The Effects of Working Hours on Health Based on China's Observations

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Research Article

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Abstract

Background: At a time of rapid economic development, the quality of the labor force is an issue worthy of attention, and health is an important factor in the quality of the labor force. In recent years, the working hours of the workers have been continuously extended, and excessive labor has gradually become a common phenomenon, directly affect the health level of workers, but also not conducive to social stability and economic development.To understand the relationship between labor market performance and health is of great significance to expand the factors influencing the health level of labor force.

Method: From the perspective of working hours, this study uses China Family Panel Studies(CFPS) data and order probit model to explore the impact of working hours on labor health, further analyze the heterogeneity of whether to participate in medical insurance, and explore the difference of education level.

Result:First, the depreciation rate of healthy capital increases, and the increment of healthy capital decreases, thus lowering the health level of the labor force. Second, working hours have a more significant impact on the self-rated health of the labor force who does not participate in medical insurance. Thirdly, the work time of junior high school and below has more significant impact on self-rated health, and the work time of labor who is not in the 41-50 age stage has more significant impact on health.

Conclusion: This paper focuses on the relationship between working hours on workforce health using the oprobit model. Based on the literature on the impact of workforce health levels, the variables are tightly controlled to address estimation bias caused by omitted variables and to ensure the credibility of the results.

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Background

At a time of rapid economic development, the quality of the labor force is an issue worthy of attention, and health is an important factor in the quality of the labor force. In recent years, the working hours of the workers have been continuously extended, and excessive labor has gradually become a common phenomenon, directly affect the health level of workers, but also not conducive to social stability and economic development. China published the Plan of Health China 2030. The goal is to provide health services to every citizen by 2030. China's basic medical insurance system has basically reached the goal of covering both urban and rural residents, meeting their medical needs and providing a strong guarantee for improving the health of the workforce. To understand the relationship between labor market performance and health is of great significance to expand the factors influencing the health level of labor force.

There are two main types of measures of workforce health, one is self-assessment of health status, which can reflect the health status of individuals more intuitively and is more closely

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related to individual choice studies such as labor force participation and retirement, and data are more easily available. ADL, but there is little variation in ADL in young populations[1]; the SF-36 index [2], Euroqol-5D index[3], HUI index[4], Quality of Well-Being Scale (QWB) indicators [5], which include objective indicators based on individual health status, are also limited. Reflects an individual's subjective assessment of his or her own health status, but quality of life indicators are very rigorous in their data requirements. There is a rich body of scholarly research on the impact of working hours on workforce health.

There are two main perspectives: first, shorter working hours can be detrimental to subjective health, but within certain limits it can be beneficial to the health of the workforce, and longer working hours are motivated by the possibility of job advancement or better employment opportunities and higher wages. According to the efficiency wage theory, the cost of unemployment is positively related to the number of hours worked, and increasing the number of hours worked is an important indication of work effort, but above a certain level can be detrimental to the health of the population, with some degree of overtime being associated with high levels of stress, and the health effects are also cumulative over time[6,7,8,9]. Second, the relationship between the two is shaped like a mountain curve[10], with both job stability and shortened working hours having a favorable impact on health, and excessive working hours and work stress producing negative emotions [11,12].

The impact of working hours on health is heterogeneous, with studies focusing on specific groups, occupations, and types of industries, but also influenced by different socioeconomic factors. In the case of migrant workers, their spare time is relatively monotonous and their working hours vary greatly, with the average working hours exceeding the standards set by the national Labor Law[13,14]. Mild differences in labor and heterogeneity in time commitment between occupations can have different effects on health, with more resources and energy invested in career development having more distinct occupational identities, and highly complex jobs having more significant effects on health[15].There are also gender differences in the relationship between working hours and health, mainly due to the differences in social roles and socioeconomic status of different gender groups, involuntary overwork is positively associated with poor mental health in men, while in women, both involuntary and overwork can lead to poor physical health[16], and working hours can be detrimental to both individual and spousal health. impact[17].

After reviewing the relevant literature, we found that the relationship between working hours and labor health, most of the studies are qualitative, while the quantitative studies are regional and lacking in general studies; the research perspectives are mostly analyzed from one side, such as the impact of working hours on the health status of a certain group of migrant workers, while the heterogeneous analysis focuses on special groups and occupational types, with little attention to differences in medical insurance participation, education level and age.

Therefore, based on existing research results,this paper used CFPS survey,which to explore the relationship between working hours and labor health, and further discussed its heterogeneity.

2. Data and Methods

2.1 Data

The data used in this paper comes from the China Family Panel Studies (CFPS), which covers 25 provinces/municipalities/autonomous regions, and has four main questionnaires: the community questionnaire, the family questionnaire, the adult questionnaire and the children questionnaire. It can be used for the study of individual micro-behavior. In this paper, the data of 2016 and 2018 are combined into a panel data analysis, and the subjects are the non-farm labor force aged 18-65. 6,981 valid samples are obtained after deleting missing values, extreme values, and unreasonable values.

2.2 Variables' Measurement

2.2.1. Measurement of Health Level of Labor Force

The outcome variable of this study was self-rated health levels.According to the design of the CFPS questionnaire,we choose the following question to measure the health level of labor force:"How do you consider your health to be?" . In this paper, the questionnaire is divided into "unhealthy", "fair", " relatively healthy ","healthy"and ."very healthy" are assigned a value of 1-5 respectively. Table 1 shows that the average self-rated health levels of respondents was fair levels.

2.2.1.Measurement of Weekly Working Hours

The core explanatory variable of this paper was working hours. According to the design of the CFPS questionnaire,we choose the following question to measure working hours:" How many hours a week does this job typically work?". Table 1 shows that labour force works 52 hours a week, well above standard working hours.

2.2.3. Measurements of Covariates

To reduce possible bias in the statistical model due to omitted variables, variables were controlled for in the empirical analysis: including gender, whether the age is 41-50 years, and Education level, personal income, marriage, whether or not they smoke, whether or not they drink, how often they exercise and whether or not they participate in medical insurance.The specific definitions are presented in Table 1.

Table1. Variable definitions and descriptive statistics

Variables	**Definition**	Full sample （N=6981）		Get Health Insurance （N=6293）		Uninsured （N=688）	
		Mean	Standard Error	Mean	Standard Error	Mean	Standard Error
Self-rated health	Unhealthy=1,fair=2,relatively healthy =3, healthy=4, very healthy=5	3.21	1.05	3.20	1.05	3.32	1.10
Working hours	Working hours per week	52.16	19.42	52.04	19.34	53.34	20.12
sex	Male=1,female=0	0.30	0.46	0.29	0.46	0.30	0.46
income	Annual personal income	8.42	4.03	8.47	4.01	7.92	4.21
Is 41 to 50 years old	Age 41-50 = 1,otherwise = 0	0.23	0.42	0.23	0.42	0.18	0.39
Level of education	Junior secondary and below = 1, senior secondary/technical school/vocational high school = 2, Junior College and above =3	1.84	0.88	1.85	0.88	1.74	0.87
Marital status	At the wedding =1,otherwise=0	0.80	0.40	0.81	0.39	0.63	0.48
Whether or not to smoke	Smoking = 1,otherwise = 0	0.05	0.22	0.05	0.22	0.05	0.23
Whether or not to drink	3 times a week in the past month = 1	0.07	0.26	0.07	0.26	0.05	0.22
Exercise Frequency	How many times a week do exercise	2.16	2.92	2.20	2.95	1.81	2.61
Whether or not you have health insurance	Health Insurance =1,No=0	0.90	0.30	-	-	-	-

2.3 Ordered Probit Model

This paper focuses on the effect of working hours on the physical health of the workforce, with the explanatory variable health as the multi ordered data is not suitable for estimation using OLS. The model is an extension of the probit model, dealing specifically with the case where the interpreted variable is sorted data. the model is set as follows:

$$\text{health}_{i,t} = F\left(\beta \text{ workhour }_{i,t} + \gamma X_{i,t} + \varepsilon_{i,t}\right)$$

Where $\text{health}_{i,t}$ represents the dependent variable; β is the intercept term; $X_{i,t}$ represents a series of controlled variables; γ indicates the coefficient of the impact of these controlled variables on the respondent's health level ,and $\varepsilon_{i,t}$ is a random error term. F (•) is a nonlinear function in the form of:

$$\mathrm{F}\left(y_{i,t}^{*}\right) = \begin{cases} 1 & y_{i,t}^{*} \le C_1 \\ 2 & C_1 < y_{i,t}^{*} \le C_2 \\ \vdots & \vdots \\ J & y_{i,t}^{*} > C_{j-1} \end{cases}$$

Where $y_{i,t}^{*}$ represents the latent variable,satisfying:

$$y_{i,t}^{*} = \beta \text{workhour}_{i,t} + \gamma X_{i,t} + \varepsilon_{i,t}$$

$C_1 < C_2 < \cdots < C_{J-1}$ are tangent point and is the parameter to be estimated.

$$\mathrm{P}\left(\mathrm{y}_{i,t} = 1 | X_{i,t}\right) = P\left(y_{i,t}^{*} < C_1\right)$$

$$\mathrm{P}\left(\mathrm{y}_{i,t} = 2 | X_{i,t}\right) = P\left(C_1 \le y_{i,t}^{*} < C_2\right)$$

$$\mathrm{P}\left(\mathrm{y}_{i,t} = 3 | X_{i,t}\right) = P\left(C_2 \le y_{i,t}^{*} < C_3\right)$$

$$\cdots\cdots$$

$$\mathrm{P}\left(\mathrm{y}_{i,t} = J | X_{i,t}\right) = 1 - P\left(C_{n-2} \le y_{i,t}^{*} < C_{n-1}\right)$$

If the random error term is normal distribution, then the probability of labor force's health level.

3. Results

Table 2 reports the regression results of the impact of working hours on individuals' health level.Columns (1)-(3) were the regression results of the whole sample, the Medicare sample and the uninsured sample.The regression results suggest that,across the entire sample, working hours were negatively correlated with health at a significant 5% level, other things being equal. The increase in working hours, diminishing returns, and the decline in self rated health of the workforce. From the point of view of health insurance, working hours have a more significant impact on self-rated health of uninsured workers.

Table 2. Impact of working hours on individuals' health level

	（1） Full sample	（2） Get Health Insurance	（3） Uninsured
Working hours	-0.00149*	-0.00143	-0.00241*
	(1.91)	(1.69)	(1.14)
Sex	0.124***	0.147***	-0.0349
	(3.47)	(3.74)	(-0.37)
41 to 50 years old	-0.295***	-0.307***	-0.175

	(-7.13)	(-6.72)	(-1.55)
Income	0.0116***	0.01000**	0.0195**
	(3.06)	(2.44)	(2.00)
Level of education	0.0716***	0.0793***	0.0273
	(3.77)	(3.79)	(0.54)
Marital status	-0.145***	-0.141***	-0.185**
	(-3.72)	(-3.27)	(-2.03)
Smoke	-0.168**	-0.218***	0.189
	(-2.38)	(-2.84)	(1.00)
Drink	0.0897	0.0956	0.0298
	(1.52)	(1.52)	(0.16)
Exercise Frequency	0.0140***	0.0127**	0.0291*
	(2.77)	(2.36)	(1.84)
Medical Insurance	0.116**	—	—
	(-2.34)	—	—
Year	Control	Control	Control
Observations	6981	6293	688

Notes: T value in parentheses ;*** p < 0.01, ** p < 0.05, and * p < 0.1.

The above analysis shows that the health level of the labor force is constrained by long working hours. But people's behavior is generally dominated by people's belief, value orientation and attitude to realistic interests. Different cultures form different ideas and life styles, and ultimately directly or indirectly affect people's health.so,the impact of working hours on labor force's health level varies among different age-stage and education level.

Table 3 divides the education level and age-stage, further reports the impact of working hours on labor force's health level among different age-stage and education level.From the perspective of the difference in educational level, the impact of working hours on self-rated health is more significant for the workforce with lower educational attainment of junior high school and below, and the impact of working hours on health is limited for the workforce with other educational attainment.

Table 3. The impact of working hours on self-rated health among different age-stage and education level

	Lower secondary and below	High school level	Tertiary and above	In the 41-50 age group	Not in the 41-50 age group
Working hours	-0.00313***	-0.000774	-0.00241	-0.000169	-0.00209**
	(2.60)	(-0.41)	(-1.21)	(-0.09)	(2.32)
Sex	0.168**	0.196**	0.0660	0.265**	0.0914**
	(2.56)	(2.16)	(1.12)	(1.96)	(2.37)
41 to 50 years	-0.309***	-0.272***	-0.439***	—	—
	(-4.45)	(-2.64)	(-4.38)	—	—
Income	0.0192***	0.00335	-0.00805	0.00829	0.0133***
	(3.11)	(0.37)	(-0.89)	(0.87)	(3.09)
Level of	—	—	—	0.0710	0.0682***
	—	—	—	(1.19)	(3.33)

Marital status	-0.0652	-0.347***	-0.136**	0.357*	-0.198***
	(-0.89)	(-3.20)	(-2.28)	(1.85)	(-4.80)
Smoke	-0.125	-0.254	-0.270*	-0.197	-0.158**
	(-1.10)	(-1.60)	(-1.88)	(-0.92)	(-2.06)
Drink	0.0952	-0.0996	0.246*	0.225	0.0429
	(1.09)	(-0.69)	(1.84)	(1.48)	(0.63)
Exercise	0.00577	0.00845	0.0478***	0.0303*	0.0103*
	(0.74)	(0.74)	(4.12)	(1.81)	(1.82)
Medical Insurance	0.163**	0.108	0.0260	0.286*	0.0814
	(-1.98)	(-0.87)	(-0.27)	(-1.65)	(-1.52)
Year	Control	Control	Control	Control	Control
sigma2_u	0.653	0.448	0.257	0.972	0.206
_cons	(1.26)	(0.92)	(0.92)	(0.71)	(1.22)
Observations	3375	1356	2250	1587	5394

Notes: T value in parentheses ;*** $p < 0.01$, ** $p < 0.05$, and * $p < 0.1$.

When analysed from the perspective of age differences, the effect of working hours on health was significant at the 1% level for those not in the 41-50 age group.From the point of view of medical insurance, participation in medical insurance has a greater impact on the health of the workforce in the 41-50 age group.

4. Discussion

This paper focuses on the relationship between working hours on workforce health using the oprobit model. Based on the literature on the impact of workforce health levels, the variables are tightly controlled to address estimation bias caused by omitted variables and to ensure the credibility of the results.

4.1 The health of the workforce depends on a combination of working hours, individual fitness, education and income levels

Across the entire sample, working hours were negatively correlated with health.The increase in working hours, diminishing returns, and the decline in self rated health of the workforce. Work activities can play the physical and social functions of workers, but no longer obtain a sense of pleasure and belonging, even if wage returns increase, the mental and physical strength of the labor force will be impaired, to improve the risk factors of depression, hypertension and other diseases, the self-rated health level of the labor force will gradually decline.

Working hours have a more significant impact on self-rated health of uninsured workers.and this difference may be more significant than that of uninsured workers, participating in medical insurance has certain welfare guarantee, which embodies the function of “Social Protection Net” , can make up the cost of time to a certain extent, and release the medical demand of the labor force, increased access to health services and therefore increased working hours were more associated with self-reported health status.

4.2 The impact of working hours on self-rated health varies among different age-stage and education level

The impact of working hours on self-rated health is more significant for the workforce with lower educational attainment of junior high school and below.One possible reason for this is that the workforce with lower education level is mostly engaged in manual labour, such as

manufacturing, construction and service industries. Due to the characteristics of these industries: there are problems of poor working environment and high job mobility, which require high physical ability of people, the increase in working hours has a greater impact on health. Compared to junior high school and below, other workforces with higher education levels have a less significant impact on health levels by working longer hours, consciously learning about health and effectively managing their own health levels, indicating that improving the education level of the workforce can mitigate the impact of excessive working hours on the health of the workforce to a certain extent.

The effect of working hours on health was significant at the 1% level for those not in the 41-50 age group. This may be due to the fact that at this age, the workforce is in the rising stage of career development, making full use of mental and physical strength, while the pressure from family and society increases and the relative burden is heavier, working hours increase, the marginal output of health capital decreases more and the decline in self-rated health is more pronounced.

Participation in medical insurance has a greater impact on the health of the workforce in the 41-50 age group, which may be related to their higher participation rate in health insurance. Participation in health insurance can improve the health needs of the workforce to a certain extent, reflecting the fact that the health insurance system produces a better social effect; when there is good medical coverage at this age, medical needs are met, the price of medical services is relatively reduced and the financial burden is lessened; the health impact of participation in health insurance is higher for the workforce with an education level of junior high school or below compared to the workforce with other education levels, compared to A more educated workforce, which does not focus on the upfront accumulation of healthy human capital, will have higher health needs when enrolled in health insurance.

5. Conclusions

This paper examines the impact of working hours on the health of the workforce through the lens of working hours, using the non-farm employed workforce and using the China Family Panel Studies (CFPS) in 2016 and 2018. The study found that working hours were negatively correlated with health,and the impact of working hours on self-rated health is more significant for the workforce with lower educational attainment of junior high school and below.The effect of working hours on health was significant at the 1% level for those not in the 41-50 age group, which is of great implication to future research. Future research should mainly focus on working time regulation and health insurance system improvements.

First, further implementation of the rules relating to statutory working hours for employees. In the short term, it may seem that long hours for employees may be beneficial to a company's profit maximisation goals and increased working hours may have higher performance, but over a longer period of time, health is an important human capital factor for workers and long hours do not lead to sustained productivity gains, leading to an excessive drain on the workforce's personal energy, crowding out time spent on health investments, bringing more work stress, This can lead to more work stress, mental stress and physical health problems, and even forced cessation of work. The analysis in this paper shows that the average working hours of the workforce exceeds the requirements of the Labour Law and therefore it is necessary to limit the excessive working hours of the workforce and promote the regularisation of working hours in the labour market. Secondly, the regulations related to overtime hours should be further regulated, and employers should pay wages for overtime hours according to the relevant legal standards, so as to reduce the damage of excessive working hours on the health level of the workforce and to ease the workforce's balance between work and non-work.

Second, from the introduction of the Opinions on Integrating the Basic Medical Insurance System for Urban and Rural Residents to the completion of system integration in the vast

majority of regions, medical insurance has brought about more medical needs, medical insurance coverage has expanded, and the goal of universal medical insurance has basically been achieved [18].However, there are still issues that need to be addressed in the implementation of China's basic medical insurance system, such as the possibility of adverse selection by participants. When the workforce participates in urban residents' health insurance, the government will not provide diverse choices for different population health levels to create a balanced separation of different risks, which may lead to the phenomenon of adverse selection in the process of workforce participation. Therefore, the issue of the burden on health insurance funds due to adverse selection should be taken seriously, and while continuing to follow the principle of voluntary enrolment, attention should be paid to areas that are difficult to be covered by public healthcare, pay attention to the internal differences of the enrolment population, and combine different risk categories and insurance grades to promote the effective implementation of the health insurance system.

The empirical analysis of this paper shows that excessive working hours can damage the health level of the workforce. In terms of medical insurance, the current national medical insurance covers mainly general, common and multiple diseases, and medical insurance and occupational disease prevention and control should be established to consolidate and develop the medical insurance system so that excessive labour prevention and control is more complete and effective, and the health level of the workforce is improved in order to effectively improve labour productivity.

Declarations

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Authors' Contributions

The literary the material preparation, data collection and analysis survey sections were primarily written by L.C,and L.C commented on previous versions of the manuscript. L.C has read and agreed to the published version of the manuscript.

Availability of data and materials

The datasets used during the current study are available from website of Institute of Social

Science Survey(http://isss.pku.edu.cn/cfps/download/login).
The datasets analysed during the current study are available from the corresponding author on reasonable request.

Ethics approval and consent to participate

Not applicable.

Consent for publication

Not applicable.

Competing interests

The author declare no conflict of interest.

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