0	35.50***
	Matched	8.223	7.932	6.5		3.98***
MYoE	Unmatched	1.463	0.465	109.0	99.4	73.08***
	Matched	1.463	1.469	-0.6		-0.34
FES	Unmatched	0.973	0.860	34.8	99.5	22.12***
	Matched	0.973	0.973	0.2		0.12

Note: *** represents $p < 0.001$; ** represents $p < 0.01$; * represents $p < 0.05$. Numbers in parentheses are standard errors.

namely nearest neighbor matching (1:1), near neighbor matching (1:4), Kernel matching, local linear matching, and Martingale matching strategy, to estimate the average treatment effects of Internet usage on gender division of labour bias, respectively. The estimation results are shown in Table 4.

The estimation results showed that in terms of gender division of labour bias, the treatment group sample was significantly less likely to agree on gender division of labour bias than the control group due to their frequent Internet usage, and the average treatment effect was -0.130, -0.142, -0.148, -0.141, and -0.148 for the five matching strategies, respectively, and all were significant at the 0.1% level with statistically significance. The above estimates suggest that frequent Internet usage will result in a significant decrease in respondents' identification with gender division of labour bias (0.130 and 0.148) and a significant improvement in gender division of labour bias.

4.5. Sensitivity Test. In order to avoid the results being greatly influenced by unobservable factors, this paper attempts to perform a sensitivity test on the propensity score

matching results. The corresponding test results are shown in Table 5.

The results of the Rosenbaum's bounds test showed that the propensity score matching results did not change even when $\Gamma > 3.600$ at the 0.1% significance level. The results of the H-L confidence interval test showed that the propensity score matching results changed only when $\Gamma > 3.600$ at the 0.1% significance level. The above test results indicate that the findings of this paper have some reliability.

4.6. Further Analysis. Although it has been previously argued that Internet usage significantly reduces the overall agreement of gender division of labour bias, it remains to be further examined whether Internet usage strengthens women's self-identification, improves men's exclusion bias, or both. To this end, this paper groups the entire sample according to respondents' gender and uses the five matching strategies described above to estimate the effect of Internet usage on gender division of labour bias held by different genders. The estimated results are presented in Table 6.

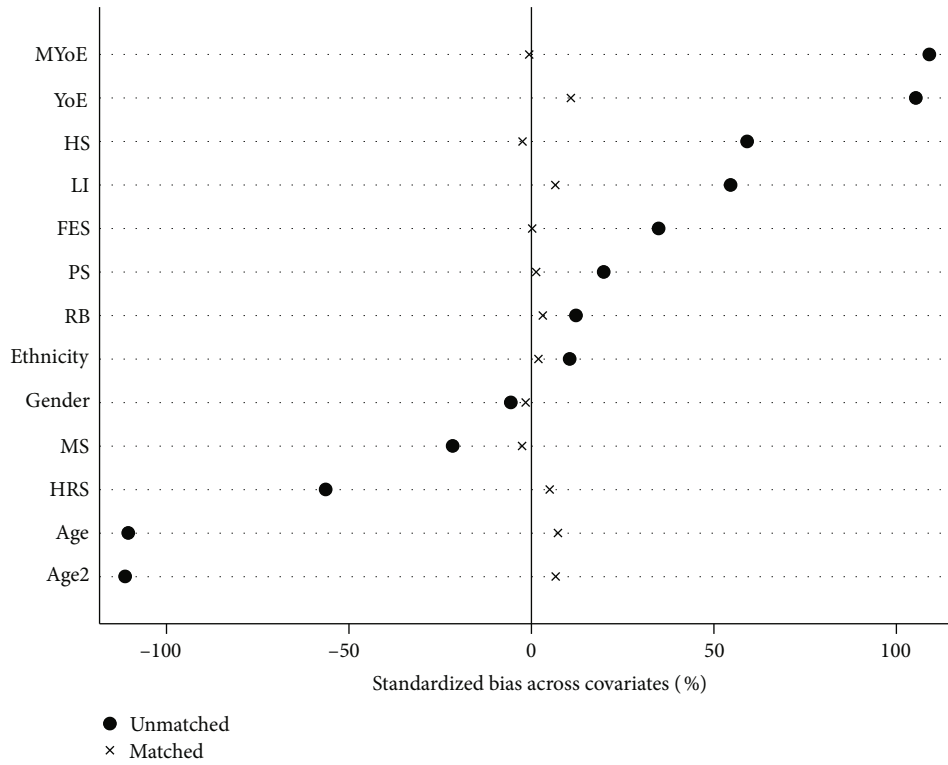


FIGURE 1: Changes in standardized percentage deviation of covariates before and after matching.

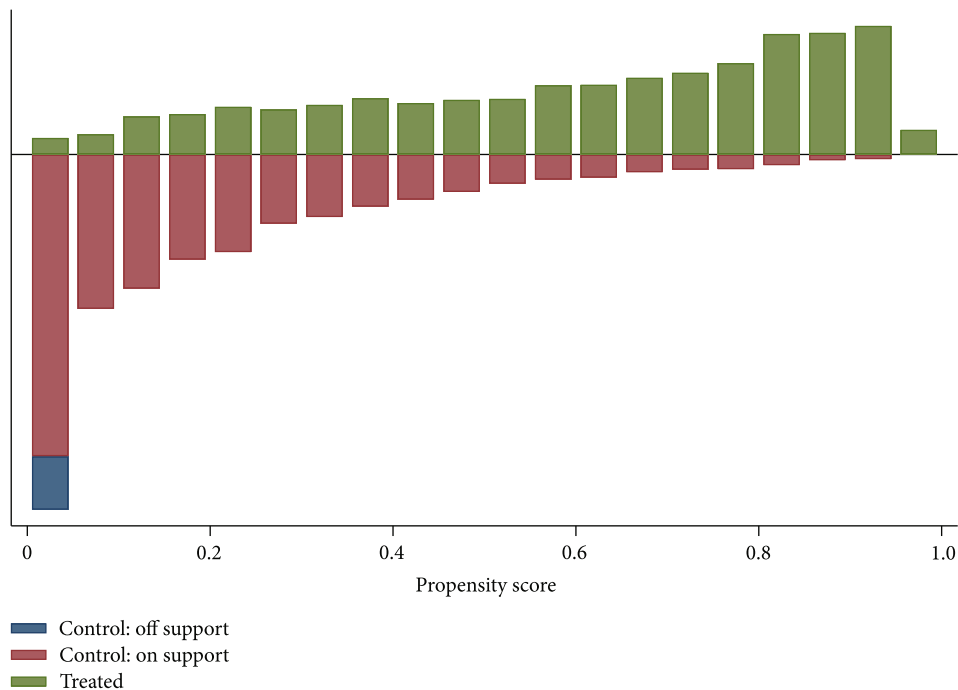


FIGURE 2: Common range of values for propensity score.

The estimation results showed that for the women sample, the treatment group had a significantly lower level of identification with gender division of labour bias than the control group due to frequent Internet usage, and the average treatment effect was -0.166, -0.165, -0.180, -0.172, and

-0.194 for the five matching strategies, all of which were statistically significant at the 0.1% level. For the men sample, the average treatment effects were -0.131, -0.131, -0.115, -0.112, and -0.102 for the five matching strategies and were all statistically significant at the 0.1%, which is statistically

TABLE 4: Impact of Internet usage on gender division of labour bias.

Matching strategy	Matching state	Treated	Control	Average treatment effects	T-stat
Nearest neighbor matching (1:1)	Unmatched	0.419	0.678	-0.260***	-35.53
	Matched	0.419	0.549	-0.130***	-6.55
Near neighbor matching (1:4)	Unmatched	0.419	0.678	-0.260***	-35.53
	Matched	0.419	0.561	-0.142***	-8.60
Kernel matching	Unmatched	0.419	0.678	-0.260***	-35.53
	Matched	0.419	0.567	-0.148***	-11.06
Local linear matching	Unmatched	0.419	0.678	-0.260***	-35.53
	Matched	0.419	0.560	-0.141***	-7.12
Martingale matching strategy	Unmatched	0.419	0.678	-0.260***	-35.53
	Matched	0.419	0.567	-0.148***	-11.45

Note: *** represents $p < 0.001$; ** represents $p < 0.01$; * represents $p < 0.05$. Numbers in parentheses are standard errors.

TABLE 5: Sensitivity test results.

Γ (gamma)	Rosenbaum's bounds test		H-L confidence interval test	
	Sig+	Sig-	t-hat+	t-hat-
1.000	0.000	0.000	-0.093	-0.093
1.100	0.000	0.000	-0.100	-0.085
1.200	0.000	0.000	-0.108	-0.080
1.300	0.000	0.000	-0.115	-0.073
1.400	0.000	0.000	-0.122	-0.067
1.500	0.000	0.000	-0.128	-0.063
1.600	0.000	0.000	-0.137	-0.058
1.700	0.000	0.000	-0.147	-0.054
1.800	0.000	0.000	-0.158	-0.050
1.900	0.000	0.000	-0.179	-0.047
2.000	0.000	0.000	-0.457	-0.043
2.100	0.000	0.000	-0.469	-0.040
2.200	0.000	0.000	-0.478	-0.037
2.300	0.000	0.000	-0.488	-0.034
2.400	0.000	0.000	-0.500	-0.031
2.500	0.000	0.000	-0.506	-0.028
2.600	0.000	0.000	-0.510	-0.025
2.700	0.000	0.000	-0.513	-0.023
2.800	0.000	0.000	-0.517	-0.020
2.900	0.000	0.000	-0.520	-0.017
3.000	0.000	0.000	-0.523	-0.015
3.100	0.000	0.000	-0.525	-0.012
3.200	0.000	0.002	-0.528	-0.010
3.300	0.000	0.026	-0.531	-0.007
3.400	0.000	0.142	-0.533	-0.004
3.500	0.000	0.409	-0.535	-0.001
3.600	0.000	0.722	-0.537	0.004

significant. Frequent Internet usage will result in a significant decrease in men's agreement with the gender division of labour bias (0.102 and 0.131), although the effect is significantly lower than the effect on women, but it also improves

men's exclusion bias to some extent. The above estimates suggest that frequent Internet usage not only strengthens women's self-identity but also ameliorates men's exclusion bias and has a stronger effect on women's self-identity.

TABLE 6: Influence of Internet usage on gender division of labour bias held by different genders.

Matching strategy	Average treatment effect for women sample	Average treatment effect for men sample
Nearest neighbor matching(1:1)	-0.166*** (0.026)	-0.131*** (0.026)
Near neighbor matching (1:4)	-0.165***.(0.022)	-0.131*** (0.022)
Kernel matching	-0.180*** (0.019)	-0.115*** (0.019)
Local linear matching	-0.172*** (0.026)	-0.112*** (0.026)
Martingale matching strategy	-0.194*** (0.017)	-0.102*** (0.019)

Note: *** represents $p < 0.001$; ** represents $p < 0.01$; * represents $p < 0.05$. Numbers in parentheses are standard errors.

5. Discussion and Implications

This paper examined the relationship between Internet usage and gender division of labour bias from a quantitative perspective by constructing a propensity score matching model, which found that frequent Internet usage did significantly reduce respondents' agreement with gender division of labour bias and had a considerable impact on traditional-established social relations [20]. This means that cyberspace is not only a relatively more egalitarian environment in which gender differences are less important, women gradually have more access to internal and external resources in cyberspace, and ultimately women's voices are enhanced [20, 25, 26] but also that knowledge and education in cyberspace can indeed be better disseminated thanks to the Internet as an underlying digital technology. The function and properties of cyberspace are thus educational, which also has a demonstration effect on improving gender division of labour bias and promoting gender equality [27]. However, it is important to note that Internet usage is significantly more effective in improving gender division of labour bias for women than for men, perhaps because men are still the dominant force in the Internet industry and are more likely to serve as "gatekeepers" for new online media and as "opinion leaders" in public sphere issues [29], but this does not entirely prevent the positive impact of Internet usage on gender division of labour bias, which will be significantly reduced with frequent Internet usage for both men and women.

In summary, this paper discussed the relationship between Internet usage and gender division of labour bias both from the perspective of theoretical analysis and also tests the relationship from the perspective of empirical analysis, which indeed enriches the existing theory to a certain extent while breaking through the status quo of studies that is dominated by qualitative analysis and lacking the support of data analysis [19, 28, 29]. However, this paper also has certain shortcomings, and although the construction of propensity score matching model can largely eliminate the influence of sample self-selection bias on the estimation results, it cannot yet eliminate the possible sample selection bias. Therefore, in a more in-depth study of the relationship between Internet usage and gender division of labour bias in the future, this paper will experimentally use the Heckman two-stage model in combination with the propensity score matching model to eliminate sample selection bias as much as possible while eliminating sample self-selection bias in order to obtain more accurate estimation results and try to clarify the net effect of Internet usage on gender division of labour bias.

6. Conclusions and Recommendations

This paper estimates the realistic impact of Internet usage on gender division of labour bias using propensity score matching models based on Chinese General Social Surveys in 2010 and 2017, and the main findings are as follows: firstly, a series of personal characteristics factors such as respondents' gender, age, years of education, ethnicity, political status, health status, marital status, household registration status, labour income, mother's years of education, and family economic status can significantly affect whether they use the Internet frequently; secondly, the estimation results of the whole sample of the propensity score matching model show that respondents' agreement with gender division of labour bias will be significantly reduced (0.130 and 0.148) with frequent Internet usage; respondents' gender division of labour bias has been improved considerably, and the results of the Rosenbaum's bounds test and the H-L confidence interval test support the above findings, indicating that the estimation results of the propensity score matching model have some reliability; thirdly, the estimation results of the propensity score matching model for women and men samples show that the gender division of labour bias held by both women and men respondents has both been greatly improved by frequent Internet usage and shows a greater impact on women respondents. Specifically, frequent Internet usage will significantly reduce the agreement of gender division of labour bias among women and men respondents, respectively (0.165 and 0.194) and (0.102 and 0.131), indicating that not only women's self-identity is strengthened to a great extent under the condition of frequent Internet usage but also men's exclusionary bias has also been improved to some extent.

The above findings have obvious policy implications. On the one hand, government departments should continue to promote the construction of Internet infrastructure and the popularization of Internet usage, so that more people can access to the Internet and consider to promote appropriate policies for the Internet industry to lower the cost of usage and further increase people's access to the Internet while encouraging them to improve their service quality. On the other hand, government departments should guide various online media to promote more images of women with diverse social roles, so as to completely break the traditional positioning of women as virtuous wives and mothers and give women more freedom to develop. In addition, while disseminating the concept of gender equality, government departments should also strengthen the control of the

content and behavior of various online media and promptly correct their deviant behavior such as disseminating gender stereotypes and promoting stereotypical gender images.

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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