Computer Fraud and Security
ISSN (online): 1873-7056

A Study on Internet Use, Gender Concepts, and Full Employment of Women Based on the Ologit Model

Qiaoling Xu*

[1]*Department of Economics and Management, Taiyuan Institute of Technology, Taiyuan 030008, Shanxi, China*
**Corresponding Author.*

Abstract:
Full employment is not only related to the healthy development of the labor market but also to the optimization of educational resource allocation and the normal functioning of the education system. Therefor, identifying the factors that affect females' full employment is particularly necessary. This study examines the state of full employment from the perspective of females' internet use. Based on data from the China Family Panel Studies (CFPS), this research constructs indicators for internet use and full employment, employing ordinal logistic regression (Ologit) to analyze their relationship. The findings reveal that internet use among females increases their likelihood of achieving full employment. Females who use internet more are less likely to experience educational mismatches, insufficient working hours, and lower labor compensation. Particularly, females with low levels of education, those living in rural areas, and married females are more significantly affected. Internet use influences full employment by steering females toward equal gender perception. The article emphasizes the importance of considering internet use and gender perception in females' full employment and advocates for the promotion of females' legal and equal labor rights.

Keywords: internet use, internet use frequency, gender perception, full employment, ologit

INTRODUCTION

The Central Economic Work Conference has emphasized the prioritization of employment in the economic agenda for 2024. However, data released by the National Bureau of Statistics indicate a continuous increase in urban unemployment in China since 2019, which only accounts for overt unemployment. When considering underemployment, the unemployment rate would be even higher. Under the threat of unemployment, individuals often opt for positions that are beneath their capabilities to enhance their employability, leading to underemployment [1]. Underemployment hinders the realization of workers' productive potential, reduces the return on education, incurs income penalties [2], and diminishes job satisfaction [3], resulting in work negligence and turnover. Amid rising educational levels and deteriorating employment conditions, the issue of underemployment becomes more pronounced, fostering sentiments such as "education is futile" and "diploma devaluation", which are detrimental to the healthy development of the education system and hinder the formation of new productive forces. Recognizing the phenomenon of underemployment and exploring corresponding strategies is of significant importance to individuals, enterprises, and society as a whole. This is why both the 19th and 20th National Congress reports have underscored the crucial role of full employment in improving people's livelihoods and enhancing social governance.

China is currently experiencing a phase of population aging, with the elderly support ratio increasing from 16.8% in 2018 to 21.8%. The simultaneous rise in the elderly population and the continuous decline in the working-age population, combined with a persistently low fertility rate, indicates a trend toward the erosion of China's demographic dividend. However, over the past decade, the proportion of females in China has remained between 48.8% and 48.9%, leading many scholars to suggest that a gender dividend could initiate a new wave of economic growth. From a corporate perspective, female employment can significantly reduce labor costs and enhance productivity, thereby promoting corporate exports [4]. From a familial perspective, the participation of married females in the labor force can significantly reduce the vulnerability of household poverty [5]. From a societal perspective, promoting female employment is conducive to improving labor allocation efficiency and driving economic growth [6]. With the development of higher education in China, females' educational advantages have become increasingly prominent [7]. However, these educational advantages have not translated into the labor market, and the issue of female underemployment is quite prominent. Existing research has primarily focused on females' labor market participation rates and gender income disparities, neglecting the underemployment issues stemming from employment distortions among females. Although some scholars have noted the issue of hidden

unemployment [8] and proposed that full employment is key to narrowing income disparities [9], research on full employment issues is still scarce, especially regarding females' full employment, which remains an uncharted territory.

The internet is a widely and significantly utilized space for human activities in today's society [10], permeating every aspect of daily life. The 54th Statistical Report on the Development of the Internet in China, released in 2024, indicates that as of June 2024, the number of internet users in China approached 1.1 billion, an increase of 7.42 million from December 2023, with an internet penetration rate of 78.0%. The extensive use of the internet brings new opportunities to address the quality of labor employment. On one hand, the development of internet technology and the rise of the digital economy have given birth to new forms of employment (such as platform employment, shared employment, "crowdsourcing," and "crowd creation"), offering a wealth of job opportunities for workers. On the other hand, the internet provides abundant resources and information, which helps reduce the search costs for workers and alleviate the information asymmetry between labor and capital, creating favorable conditions for improving employment quality [11]. Therefore, in the era of accelerated digital economic development, a profound understanding of the relationship between internet usage and labor employment quality is crucial for fully leveraging the internet's potential in promoting the enhancement of employment quality. Although there is extensive research on the individual and household economic effects of internet usage, there is still a lack of empirical evidence on the impact of mobile internet usage on females' full employment. Mobile internet provides more diverse opportunities for females to participate equally in social life, promote their own development, and realize their value. This paper focuses specifically on whether the use of the internet can significantly impact females' full employment, thereby supplementing the research on the influence of the internet on females' economic behavior.

This paper examines the impact of identity recognition on females' full employment, utilizing data from the China Family Panel Studies conducted in 2018 and 2020. It tests the mechanism by which internet use influences females' full employment through their gender perceptions. The findings of the study reveal that internet use promotes the level of females' full employment. Furthermore, internet uses decreases the traditional gender perceptions, which affects the efficiency of job search matching and reduces job-person matching, ultimately leading to females' underemployment.

Compared to other literature on females' employment, the main innovations of this paper are as follows: First, the focus of this paper is on females' full employment, which is a perspective on the quality of employment rather than merely the quantity of labor participation rate. Second, the definition of underemployment in this paper revolves around whether the work can fully utilize females' educational human capital, describing the degree of matching between work skills, labor duration, and labor compensation with education from three aspects. Thirdly, in terms of the mechanisms of influence, other studies tend to focus more on the effects of increased social capital and information channels that internet usage brings to females, while this paper emphasizes the reshaping of females' gender role perceptions through internet use, which is an intrinsic driving force affecting females' full employment.

The structure of the remainder of this paper is organized as follows: The second section provides a literature review and an analysis of the theoretical mechanisms. The third section outlines the research strategy, which includes data sources, variable selection, and the construction of the empirical model. The fourth section presents the empirical results, encompassing baseline regression, robustness checks, endogeneity analysis, heterogeneity analysis, and mechanism verification. Finally, the fifth section concludes with policy recommendations.

LITERATURE REVIEW AND THEORETICAL HYPOTHESES

Literature Review

The literature pertinent to this study can be categorized into two primary streams: the first centers on the factors influencing full employment, while the second examines the influence of internet use on employment.

Factors influencing full employment

Full employment refers to a condition in which individuals are engaged in work that aligns with their knowledge, skills, and abilities, thereby fully utilizing their potential. Current research on full employment is limited and primarily focuses on underemployment from the perspective of educational and skill matching. Fan Aiai and Ding Xiaohao (2013) demonstrated that the level of full employment at the micro level is influenced by sectoral segmentation, with employees in the secondary labor market being more susceptible to underemployment and experiencing a significant degree of diploma devaluation [12]. Yuan Yuzhi and Du Yuhong (2021) developed a skill mismatch indicator based on educational level, professional positions, and skill levels, revealing skill mismatch rates ranging from 27.8% to 65.28%, which indicates a high likelihood of underemployment [13]. Li Jianqi and Zhang Kangsi (2023) assessed underemployment from the perspectives of cognitive and non-cognitive skills, showing that skill mismatch can account for 19% to 29% of income inequality [14].

Since full employment results from a balance between labor supply and demand, existing studies have examined its causes from both perspectives. From the demand side, underemployment occurs when the economic structure and market demand for labor lag behind educational advancements, preventing the occupational structure from accommodating the increasing number of educated workers [15]. Shen Yu et al. (2023) also noted that college graduates often struggle to find positions that align with their educational qualifications, compelling them to accept jobs that do not utilize their skills, which contributes to underemployment [16]. The development of the digital economy and the enhancement of urban innovation capabilities can effectively absorb the growing skilled labor force and mitigate underemployment [17, 18]. On the supply side, individual capabilities, educational attainment and quality, chosen majors, and family backgrounds all influence the full employment status of workers. Li Xiaoguang (2021) and colleagues elucidated the mechanisms behind horizontal and vertical educational mismatches across four dimensions: school level, academic performance, major types, and professional qualifications. They highlighted that workers with higher educational attainment, better academic performance, greater market relevance of their majors, and recognized professional qualifications are less likely to experience overeducation [19].

Internet use and employment

Current research on the relationship between internet usage and employment primarily focuses on two aspects: first, the impact of internet usage on labor participation, and second, its effect on employment quality. Zhang Weidong et al. (2021), using data from the Chinese General Social Survey, found that internet usage significantly promotes the non-agricultural employment of rural labor force [20]. Chen Ying et al. (2021), based on data from the China Family Panel Studies, discovered that internet usage enhances the flexibility of employment for workers, expands employment information and opportunities, thereby increasing the likelihood of multiple employment for workers [21]. Additionally, internet usage increases the probability of entrepreneurship. Serving as both an informational and financial intermediary, the internet helps entrepreneurs seize business opportunities and communicate information during the entrepreneurial process, while also providing financial support for startups and alleviating financing constraints. Empirical research by Zhou Guangsu and Fan Gang (2018) has confirmed that internet usage enhances the probability of household entrepreneurship through four channels: the information channel effect, financing effect, social interaction effect, and risk preference effect [22]. The impact of the internet on the quality of employment for workers is mainly reflected in aspects such as work income, working hours, job autonomy, job stability, and labor protection. Research by Mao Yufei et al. (2019) indicates that internet usage can increase workers' employment income, reduce working hours, and enhance job autonomy [23]. Studies by Zhang Min et al. (2024) also show that internet usage significantly increases job stability, labor income, and the level of social security for workers [24].

Critique of the literature review

Females constitute 43.5% of the total employed population in China and represent a key demographic in achieving higher quality and more comprehensive employment. Despite this, Li Xiaoguang (2022) found, based on multiple waves of CGSS data, that the probability of females experiencing over-education is 15% higher than that of men, indicating that the reversal of gender disparities in education has not resulted in equitable employment opportunities [25], high educational attainment of females has not translated into equitable employment

opportunities. Current literature on full employment is limited, and there is a notable lack of research addressing the causes of females' underemployment. Compared to mere labor participation and employment quality, full employment, which examines whether an individual's human capital is fully utilized based on their knowledge and skills, holds greater significance. It is not only related to the healthy development of the labor market but also to the optimization of educational resource allocation and the normal functioning of the education system in China. With the advent of the internet, extant research has delved into the role of the internet in fostering labor participation and enhancing the quality of employment. However, studies examining the impact of the internet on females' full employment are relatively scarce, and these studies have predominantly focused on the informational effects of the internet on employment, neglecting the influence of the internet on females' gender concepts and its subsequent impact on their employment quality.

This paper aims to address this gap by examining the impact of internet use on females' full employment and the mechanisms through which internet use influences females' gender perceptions and, consequently, their overall employment outcomes.

Theoretical Hypotheses

Internet use and females' full employment

Firstly, the utilization of the internet enhances the likelihood of females' securing employment. Internet platforms provide a wealth of information resources, enabling them to quickly and conveniently access detailed information about relevant job positions, thereby expanding their range of employment choices and opportunities [26]. Historically, mothers have been portrayed as selflessly dedicated caregivers, with married females experiencing a significant reduction in both work and leisure time, while their involvement in domestic labor and caregiving for family members increases substantially [27]. This diminishes their connection to the workplace, reducing opportunities to establish professional networks [28], making it challenging for them to leverage social resources for employment support. Consequently, internet usage has opened up additional avenues for females to seek employment, increasing their job opportunities. Qiu Hua and Yin Zhichao (2023) argue that the achievement of high-quality employment for females is primarily attributed to digital transformation [29]. They note that the digital transformation of households enhances females' ability to obtain employment information, thereby increasing both the quantity and quality of females' employment. Secondly, internet usage reduces the incidence of educational mismatch among females. Zhao Fang and Jiang Guoliang (2023) highlight that the internet broadens information channels, expands workers' social networks, and provides online learning opportunities, all of which contribute to mitigating educational mismatch among females [30]. Additionally, internet usage helps females overcome spatial limitations in employment and alleviate conflicts between family and work, thereby addressing the issue of over-education among females [31]. Thirdly, beyond reducing educational mismatch, internet usage also improves the quality of females' employment. The digital economy increases females' accumulation of human capital and disposable time, promoting a higher-level structure of female employment and allowing high-skilled females to reap greater employment benefits from the digital economy [32]. Furthermore, the platform economy based on the internet enhances employment conditions for females, weakens the constraints of family responsibilities, facilitates job search for females, thereby increasing their employment capabilities and opportunities, and improving the quality of females' employment [33]. The increase in females' employment opportunities, the reduction in the probability of educational mismatch, and the improvement in employment quality all contribute to the realization of full employment for females.

Internet use, gender perception and females' full employment

While the use of the internet has increased females' employment opportunities, the probability of education-job matching, and the quality of employment, it merely provides an objective possibility for females to achieve full employment. Only when the traditional gender roles of "women managing the home and men managing the outside world" change can women utilize the internet to seek job opportunities. Therefore, the reshaping of gender role perceptions by the internet is a key mechanism in promoting full employment for females. Li Qingyuan's (2024) research indicates that the internet expands channels for information acquisition, allowing people to access more information about gender equality, thereby increasing attention to gender equality and making individual gender role perceptions more equal in dimensions such as capability, job rights, and household responsibilities

[34]. Research by Wang Weidong et al. (2021) shows that the use of the internet has a particularly significant impact on the formation of modern gender role perceptions among females [35]. The use of the internet brings more feminist issues into the public view, especially with female elites playing a positive exemplary role online, embedding modern gender role perceptions deeply into people's minds. This shift in perception leads to a change in behavior. Traditional gender role expectations not only place a greater burden of family responsibilities on females but also diminish their independence and competitiveness, leading to increased dependence on their families and male partners [36]. However, under the influence of modern gender role perceptions, females are more likely to break free from the constraints of family responsibilities and dependence on male partners, enhancing their competitiveness in the labor market and improving the level of full employment.

Based on the theoretical analysis presented above, this paper proposes the following hypotheses:

H: Internet use promotes females' full employment.

H1: Internet use increase the likelihood of equal gender perceptions, thereby promoting full employment.

RESEARCH STRATEGY

Data Sources, Variable Selection, and Descriptive Statistics

Data sources

The primary data source for this study is the China Family Panel Studies (CFPS) from 2018 and 2020. The construction of the female full employment index, internet use and other control variables is based on the CFPS 2018 data. Due to the absence of gender identity-related questions in the 2018 survey, and considering that gender perception as a cultural concept does not change rapidly, relevant questions from the 2020 survey data are utilized to measure gender perceptions. The CFPS encompasses a wide range of data on communities, families, and individuals' work and subjective attitudes, featuring a large sample size and strong representativeness, making it widely used in economic research. Unlike other studies on female labor participation, this study focuses on the degree of full employment among females already in the labor market, defining the research subjects as "female professional workers currently employed and earning an income" aged 16 to 60, while excluding those who are unemployed, out of work, or retired at the time of the survey. After data cleaning, a total sample of 5,455 individuals was obtained.

Variable selection

(1) Dependent variable.

The dependent variable in this study is full employment. Li Jianqi and Ding Shulei (2024) define full employment based on working hours and labor stability [37]. More commonly, Chen Guifu et al. (2022) measures full employment from multiple dimensions, including working hours, labor compensation, working conditions, and the social security system [38]. However, these methods do not take into account the level of human capital of the workers themselves. This paper argues that full employment is the full utilization of educational human capital in work; therefore, mere working hours, labor compensation, and working conditions cannot reflect the full employment status of workers. Focusing on whether work can fully utilize females' educational human capital, this paper describes the degree of matching between work skills, working hours, and labor compensation with education from three aspects. First, according to the definition of full employment, when the knowledge and skills required by the actual work match the knowledge and skills possessed by the workers, it is considered full employment. Thus, the paper defines full employment as the actual required educational level for work being greater than or equal to the educational level possessed by the workers. Here, the actual required educational level for work is determined by the mode of the identity and industry category to which the worker belongs. Second, compared with workers of the same educational level in the same province, the longer the working hours, the more likely it is to fully utilize their knowledge and abilities. Therefore, working hours that are higher than or equal to the mode of working hours of workers with the same educational level in the same province are defined as full employment. Third, considering that the match between working hours and education will ultimately be reflected in output, this paper also measures full employment based on whether labor compensation matches education. If labor income is higher than or equal to the wage mode of workers with the same educational level

in the same province, it is defined as full employment. In the benchmark regression of this paper, the values of these three measurement methods are added together as the final indicator for measuring full employment, with a range of 0-3. The higher the score, the higher the degree of full employment.

(2) Core Explanatory variable.

The core explanatory variable in this paper is internet use. Drawing on the research by Xie Shang et al. (2023) [39], this variable is defined based on two questions in the questionnaire: "Do you access the internet via mobile devices?" and "Do you access the internet via a computer?" If at least one of these questions is answered affirmatively, the variable is coded as 1; otherwise, it is coded as 0.

(3) Mechanism variables.

This study examines female equal gender perceptions as a mechanism influencing female full employment. Consistent with most research on gender perceptions, this study employs four indicators to measure this construct: "Men should focus on careers, females on families," "It's better to marry well than to work hard," "A woman is complete only if she has children," and "Men should share half of the household chores." Notably, the first three questions serves as a reverse indicator, therefore, it is first adjusted to function as a positive indicator. Each item is rated on a scale of 1 to 5, with higher scores indicating a stronger equal gender role perception. The final gender perception variable score is calculated as the sum of these four indicators, yielding a range from 0 to 20.

(4) Control variables.

Like other studies on employment, this research selects demographic characteristics of the labor force, family characteristics, and regional characteristics as control variables that influence full employment. The specific control variables include age, household registration, educational background, marital status, self-rated health, family income, family net worth, family size, and the number of individuals over 60 and under 16 within the household.

Descriptive statistics of variables

In the final sample, urban household registration constitutes 33.9%, resulting in a relatively balanced distribution. The proportion of educational full utilization is approximately 67.16%, while the percentage of income that fully reflects human capital value is about 45.41%. Additionally, the proportion of labor time utilized fully reaches 74.21%. Overall, the level of female full employment is moderate. The overall level of internet use is around 0.712, while frequency of internet use is only 0.328. The main descriptive statistics for each variable are presented in Table 1.

Table 1. Summary statistics for key variables.

Variable Name	Variable Description	Mean	Standard Deviation	Minimum	Maximum
Full Employment1	Comprehensive Indicator	1.6467	0.8871	0.0000	3.0000
Full Employment2	Sufficient Working Hours	0.7421	0.4524	0.0000	1.0000
Full Employment3	Effective Utilization of Education	0.6716	0.4939	0.0000	1.0000
Full Employment4	Adequate Labor Compensation	0.4541	0.4787	0.0000	1.0000
Internet use1	whether uses the internet	0.712	0.484	0.0000	1.0000
Internet use2	Frequency of internet use	0.328	0.468	0.0000	1.0000
Gender perception	Equal Gender perception	12.1026	3.1791	4.0000	20.0000
Age	Age	36.4965	8.0317	17.0000	60.0000
Household Registration	Household Registration Type	0.3390	0.4241	0.0000	1.0000
Education	Level of Education	3.8253	2.1312	0.0000	8.0000
Marital Status	Marital Status	0.9150	0.2790	0.0000	1.0000
Health	Self-Rated Health	3.1492	1.1305	1.0000	5.0000
Family Income	Natural Log of Family Income	9.7352	0.9406	0.0000	15.0094
Family Net Worth	Natural Log of Family Net Worth	12.8957	1.2709	0.0000	17.7288
Family Size	Family Size	4.8858	1.9902	1.0000	21.0000
Number of Elderly	Number of Elderly	0.4014	0.6584	0.0000	3.0000
Number of Minors	Number of Minors	1.1645	1.0773	0.0000	9.0000

Model Construction

Using the aforementioned sample, this study examines the impact of females' internet use on their full employment, constructing the model as shown in Equation (1). Since the dependent variable is an ordinal variable that ranges from 0 to 3, ordinal logistic regression (ologit) is primarily employed.

$$Fullemployment_i = \beta_0 + \beta_1 \text{int}\, ernet_i + \sum_{k=2}^{n} \beta_k X_{ki} + \varsigma_i \quad (1)$$

Where:

Fullemployment represents the extent of full employment.

Internet represents whether uses the internet.

X_i includes a series of control variables that may influence females' labor supply, specifically: age, household registration, educational background, marital status, self-rated health status, family income, family net worth, family size, number of minors, and number of elderly.

B0 is the intercept.

The coefficients for the independent variables are denoted as β1, β2,...,βk

The term ςi represents the error.

When examining the mechanism by which internet use influences full employment, we follow the mediation effect testing steps outlined by Wen Zhonglin et al. (2005) [40]. The following regression models are established:

$$identity_i = \alpha_0 + \alpha_i \text{int}\, ernet_i + \sum_{k=2}^{n} \varepsilon_i X_{ki} + \sigma_i \quad (2)$$

$$Fullemployment_i = \lambda_0 + \lambda_1 \text{int}\, ernet_i + \lambda_2 identity_i + \sum_{k=3}^{n} \lambda_k X_{ki} + \eta_i \quad (3)$$

Where:

The term identity is the mediating variable.

Other variables have the same meanings as those in Equation (1).

α0 represents the intercept in the mediator model.

α1, α2, ..., αk are the coefficients for the independent variables in the mediation model.

The term σi is the error term in the mediator model.

The intercept for the full employment model, including the mediator, is denoted as λ0.

The coefficients λ1, λ2, ..., λk represent the independent variables in the full employment model that includes the mediator.

If the coefficients for the gender perception variable in Equations (1) and (2) are significant, and the coefficient for the mediator variable in Equation (3) is also significant, this indicates that the mediator variable selected in this study serves as a transmission mechanism through which internet use influences females' full employment.

RESEARCH RESULTS AND ANALYSIS

Baseline Regression Results

The degree of full employment is assessed through a comprehensive index that encompasses effective utilization of education, sufficient working hours and adequate labor compensation. The regression analysis is performed using the ordinal logistic regression (Ologit) method, with results presented in Column (1) of Table 2 The

coefficient for the impact of internet use on full employment is 0.057, with a significance level of 1%. This indicates that the stronger a woman uses internet, the lower her level of full employment.

Next, the analysis examines the impact of females' internet use on three aspects of full employment, specifically: the sufficiency of working hours, the extent to which labor income reflects human capital value, and the effective utilization of education, which serve as dependent variables. The regression results presented in Column (2) indicate that the coefficient for the effect of internet use on sufficient working hours is 0.030, significant at the 1% level. This suggests that the more females use internet, the more they are likely to participate in the labor market.

The regression results in Column (3) indicate that the coefficient for the impact of internet use on the effective utilization of education is 0.090, which is significant at the 1% level. This finding suggests that females who use internet more are more likely to participate in work with higher degree of educational utilization.

Column (4) presents results indicating that internet use significantly increases the adequacy of labor compensation, with an impact coefficient of 0.019, however, this result is only marginally significant at the 10% level. One possible explanation for this finding is that the measurement of labor compensation adequacy is based on the entire sample of both men and females, which may introduce labor market discrimination and consequently diminish the explanatory power of the independent variable. Furthermore, it is likely that income itself is influenced by factors such as working hours and educational attainment. Therefore, internet use may affect income indirectly by impacting working hours and education, leading to a mediation of some of the observed effects.

Table 2. Baseline regression results of internet use's impact on full employment.

	(1) Comprehensive Indicator	(2) Sufficient Working Hours	(3) Effective Utilization of Education	(4) Adequate Labor Compensation
	Full Employment 1	Full Employment 2	Full Employment 3	Full Employment 4
Internet use1	0.057***(6.09)	0.030***(2.62)	0.090***(8.00)	0.019*(1.67)
Age	-0.014***(-7.22)	-0.022***(-4.14)	-0.025***(-4.51)	-0.027***(-4.96)
Household Registration	0.143***(4.65)	0.213**(2.41)	-0.179**(-2.25)	0.679***(8.38)
Education	-0.098***(-12.22)	0.060***(2.84)	0.125***(5.42)	-0.725***(-26.90)
Marital Status	0.083*(1.71)	-0.171(-1.14)	0.217*(1.72)	0.318**(2.52)
Health	0.014(1.33)	0.046*(1.68)	-0.070**(-2.38)	0.086***(3.00)
Family Income	0.233***(14.30)	0.267***(5.92)	0.626***(11.96)	0.422***(8.57)
Family Net Worth	0.050***(4.47)	0.009(0.31)	0.204***(6.05)	0.025(0.81)
Family Size	0.019**(2.11)	0.049**(2.00)	0.029(1.20)	0.029(1.21)
Number of Elderly	0.040**(2.07)	0.111**(2.13)	0.021(0.39)	0.090*(1.76)
Number of Minors	-0.028*(-1.73)	-0.038(-0.87)	-0.071(-1.58)	-0.042(-0.95)
Sample Size	5455	5455	5455	5455
R^2	0.143	0.172	0.167	0.219

Notes: The coefficients are presented with t-statistics in parentheses. ***p < 0.01; **p < 0.05; *p < 0.10.

This table summarizes the baseline regression results, highlighting the significant positive impact of internet use on various dimensions of full employment. The findings indicate that internet use are associated with increase of full employment, sufficient working hours, effective utilization of education, and adequate labor compensation. Each coefficient reflects the extent to which the respective variable influences the dependent variable, with significance levels indicating the reliability of these results.

Robustness Test Results

First, this paper employs internet use frequency as a robustness check for the binary measure of internet use. First, respondents are asked about the frequency with which they use the internet for work, study, socializing, and commerce. Next, these frequencies are assigned values from 1 to 7, ranging from "never" to "almost every day." Finally, using the entropy method, a weighted average of these four different internet usage frequencies is calculated to obtain a comprehensive measure. The higher the value, the greater the degree of an individual's

internet use. The regression results are presented in Column (1) of Table 3. The impact coefficient of internet use on the level of full employment is 0.334, which is significant at the 1% level.

Second, this paper conducts a robustness check by replacing the dependent variable. Full employment in robustness check is defined as meeting three criteria at the same time: sufficient working hours, full utilization of educational qualifications, and labor compensation that accurately reflects the value of human capital, and employed Logit regression for analysis. The results are displayed in Column (2) of Table 3, where the impact coefficient of internet use on full employment is 0.042, significant at the 5% level.

Lastly, considering that females may face constraints in labor participation due to lower family status, which can lead to forced underemployment, this study isolated the influence of family decision-making power on gender consciousness by selecting only females with family decision-making authority for regression analysis. Females who are "most familiar with family finances" are deemed to possess family decision-making power. The regression results indicate that for females with family decision-making authority, the impact coefficient of internet use on full employment is 0.050, significant at the 1% level.

Table 3. Robustness test results of internet use's impact on females' full employment.

	(1)	(2)	(3)
	Full Employment1	Full Employment5	Full Employment1
Internet use2	0.334***(5.90)		
Internet use 1		0.042**(3.08)	0.050***(3.29)
Age	-0.015***(-7.66)	-0.022***(-3.28)	-0.015***(-4.66)
Household Registration	0.150***(4.89)	-0.150(-1.52)	0.273***(5.51)
Education	-0.088***(-11.32)	-0.097***(-3.60)	-0.124***(-9.82)
Marital Status	0.064(1.37)	0.485***(3.13)	-0.175*(-1.76)
Health	0.015(1.51)	0.017(0.48)	0.014(0.85)
Family Income	0.223***(13.78)	0.594***(9.85)	0.294***(10.74)
Family Net Worth	0.051***(4.58)	0.069*(1.75)	0.081***(4.47)
Family Size	0.022**(2.47)	0.052*(1.75)	0.006(0.35)
Number of Elderly	0.039**(2.08)	0.107*(1.70)	0.064*(1.82)
Number of Minors	-0.041**(-2.57)	-0.152***(-2.78)	-0.010(-0.36)
Sample Size	5455	5455	2227
R^2	0.139	0.151	0.165

These robustness tests provide additional evidence that internet use is positively associated with full employment, regardless of the method used to measure or define internet use. The consistently positive and significant coefficients across various specifications indicate that the initial findings are robust and not influenced by the specific measurement of internet use.

Endogeneity Test

Endogeneity can bias regression results due to reverse causality, omitted variables, and measurement errors. To address these concerns, the following steps were implemented:

1. Omitted Variable Bias: Although the study controls for individual and family characteristics, unobservable regional factors may still influence both gender perception and full employment. To address this issue, province fixed effects were incorporated, and the regression analysis was conducted again. The results, presented in Column (1) of Table 4, indicate that even after accounting for unobservable regional factors, females' gender perceptions significantly decrease their level of full employment.

2. Reverse Causality and measurement errors: To control for reverse causality and measurement errors, the study employs instrumental variable (IV) methods. Previous studies have employed various instruments for internet use, such as the level of internet penetration in cities [41] the e-commerce development index of the province [42], the internet usage rate in the district or county [43]. The selection of instrumental variables must adhere to two principles: relevance and exogeneity. Drawing on existing literature, this paper chooses the internet penetration rate at the community or village level where individuals reside as the instrumental variable. This is because, on

one hand, the internet penetration rate indirectly reflects the current state of network infrastructure in the area and influences individual internet usage through "peer effects," satisfying the relevance criterion for an instrumental variable. On the other hand, the internet penetration rate of the locality does not directly affect an individual's employment decisions, meeting the exogeneity requirement for an instrumental variable. A two-stage least squares (2SLS) regression analysis is conducted, with the results presented in Column (2) of Table 4. After addressing endogeneity using the instrumental variable, the positive impact of internet use on full employment remains significant, with a coefficient of 0.330 at the 5% significance level. To assess the validity of the IV regression, weak instrument tests and over-identification tests were performed. The Cragg-Donald Wald F statistic is 17.864, which exceeds the Stock-Yogo critical value of 16.38 at the 10% significance level, indicating no weak instrument problem. The corresponding P-value for the Hansen J statistic is 0, suggesting no over-identification issue.

Table 4. Endogeneity test results.

	(1) FE	(2) 2SLS
	Full Employment1	Full Employment1
Internet use1	0.061**(6.39)	0.330**(1.94)
Age	-0.001(-0.14)	0.012(0.83)
Household Registration	-0.328***(-3.90)	-0.105*(-1.76)
Education	-0.207***(-7.40)	-0.307***(-2.72)
Marital Status	0.242*(1.79)	0.353**(2.30)
Health	0.106***(3.07)	0.029(0.80)
Family Income	0.367***(6.66)	0.067*(1.87)
Family Net Worth	0.097***(2.64)	-0.001(-0.03)
Family Size	0.002(0.08)	-0.099***(-2.69)
Number of Elderly	0.050(0.90)	0.127***(2.65)
Number of Minors	-0.017(-0.33)	0.178**(2.07)
province fixed effects	control	control
Sample Size	5455	5455
R^2	0.072	0.085

The endogeneity tests confirm the robustness of the findings that females' internet use positively impacts their level of full employment. The consistent significance of internet use across various models and methods indicates that the relationship is not attributable to endogeneity issues.

Heterogeneity Test

The impact of internet use on employment varies among females with different educational backgrounds. The results presented in Column (1) of Table 5 indicate that internet use has a significant positive effect on the full employment status of females with an education level below a bachelor's degree. In contrast, Column (2) demonstrates that internet use do not significantly affect the full employment status of females with a bachelor's degree or higher. The internet provides females with lower levels of education with assistance in various aspects, including information acquisition, skill enhancement, flexible employment, career development, and social support. This enables them to better adapt to the demands of the job market, improve their professional abilities and occupational qualities, thereby achieving an enhancement in employment quality.

Column (3) examines the impact of internet use on the full employment status of rural females, revealing that internet use significantly increases the full employment levels of rural females at the 1% significance level. Conversely, Column (4) presents results for urban females, where internet use does not significantly affect their full employment status. The internet provides rural females with assistance in various aspects, including information acquisition, skill enhancement, flexible employment, economic independence, and social support. This enables them to better adapt to the demands of the job market, improve their professional abilities and employment quality, thereby achieving an increase in their level of employment. Although the internet offers urban females more employment information and opportunities, its impact on improving the employment quality of urban females may not be significant due to factors such as intense job competition, gender discrimination, differences in digital skills, conflicts in family roles, and insufficient policy support.

Marriage, as a significant life transition, directly influences females' behavioral logic. Consequently, the analysis is further categorized based on marital status to assess the impact of gender perception on full employment levels. The results presented in Column (5) indicate that internet use does not significantly affect the full employment status of unmarried females. In contrast, Column (6) reveals that internet use substantially increases the full employment levels of married females. Internet use has a more significant impact on improving the employment quality of married females, primarily by helping them better balance family and work, access information and resources, and expand their social networks. In contrast, its effect on unmarried females is relatively smaller, mainly constrained by factors such as job market competition, career development limitations, and societal role expectations.

Table 5. Heterogeneity of gender perception's impact on females' full employment.

	(1) Below Bachelor's	(2) Bachelor's and above	(3) Rural	(4) Urban	(5) Unmarried	(6) Married
	Full Employment1	Full Employment1	Full Employment1	Full Employment1	Full Employment1	Full Employment1
Internet use1	0.027*** (5.53)	0.012 (1.40)	0.035*** (7.20)	0.001 (0.11)	0.003 (0.26)	0.030*** (6.73)
Age	-0.020*** (-9.23)	0.010** (2.09)	-0.020*** (-9.07)	0.007 (1.64)	-0.016** (-2.33)	-0.014*** (-6.98)
Household Registration	0.142*** (3.63)	-0.039 (-0.80)	0.000 (.)	0.000 (.)	-0.180** (-2.27)	0.188*** (5.69)
Education	-0.154*** (-16.10)	0.060 (1.44)	-0.130*** (-14.56)	0.006 (0.35)	-0.095*** (-2.99)	-0.103*** (-12.37)
Marital Status	0.05 6(0.81)	0.029 (0.41)	0.005 (0.08)	0.047 (0.57)	0.000 (.)	0.000 (.)
Health	0.017 (1.51)	-0.006 (-0.23)	0.024** (2.02)	-0.022 (-1.03)	-0.034 (-0.99)	0.017 (1.55)
Family Income	0.243*** (13.67)	0.096** (2.36)	0.280*** (15.32)	0.056 (1.60)	0.390*** (6.18)	0.223*** (13.24)
Family Net Worth	0.056*** (4.46)	0.026 (1.07)	0.054*** (4.23)	0.051** (2.17)	-0.129*** (-3.64)	0.066*** (5.56)
Family Size	0.019* (1.88)	0.006 (0.37)	0.037*** (3.68)	-0.042** (-2.21)	0.005 (0.16)	0.021** (2.22)
Number of Elderly	0.033 (1.55)	0.081** (1.98)	0.039* (1.75)	0.069* (1.89)	0.020 (0.29)	0.040** (2.01)
Number of Minors	-0.040** (-2.22)	0.027 (0.73)	-0.060*** (-3.30)	0.083** (2.36)	-0.024 (-0.34)	-0.030* (-1.78)
Sample Size	4354	1101	3606	1849	464	4991
R^2	0.111	0.033	0.121	0.028	0.114	0.198

The heterogeneity tests indicate that internet use has differing impacts on females' full employment, depending on factors such as educational attainment, rural versus urban residence, and marital status. These findings emphasize the complexity of internet use's influence on employment outcomes, highlighting the necessity for targeted policies that take these differences into account.

Mechanism Analysis

This study examines the impact of females' internet use on their full employment by changing their gender perception. As indicated in the first column of Table 6, the impact coefficient of internet use on females' full employment is 0.057, which is significant at the 1% level. Table 6 presents the results of mediation effect regressions with the introduction of mediator variables. Columns (1) and (2) in Table 6 explore the impact pathway of gender role mechanism.

Column (1) of Table 6 indicates that females' internet use has facilitated the transformation of gender perceptions from tradition to modern among females. Column (2) includes both internet use and gender perception variables in the regression analysis. The results indicate that the coefficient for gender perception remains significant, while the coefficient for internet use is considerably reduced. This suggests that gender perception mediates the relationship between internet use and full employment. Internet use has reduced the constraints of traditional gender perceptions among females, thereby increasing the probability of full employment.

Table 6. Mechanism Analysis of Gender Perception's Impact on Females' Full Employment.

	(1) Gender Perception	(2) Full Employment
Internet use	0.200***(2.67)	0.036*(1.67)
Gender perception		0.114**(1.82)
Age	0.011(5.71)	0.001(3.28)
Household Registration	-0.020***(-6.30)	0.011**(2.24)
Education	-0.009***(-10.75)	0.018***(13.87)
Marital Status	0.018***(3.64)	-0.026***(-3.32)
Health	-0.002*(-1.86)	0.112(2.28)
Family Income	-0.110***(-5.61)	0.022***(1.72)
Family Net Worth	-0.104***(-3.33)	-0.000(-0.17)
Family Size	-0.001(-0.83)	-0.002(-1.45)
Number of Elderly	-0.002(-0.79)	-0.005(-1.58)
Number of Minors	-0.000(-0.29)	-0.009***(-3.52)
Sample Size	5516	5516
R^2	0.177	0.191

CONCLUSION AND RECOMMENDATIONS

Research Conclusions

Based on data from the China Family Panel Studies (CFPS), this study constructs indicators for internet use and full employment, employing ordinal logistic regression (ologit) for analysis. The results indicate that internet use among females positively impacts their level of full employment. Specifically, the more females use internet, the less likely they are to experience educational mismatches, insufficient working hours, and lower labor compensation. The influence of internet use on full employment varies among different groups: females with lower levels of education, those residing in rural areas, and married females are significantly affected by their internet use, whereas those with higher education, urban residents, and unmarried females are not. Internet use affects full employment by leading to the equal gender perception.

Policy Recommendations

Based on the research findings presented above, this study proposes the following developmental directions:

Enhancing internet access and digital literacy

Expanding Internet Infrastructure: Prioritize the construction of internet infrastructure in remote areas, rural regions, and low-income communities, such as laying fiber optics and adding wireless network base stations, to lower the barriers to network access and enable more females to conveniently access and use the internet.

Strengthening Digital Literacy Education: Integrate digital literacy courses into educational systems at all levels, especially targeting female groups, teaching them how to use the internet safely and efficiently to obtain information, learn new knowledge, and improve skills, thereby enhancing their ability to use the internet to promote their own development.

Promoting equal participation of women in cyberspace

Advocating for Gender-Equal Cyber Culture: Through media promotion and guidance on online platforms, advocate for a cyber culture that respects females and treats them equally, combating cyber gender discrimination and cyber violence, and creating a healthy and inclusive online environment where females can participate more confidently and safely.

Supporting Females' Online Entrepreneurship and Employment: Encourage and support females in using the internet for entrepreneurial activities, such as opening online stores and participating in live streaming sales, providing policy support such as entrepreneurial guidance, financial assistance, and tax incentives. At the same

time, guide enterprises to recruit female employees through online platforms to broaden employment opportunities for females.

Leverage the Development of New Quality Productive Forces: it is necessary to promote high-quality development, e.g. foster the growth of the platform economy and sharing economy, and improve the quality of employment for flexible workers, thereby achieving full employment for females.

Improving females' employment capabilities and opportunities

Enhancing Vocational Skills Training: Conduct diverse vocational skills training programs tailored to the employment needs of females, such as e-commerce, information technology, and new media operations, which are related to the internet, to improve females' competitiveness in the job market. Emphasize the practicality and relevance of training content to ensure that training outcomes can truly be converted into employment capabilities.

Promoting the Development of Women Talents: Increase efforts in cultivating and utilizing female talent in emerging fields such as technology and the internet, breaking down gender barriers, and providing more career development opportunities and promotion spaces for women. Encourage enterprises to establish mechanisms for the development of female talent, such as female leadership training programs and female talent reserve plans, to enhance the status and influence of women in enterprises.

Protecting women's employment rights

Improving Laws and Regulations: Further refine labor laws and related regulations, explicitly prohibiting gender-based employment discrimination, and strengthen the protection of women's employment rights. At the same time, increase penalties for illegal acts, raise the cost of violations, and create an effective legal deterrent.

Strengthening Enforcement and Supervision: Establish and improve mechanisms for the enforcement and supervision of women's employment rights protection, strengthen inspections and supervision in areas such as corporate recruitment and compensation, and promptly identify and correct gender discrimination behaviors. Encourage women to actively protect their legal rights and interests, and provide legal aid and support to women who suffer from gender discrimination.

Creating a positive social atmosphere

Promoting Gender Equality Concepts: Through various channels and methods, widely promote the concept of gender equality, raise public awareness of the importance of women's employment, eliminate gender bias and discrimination, and create a positive social atmosphere that supports women's employment.

Setting Examples of Women's Employment: Unearth and publicize successful cases of women's employment and outstanding female entrepreneurs, professional women, and other role models, showcasing the achievements and contributions of women in the employment field, and inspiring more women to actively engage in employment and entrepreneurship, pursuing career development.

ACKNOWLEDGMENTS

This research is supported by the "Taiyuan Institute of Technology Talent Introduction Scientific Research Funding Project (2023KJ047)."

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