Education level, underemployment, and workers' health Nan Li<sup>1</sup>, Dan Wu<sup>2,\*</sup>

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Abstract: Under the dual background of underemployment and health inequality, this paper empirically analyzes the impact of education level on underemployed workers' health based on CLDS2016 data. The results show that underemployment is significantly related to the decline of self-rated health, increased depression tendency, and morbidity in a certain period. The results indicate that underemployment can significantly reduce the health level of workers in the low education level group and the high education level group. However, it has no significant impact on workers' health in the middle education level group; even if we change the measurement method of indicators and consider endogeneity, the research conclusion is still robust. Moreover, this kind of health inequality mainly comes from the difference in economic effect and leisure effect of underemployment to workers with different educational levels. This paper provides empirical support for increasing the labor protection mechanism of underemployed people and reducing the health inequality caused by educational level differences.

Keywords: education; underemployment; health

### 1. Introduction

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As two significant components of human capital, the complementary relationship between health and education has always attracted the attention of the academic community. Previous researches show that workers with good educational background not only have inherent advantages in access to health care knowledge, medical resources, health resources, and service accessibility[1-2], and they also have a relatively healthier lifestyle[3]. Moreover, compared with workers with a low level of education, workers with a high level of education can feel a sense of fulfillment and value in the work process, and their ability to regulate life and health conditions is also more robust[4]. How does education affect workers' health in the labor market?

For the vast majority of people, obtaining income through employment is the primary and principal means of survival. Employment status is related to the income level of workers and is closely related to their physical and mental health. Then, as the problem of underemployment in the labor market (a state of "employment but not full employment"), will it affect workers' health? What is the role of education in the employment of workers? Will it affect the health level of workers through the channel of "underemployment"? Although there is underemployment in all sectors of society, the problem of underemployment is more evident for some groups than others [5]. Under the influence of COVID-19 and the global economic environment, the underemployment problem of workers may deteriorate further. However, it remains unclear whether the deterioration hinders the implementation of the "Healthy China" action to a certain extent. This paper takes underemployment as the object of analysis. It discusses the impact of

underemployment on workers' health from the perspective of education level to provide practical support for developing targeted programs to improve workers' health.

## 2. Literature review and theories

## 2.1 Literature review

## 2.1.1 education and underemployment

The education level of workers does not match with job requirements in the labor market. The education level of workers is an essential response of ability, so this may cause underemployment and a high degree of state dependence[6]. However, the research results on the impact of education on the underemployment of workers are complex. Previous studies have shown that a person's education level may affect his ability to find a job[7], and a low level of education is more likely to be related to underemployment[8]. In contrast, underemployment is not evident in the high level of education professionals[9]. However, some studies have pointed out a positive correlation between an individual's educational level and underemployment because workers with higher educational levels are more likely to engage in jobs that are not commensurate with their educational level[10]. Consequently, we need more empirical research to discuss the impact of education on underemployment. Therefore, this study takes education as the primary explanatory variable rather than the control variable to further answer this practical problem.

## 2.1.2 Underemployment and health

Compared with the impact of education, existing studies generally believe that employment status is one of the main factors affecting workers' health. Most empirical literature pays attention to the impact of unemployment and over-employment on workers' health; only a few studies used cross-sectional data to analyze the relationship between underemployment and workers' health. Some studies have pointed out that an unsatisfied new job is worse than continuing to be unemployed[11], and employees who are satisfied with their jobs show higher self-esteem, more life satisfaction, and less depression tendency than those who are unsatisfied with their jobs or unemployed[12]. Because the working hours are too short to meet the workers' needs socially, psychologically, and economically [13], underemployment is significantly associated with lower goals ((e.g.lower pay), subjective career success ((e.g.lower job satisfaction), and poor mental health[14-15]. There is a significant correlation between underemployment and the psychological pressure of workers in a survey of government employees. Compared with fully employed people, underemployed people are more likely to show depression[16]. However, some studies have pointed out no correlation between underemployment and workers' health and well-being and believe that even bad jobs are better than unemployment[17].

As stated above, to the best of our knowledge, more empirical research is needed to discuss the impact of underemployment on health. This paper will further confirm that underemployment is a severe social problem through empirical research on the relationship between underemployment and workers' health.

### 2.2 Theoretical analysis

The measure of underemployment is work less than 35 hours per week at present but hope to work longer[18]. Whether can workers with high education level still obtain higher income even in underemployment to reduce the impact of underemployment on health? Alternatively, the workers who receive more education in underemployment will not increase their leisure time. We

believe that it is essential to discuss them to understand which mechanism is working.

## 2.2.1 Leisure effect

Health is an investment product[19]. Workers with different education levels pay different physical, mental, and psychological loads in different jobs. Comparatively speaking, workers with high education levels pay more mental and psychological loads, while workers with low education levels pay more physical loads[13]. Therefore, the leisure effect of underemployment during working hours and after work is different for workers with different education levels, and the time and energy for health investment will also be different.

## 2.2.2 Economic effect

Health is a consumer product[20], and people can buy specific health through spending money. Generally speaking, low-income workers often do not have sufficient healthcare expenditure. Low-income workers often do not have enough money to spend on health care. For most people, underemployment is not a good job that the laborers yearn for, but an inferior job that has to be done. Because of the existence of "low income when working long hours" and "high income in short-term work" in the labor market[21], workers in underemployment usually have different income levels. Even in underemployment, those with high education level may have higher incomes that will make their health care expenditure more. More expenditures on health care have further widened the health disparity among workers with different levels of education.

Since the pay and return of workers with different education levels during the same working hours are not the same, the leisure effect and economic effects perceive by workers with different education levels are also different when workers are underemployed. Which mechanism plays a role in the impact on health? This paper uses CLDS2016 survey data to conduct a detailed empirical analysis of education level, underemployment, and workers' health to obtain empirical support.

# 3. Data, measures, and descriptives

## 3.1 Data sources

As stated above, this paper analyzes the relationship between education level and underemployed workers' health throughout the economic effect and leisure effect. The data used in this article comes from the "China Labor-force Dynamics Survey" (CLDS) conducted by the Center for Social Survey of Sun Yat-sen University in 2016. According to the needs of the research content, we screen the samples. We exclude those who are generally outside of the labor market: students, housekeepers, retirees, and people who have never had work experience; Moreover, we limit the labor age to the legal working-age population (male aged 16-60; female aged 16-55), excluding the labor force of other age groups; Finally, we delete the extreme value and outliers, and the final sample includes 10563 observations.

## 3.2 Model setting and variable selection

This paper uses logit and ologit models to analyze the impact of underemployment on the health of workers:

# $health_i = \alpha_0 + \alpha_1 underemployment_i + \alpha_2 C_i + \varepsilon_i$

Among them, health is the health status of workers. Health is a binary variable(0=health; 1=unhealthy), C is the control variable, and  $\varepsilon$  is the residual term.

1. Dependent variable. The dependent variable analyzed in this paper is the health status of workers. Combined with previous research, the measurement of workers' health in this article

includes three dimensions: self-rated health, mental health (whether there is a tendency to depression), and whether the disease is in a certain period. The CLDS data explains these three dimensions, including the following content. Self-rated health is a five categorical variable, and it is assigned as "1, 2, 3, 4 and 5" according to "very unhealthy, relatively unhealthy, general, healthy and very healthy." Mental health is a binary variable measured by whether there is a tendency to depression and assigned as "1 and 0". Whether or not the disease has occurred within a certain period is also a binary variable, measured by whether the body has pain in the past month and assigned values of "1 and 0" respectively.

2. Core variables. Previous studies have defined underemployment as a preference, thinking that the average weekly working time is less than 35 hours and hoping to get more working hours is underemployment. Compared with many previous studies, this research focuses more on utility; workers are not satisfied with the existing working hours. It is an important nuance that differences in utility are more likely to affect the health of individuals through their psychological satisfaction. Otterbach did similar research, and he defined underemployment as the actual working time is less than the preferred working time[15]. The questions in the corresponding questionnaire are: "How many hours do you usually work in a week for your current or last job?", "Please evaluate your current/last job status and whether you are satisfied with your working hours." Because underemployment is not the "good job" that most workers yearn for, laborers who volunteer for short-time work are few. Therefore, this paper defines the weekly average working hours between 0 and 35 hours, defines dissatisfaction with working hours as underemployment, and assign it to 1; other types of working time are defined as other (non-underemployment) and assign it to 0.

3. Control variables. Combined with previous research, the control variables selected in this paper include individual characteristics, economic status, living habits, and work characteristics. Individual characteristics include gender, age, registered residence, marital status, appearance, and religious beliefs. Gender differences are one of the dimensions of health differences among people. Marriage helps people develop healthy behaviors, and it is difficult for health to change with age. Because the household registration system is the primary social management system in our country, employment is prominent. This paper argues that there may be differences in registered residence and appearance when underemployment affects workers' health. Economic status includes personal income, family income, and housing sources. The economic status of workers affects their health by affecting the quality of life, nutritional level, and lifestyle. Generally speaking, the higher the workers' income, the better their health. In terms of the characteristics of living habits, because the distribution of living habits (such as smoking, drinking, and exercise) in different social groups is different, this paper also introduces living habits variables in the analysis. Because a good working environment could reduce the probability of workers suffering from physical health injury, and the floating population groups are often in a disadvantaged position in the labor market, there are differences in labor intensity and time pay heterogeneity between different occupations. Therefore, this paper believes that the impact of work characteristics on workers' health is also different. Besides, medical insurance can promote the health of the insured, and basic endowment insurance can also improve the health of residents, and unemployment insurance expenditure also plays a positive role in promoting the health of residents. Therefore, this paper also introduces the insured characteristic variables in the analysis.

Туре	Variable		Variable explanation and assignment	Mean	SD	
		Self-rated 1=Very unhealthy; 2=Not healthy;		3.721	0.935	
		health	3=Ordinary; 4=Healthy; 5=Very healthy			
Dependent variable	Health condition	Mental health	1=Depressive tendency; 0=Not-depressed tendency	0.153	0.360	
		Prevalence	1=Pain in the past month; 0=No pain in the past month	0.304	0.460	
Core variables	Unemployment		1=Underemployment; 0=Others	0.103	0.303	
		Sex	1=Female; 0=Male	0.453	0.498	
		Age	Actual age (years)	41.890	10.356	
	Variable of individual characteristics	Education	1=Primary school and below; 2=Junior middle school; 3=Senior middle school; 4=Junior college; 5=Bachelor degree or above	2.269	1.173	
		Appearance	1-10	6.449	1.504	
		Hukou	1=Non-agricultural; 0=Agricultural	0.258	0.437	
		Marital status	1=First Marriage and remarriage; 0=Others	0.866	0.340	
		Housing source	1=Home ownership; 0=Others	0.510	0.500	
	Variable of the economic situation	Variable of the economic income		Ten thousand yuan	6.685	10.212
Control variable		Personal income	Ten thousand yuan	3.541	6.271	
		Smoking	1=Yes; 0=No	0.297	0.457	
	Variable of	Drinking wine	1=daily drink; 0=No	0.075	0.263	
	habits	Regular exercise	1=Yes; 0=No	0.287	0.452	
		Occupation type	1=Employed by others; 0=Others	0.467	0.499	
	Variable of	Labor force category	1=Floating population; 0=Non floating population	0.137	0.344	
	working characteristics	Workplace	1=Indoor(include workshops, offices, and homes); 0=Others	0.529	0.499	
		Industry	1=First industry; 2=secondary industry;	1.998	0.883	
		attributes	3=Third industry			
	<b></b>	Medical insurance	1=Yes; 0=No	0.922	0.269	
	Variable of insurance characteristics	Endowment insurance	1=Yes; 0=No	0.655	0.475	
		Unemployment	1=Yes; 0=No	0.179	0.383	
		msurance				

Table 1. Description	ptives and corr	elations amon	g study	variables

According to the survey results, we summarize some essential characteristics of the sample: there is no significant difference in the proportion of men and women in terms of individual characteristics; most of the respondents have junior high school education or below, with an average age of 41.89 years old; most of them are ordinary and beautiful, which is consistent with what we have observed in real life; the respondents are mainly married (first marriage and remarriage), and most of them have agricultural hukou. The proportion of those who own property and those who do not own property is the same in terms of economic characteristics; The proportions of low-income and high-income groups are relatively average in terms of family income and personal income. More workers engaged in agriculture, forestry, animal husbandry, and fishing in terms of job characteristics, but the proportion of those employed by others and those engaged in their own business and indoor workers and outdoor workers are close to the average. The proportion of workers who smoke and often drink is relatively tiny in living habits. We also find that the proportion of workers have medical insurance, and there are more workers with endowment insurance, but fewer workers have unemployment insurance.

#### *3.3 Descriptive statistics*

We intend to carefully examine the impact of underemployment on workers' health with different education levels. According to previous studies, we divide workers into three groups, including low education level (high school and below education level), a middle education level (high school to college education), and high education level (undergraduate and above). We then compare their differences in underemployment and health status. The sample numbers of workers with low education level, middle education level, and high education level are 7122, 2065, and 791, respectively.

		with u					
		Low	Middle	high			
Varia	ble	education	education	education	IVSII	IVSIII	IIVSIII
		leveI	level II	levelIII			
Self-rated health	1=Not healthy; 2=Ordinary; 3=Healthy	2.441 (0.008)	2.654 (0.011)	2.738 (0.017)	0.213***	0.296***	0.084***
Depressive tendency	1=Yes; 0=No	0.166 (0.004)	0.122 (0.006)	0.138 (0.012)	-0.044***	-0.028*	0.016
Illness in a certain period	1=have; 0=not have	0.342 (0.006)	0.224 (0.008)	0.225 (0.007)	-0.118***	-0.117***	-0.001
Unemployment	1=Yes; 0=No	0.125 (0.004)	0.064 ( 0.005 )	0.029 (0.005)	-0.061***	-0.096***	-0.035***

Table 2.	Underempl	oym	ent status	and	healt	h d	ifferences	of	workers
				-			-		

\*p < 0.05. \*\*p <<0.01. \*\*\*p <<0.001.

It can be seen from Table 2 that there are apparent differences in underemployment and health status of workers with different education levels. The self-rated health status of workers in the high education level group is higher than that of the workers in the middle education level group is higher than that of the workers in the middle education level group is higher than that of the workers in the low education level group in terms of self-rated health, and the differences between them are significant at 1% statistical level; the probability of depression tendency of workers in the low education level group is higher than that of the workers in the middle and high education level group in terms of mental health, and the difference between them

are significant at the 1% statistical level; in terms of prevalence in a certain period of time, the workers in the low-educated group have a higher probability of being ill in a certain period of time than those in the high-educated group, the workers in the high education level group are probably get sick in a certain period than those in the middle education level group. The difference in the prevalence of workers between the low education level group and the other two groups in a certain period is significant at the 1% statistical level. In other words, the self-rated health status of workers in the low-education group is the worst and more prone to depression and illness in a certain period.

The workers with low education level are the most likely to experience underemployment, followed by the workers with middle education level, and workers in the high education level group are the least likely to experience underemployment. The difference in whether workers are underemployed is significant at the 1% statistical level. The possible reason is that it is difficult to replace workers with higher education, and employers may be reluctant to release the trained and experienced employees they may need in the future[21]. On the contrary, when the economic situation is not good, workers with low education levels are easily replaced. However, companies are not willing to fire them but reduce their working hours, which leads to underemployment of workers with low education levels[22].

## 4. Results

Due to the apparent occupational gender segregation in the labor market, men usually have more advantages than women in the labor market. Affected by Chinese cultural characteristics and traditional concepts, women are more inclined to choose occupations with short working hours to facilitate family care[23]. Therefore, this paper discusses the impact of underemployment on the health status of workers with different education levels. This article also discusses how gender affects the pattern of underemployment in the labor market and to what extent it explains the relationship between underemployment and the health status of men and women.

### 4.1 Regression analysis

Table 5. Impact of underemployment on the nearth of neterogeneous workers							
	Female					Male	
Variable	Total	Low	Middle	High	Low	Middle	High
variable	sample	education	education	education	education	education	education
		level	level	level	level	level	level
Self-rated	-0.263***	-0.279***	-0.018	-0.585	-0.255***	-0.215	-0.125
health	(0.062)	(0.095)	(0.274)	(0.874)	(0.098)	(0.194)	(0.538)
Mental	0.285***	0.138	0.227	0.928	0.448***	0.454	-0.685
health	(0.083)	(0.128)	(0.377)	(1.053)	(0.135)	(0.282)	(1.121)
Prevalence	0.294***	0.304***	0.302	$1.897^{*}$	0.365***	0.226	-1.881
in a	(0.071)	(0.110)	(0.330)	(1.132)	(0.113)	(0.242)	(1.165)
certain							
period							
Ν	10563	3337	1059	392	3785	1591	399

 Table 3. Impact of underemployment on the health of heterogeneous workers

\*p < 0.05. \*\*p <0.01. \*\*\*p <0.001.

The impact of underemployment on the multi-dimensional health of workers has passed the significance test at a 1% statistical level for the whole sample. The self-evaluation health status,

depression tendency, and prevalence of underemployed people are 0.769 (e<sup>-0.263</sup>), 1.330 (e<sup>0.285</sup>) and 1.342(e<sup>0.294</sup>) times of those who are not underemployed under the same other conditions after controlling the individual differences, economic conditions, living habits, work characteristics and regional characteristics of workers. Compared with those who are not underemployed, the underemployed situation significantly reduces the overall health level of the workers. However, there are apparent differences in underemployment on their health for workers with different education levels. Specifically, underemployment significantly reduces workers' self-evaluation health level and significantly increases workers' prevalence in a certain period. However, there is no significantly reduces the overall health level of workers for male group; underemployment significantly reduces the self-rated health level of male workers in the low-education group, increase their depression tendency and prevalence during a specific period. Underemployment does not significantly affect workers' health, whether for a female group or a male group in the middle education level group. Underemployment only significantly increases the prevalence of female workers in a certain period of the high education level group.

#### 4.2 Endogenous treatment

The two-way causal relationship between underemployment and workers' health status may lead to a joint endogenous problem in the process of investigating the impact of underemployment on the health of workers; that is, the worse the health status is, the more likely people are to experience underemployment. Due to changes in hourly wages, employers may substitute between labor hours and the number of labor and between capital and labor[24]. Therefore, the increase of the minimum wage standard may lead to the change of the proportion of factor input by employers, which will increase the possibility of underemployed workers. Because of this, the study regards the minimum wage increase as an exogenous shock that affects underemployment to identify the effect of underemployment. Based on the actual situation of this research, we select the minimum wage standard in 2016 as an instrumental variable to solve the endogenous problem.

		Female		Male				
Variable	Low	Middle	High	Low	Middle	High		
	education	education	education	education	education	education		
	level	level	level	level	level	level		
Salf rated basth	-4.097***	-34.712	2.861	-9.395*	-7.452	-12.744		
Sell-rated health	(1.554)	(157.405)	(7.439)	(5.615)	(13.009)	(15.784)		
Montal baalth	-0.038	-1.254	-5.633	-2.822***	2.806	-1.956		
Mental nearth	(1.406)	(5.081)	(5.220)	(0.442)	(2.072)	(3.229)		
Prevalence in a	2.066***	4.057	-5.549**	3.103***	-1.564	3.998		
certain period	(0.592)	(3.412)	(2.186)	(0.182)	(7.429)	(2.501)		
Ν	3283	1059	391	3732	1571	399		

**Table 4.** Endogenous problems (adjustment of minimum wage standards in various cities)

p < 0.05. p < 0.01. p < 0.001.

The regression results of instrumental variables show that the significance level and sign of the impact of underemployment on the health status of workers with different education levels remain unchanged, ensuring the reliability of the measurement results and confirming the conclusions of this article.

4.3 Robustness test

(0.564)

609

In order to verify whether underemployment has a consistent and stable effect on the health of workers with different education levels, we use the occupational classification method of Andersson and re-divide the labor force into two categories, including high-educated labor and low-educated labor[25], and retest the model estimation results. The labor force with high education level comes from government administration, Party group organizations, technical department, office, administrative office management and related department. The rest are laborers with low education levels. We observe the estimated results in Table 5.

Table 5. Robustness test							
	Fema	le	Male	9			
Variable	Low advantion loval	High education	Low advantion loval	High education			
	Low education level	level	Low education level	level			
Self-rated health	-0.230**	-0.214	-0.237***	-0.623			
	(0.092)	(0.488)	(0.088)	(0.420)			
Mental health	0.151	-0.169	0.438***	0.499			
	(0.121)	(0.829)	(0.121)	(0.677)			
Prevalence in a	0.307***	0.521**	0.303***	0.167			

\*p < 0.05. \*\*p <0.01. \*\*\*p <0.001.

certain period

Ν

As shown in Table 5, when we use the ologit and logit models to refit the sample data after changing the measurement method, we find that the estimated results are consistent with the previous results of dividing the difference in education level into three groups, which also confirms the different characteristics of the impact of underemployment on the health of workers in different education levels.

(0.297)

670

(0.103)

5113

### 5. Further discussion: impact mechanism test

(0.105)

4077

According to the previous analysis, underemployment has a significant impact on workers' health, and this impact has significant differences on workers with different education levels. How does underemployment affect the health of workers of different education levels? As summarized in the previous paper on the mechanism of underemployment's impact on workers' health, this paper attempts to analyze the economic and leisure effects caused by underemployment to analyze its impact on workers' health at different levels of education.

### 5.1 The economic effect of underemployment

Generally speaking, high wages for both men and women will improve their physical and mental health. The better their economic status, the more they can invest in health[26]. As underemployment between unemployment and total employment is a kind of recessive unemployment, will it impact the economic status of workers?

If so, are there any differences among workers with different education levels? This paper uses four variables to measure workers' economic status when analyzing the relationship between underemployment and workers' economic status. These four variables include personal income, satisfaction with personal income, family income, and satisfaction with family income. Because underemployment may not be a bad job when the family economic status of workers is good, and their employment status will not affect the overall level of family economic status.

	Personal income			Satisfaction with personal income				
	Low	Middle	High	Low	Middle	High		
Variable	education	education	education	education	education	education		
	level	level	level	level	level	level		
Unemployment	-0.404***	-1.309**	-2.600*	-1.332***	-1.087***	-2.220***		
	(0.154)	(0.641)	(1.875)	(0.108)	(0.223)	(0.773)		
Ν	7122	2650	791	7060	2632	786		
		Family income			Satisfaction with family income			
Variable	Low	Middle	High	Low	Middle	High		
variable	education	education	education	education	education	education		
	level	level	level	level	level	level		
I I a consulta const	-0.372*	-0.684	-4.005	-0.381***	-0.017	0.274		
Unemployment	(0.204)	(0.977)	(4.480)	(0.079)	(0.198)	(0.827)		
Ν	7122	2650	791	7122	2650	727		

### Table 6. Economic effects of underemployment

p < 0.05. p < 0.01. p < 0.001.

We discover the relationship between underemployment and the economic status of workers from Table 6. The regression results show that in terms of personal income and satisfaction, the income reduction degree brought by underemployment to workers with different education levels is different after controlling individual differences, job characteristics, regional characteristics, and other conditions of workers. In particular, the high education level group has the most significant impact, followed by the middle education level group, and the low education level group has the most negligible impact. The possible reason is the heterogeneity of working time return.

In terms of household income and satisfaction, underemployment only significantly impacted the low education level group. The possible reason is that education is a crucial mechanism channel for the bottom group to achieve upward mobility[27]. The higher the level of education (for workers in the middle education level group and the high education level group), the more income they get. The reason is that they may have a good family background and rich interpersonal resources[28]. All these factors can reduce the impact of underemployment on their family income.

### 5.2 The leisure effect of underemployment

Studies have pointed out that leisure time has a promoting effect on physical health[29] because underemployment increases leisure time and increases time spent on health, positively impacting health[30]. Given the availability of data, this paper mainly measures the leisure effect of underemployment from two aspects of physical and mental fatigue at work and participation in activities outside work.

Table 7. Leisure effect of underemployment

Physical and mental fatigue <sup>1</sup>	Participation in activities <sup>2</sup>

<sup>&</sup>lt;sup>1</sup>In the CLDS2016 questionnaire, the related question of physical and mental fatigue is: "please judge the frequency of physical and mental fatigue based on your feelings and experience?" The options of this question include "every day, several times a week, several times a month, several times a year or less, never." We answer "every day" with a value of 1, and the answer "several times a week, several times a month, several times a year or less, never." is assigned a value of 0.

<sup>&</sup>lt;sup>2</sup>The questionnaire in the questionnaire corresponding to activity participation is a community and social organization participation status, involving nine items "residential committee, social work organization, owner committee, leisure/entertainment/sports club/salon organization, learning/ Training institutions, fellow villagers' associations, clan organizations, charity/social organizations/volunteer groups/religious organizations." We define activity participation as participating in social activities and assigned with a value of 1. We define not participating in social activities as someone has never participated in social activities and assigned a value of 0.

Variable	Low	Middle	High	Low	Middle	High
	education	education	education	education	education	education
	level	level	level	level	level	level
Unemployment	0.058	-0.378*	1.819	-0.459**	0.145	0.218
	(0.087)	(0.260)	(1.700)	(0.276)	(0.329)	(0.609)
Ν	7122	2623	690	7404	2910	937

\*p < 0.05. \*\*p <0.01. \*\*\*p <0.001.

According to the estimated results in Table 7, the leisure effects of underemployment on workers with different education levels are different. Underemployment will reduce workers' physical and mental fatigue with middle education level and the activity participation of workers with low education level. In other words, underemployment will only bring a positive leisure effect to workers with a middle education level, but it will bring a negative leisure effect to workers with a low education level.

It can be seen that the economic effect and leisure effect of underemployment are harmful to the workers with low education level, so the negative impact on their health is twofold. There is a positive leisure effect and a negative economic effect for workers with a middle education level; underemployment will only negatively affect workers with a high level of education. Therefore, underemployment has the most significant negative impact on workers' health with low education levels, followed by workers with high education levels, while the impact on workers with middle education levels is not significant.

### 6. Conclusion and discussion

Based on CLDS2016 data, this paper empirically analyzes the relationship between education level, underemployment, and workers' health. First of all, the impact of underemployment on workers' health is multi-dimensional. That means that underemployment is significantly related to the decline in self-rated health of workers, the increase in depression tendency, and the rise of morbidity in a certain period. Then, underemployment can significantly reduce the health level of workers with low education level and high education level but has no significant impact on the health of workers with middle education level. Even if we change the index measurement method and consider the endogeneity, the research conclusion is still robust. Moreover, this kind of health inequality mainly comes from the economic effect and leisure effect that underemployment brings to workers with different education levels. Although underemployment significantly reduces the economic level of workers in each education level group, it will bring positive leisure effect to workers with middle education level and negative leisure effect to workers with low education level and negative leisure effect to workers with low education level and negative leisure effect to workers with low education level and negative leisure effect to workers with low education level effect.

Given the above research conclusions, this paper believes that we should adopt differentiated health promotion programs for underemployed people with different education levels. We should increase training opportunities, increase the knowledge stock and technical content of underemployed workers with low education level, improve their employment competitiveness in the labor market, and let the underemployed workers achieve full employment as soon as possible through learning and vocational training. We suggest that the government adopt tax incentives or low-interest loan incentives to support employers in actively carrying out high-quality training for workers with low education levels. At the same time, it is necessary to provide professional psychological counseling for these groups, carry out various forms of care activities, and reduce the multi-dimensional health damage caused by the income reduction and psychological pressure

caused by underemployment. The government should strive to improve the efficiency of educational resource allocation. Enterprises should establish a scientific employment mechanism to fully tap the human resources of high-level talents and reduce underemployment for the workers with high education levels, especially female workers. Although the public emphasizes the importance of gender equality in the labor market, underemployment has a significant positive impact on increasing the prevalence rate in a certain period of female workers with high education levels. If we ignore this phenomenon, it will hinder the full use of the human capital of female workers with high education level and further hinder the realization of the maximization of social welfare.

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