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The Interplay of Migrant Workers' Working Hours, Income, and Well-Being in China

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Abstract: There is a history of overwork in China, and regulations to protect workers are insufficient. This study explores the relationship between working long hours and self-rated health among rural-urban migrant workers in China. Survey data from the 2018 China Family Panel Studies (CFPS) is used to construct a simultaneous equation model, and the 3SLS method is applied. The results showed that: (1) Migrant workers had good health. However, overtime work is very common among migrant workers in China, and male migrants work more overtime. (2) Migrant laborers' health and income are causally related, with better health leading to higher income. In contrast, the compensatory effect of income by extending working hours on health is smaller than the damage caused by overtime work for the male migrants who have more severe overtime work, resulting in a negative income effect on health. (3) The incentive effect of income on labor supply and the positive interaction effect of increasing labor hours to increase income are only reflected in the standard labor time sample. Therefore, for the heavy overwork group whose working hours have already reached the limit, income increases can no longer motivate them to extend their labor hours. Therefore, provincial and national policy transformations are needed to regularize working hours and remuneration while maintaining individual health.

Keywords: working hours; health; income; migrant workers; China

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1. Introduction

Well-being is increasingly seen as a multidimensional phenomenon, with health as an important facet [1]. The European Agency for Safety and Health at Work (2007) included long work hours among the top ten rising psychosocial concerns. In 2016, a total of 488 million individuals across the world were found to have engaged in prolonged working hours, resulting in 745,000 fatalities due to stroke or cardiovascular disease [2]. According to a recent study by the World Health Organization, individuals who work 55 h or more per week are at a heightened risk of experiencing a 35% increase in stroke and a 17% increase in ischemic heart disease. Japanese call overwork-related deaths karoshi. Driven by a hard-working culture and high living costs, long work hours are normalized for Singaporean young working adults, although they are a barrier to healthy diets and physical activity [3]. Long work hours, defined as working over 48 h a week, can cause individual distress and family tensions [4], suicidal ideation, and higher risks of morbidity and mortality [5]. In addition, extended working hours can increase the risk of mental disorders [6] and unhealthy behaviors such as smoking [7], the combined effect of alcoholic beverages, and insufficient physical activity [8]. Extended periods of work can also impact the likelihood of developing cardiovascular conditions [9,10], sleep quality [5], chronic fatigue, the probability of stroke, all-cause mortality, and hypertension [11,12].

Numerous countries restrict their employees' time since longer hours harm their well-being [13]. For example, the new Labor Contract Law in China, implemented in December

2018, stipulates that the maximum statutory work hours should not exceed 8 per day or forty-four hours weekly as a general rule. The working hours, typically not exceeding at most one hour each day, can be extended by the employer owing to operational or manufacturing demands once the union has engaged with the workforce. Moreover, in severe circumstances, it may be necessary to prolong the duration of the workday. It must be at most 3 h daily, which means 36 h a month. This measure is primarily intended to ensure the physical well-being of employees. Regrettably, over the past few years, there has been a proliferation of labor exploitation resulting from the prolonged working hours of employees. This phenomenon has had a direct impact on their physical well-being and adversely affected both economic progress and social stability [7]. So, from a policy perspective, whether and how working time affects health is crucial [14].

Since 2010, China has had longer average working hours than several developed and developing nations (Figure 1). In 2021, the average weekly working hours of Chinese urban employed individuals were 47.6 h, with men working 48.7 h and women working 46.2 h. Similarly, 35.1% of urban employed persons work more than 48 h weekly, with 38.3% of men and 30.8% of women working more than 48 h weekly. In addition, the average weekly working hours for 18 of the 19 reported industries are greater than 40 h. Moreover, in 14 of the 19 sectors, it is higher than 44 h, with the hotels and catering business having the highest at 52.8 h.

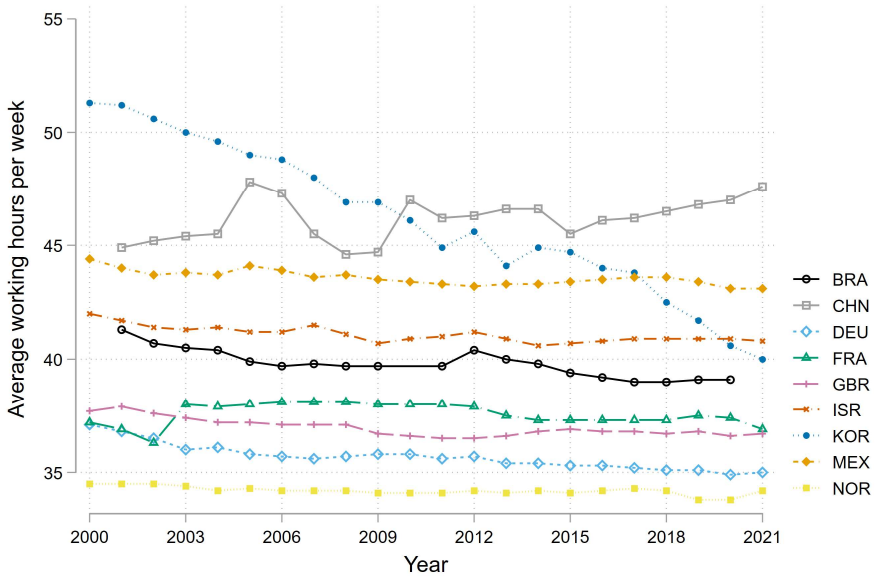

Figure 1. Average working hours per week of some countries in the world. Data source: data for China is from China Labor Statistical Yearbook; data for other countries is from OECD.

For a long time, migrant workers have been a group that suffers from excessive work, particularly severely. This situation, if continued, will deteriorate the national health. China now has 288.36 million migrant workers, compared to 225.42 million in 2008—a 62.96 million or 27.92% increase—in only 12 years. From now to 2035, population migration will remain an important demographic phenomenon in China's economic and social development, and mass population migration will remain the norm. Some researchers have analyzed the working hours and healthy relationships between Chinese urban workers [15] and the effects of prolonged working hours on wellness in the non-farm workforce based on findings in China [16]. However, rural-to-urban internal migrant workers in China account for one-fifth of China's population, and insufficient attention has been paid to them. Due to the difference in expected income between urban and rural areas, higher income is the primary motivation for rural-to-urban migration. If they can earn more by working longer hours, even at the expense of their health, then for those with initially good health, working longer hours may be a rational choice to obtain a higher income. However, in the

long term, regular overwork may cause health damage, which in turn can lower workers' future income.

Therefore, studying the issue of overtime work among migrant workers from the perspective of health status and income returns has important policy implications. This study aimed to analyze the internal relationship between the decision-making mechanisms of migrant workers' working time, health, and income against the background of normalized overwork to alleviate the health damage caused by long working hours. This research endeavor is anticipated to contribute twofold to the existing body of literature. First, compared with previous studies, which mostly focused on the relationship between health and income [16] or between health and working time [3,6,17–19], we integrated health, income, and time into a unified analytical framework by constructing a simultaneous equation model of health, income, and working hours, which is more effective for overcoming endogenous problems. Second, we attempt to explore the influencing mechanisms of the relationship between health, working hours, and income from the perspectives of the labor market system, preventive labor supply, and income compensation. Therefore, we use cross-sectional data of rural-urban migration workers in China sampled from the 2018 China Family Panel Studies (CFPS). The three-stage least squares (3SLS) regression approach is used for a multi-equation system containing endogenous variables. Robustness tests are also conducted using three methods: replacing health indicators, grouping regression based on different degrees of overtime work, and grouping regression by gender.

The paper proceeds as follows: Section 2 is a theoretical analysis. Section 3 details the data we use, the definitions of the main variables, and our econometric framework. Section 4 outlines our main results, discussion, and robustness analyses. Finally, Section 5 provides conclusions and policy implications.

2. Theoretical Analysis and Hypothesis

Several hypotheses have been proposed to elucidate the factors influencing one's health and its fluctuations, drawing from Grossman's theoretical framework [20]. It centers on the interplay between income, labor hours, and health. According to the classical model, increasing working hours limits the available time for health maintenance. The rationale behind extended working hours is often attributed to the potential for career progression, improved job prospects, and increased remuneration. In addition to direct effects, there are also indirect influence paths between health and labor market performance; therefore, it is necessary to incorporate health, working hours, and income into the same analytical framework, as shown in Figure 2.

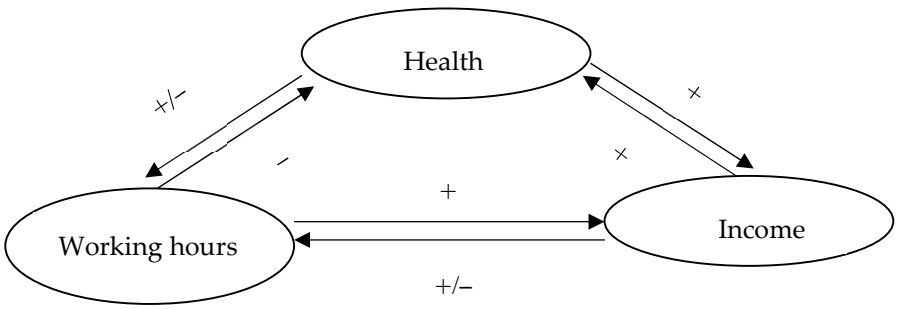

Figure 2. Conceptual model: Health, working hours, income interrelationships, and expected direction of impact. Note: The "+"and "−" indicate that a positive or negative relationship is assumed.

2.1. The Effect of Working Hours and Income on Health

Most migrant workers are confined to the secondary labor market. The lower wage level makes migrant workers more willing to sacrifice time flexibility to increase their income [21]. However, long-term overtime work may lead to the deterioration of their health. Long working hours negatively affect health, mainly through fatigue accumulation and

time squeezing. First, laboring for extended periods makes employees more tired, which has a detrimental impact on how they feel about their health [22]. Long working hours had less of an impact on mental health than perceived workplace stress [17]. Additionally, those who work long hours can lack the opportunity to get proper healthcare when they become ill. In addition, reducing employees' leisure time will exacerbate the conflict between work and life, and participation in recreational activities, social activities, and physical exercise will decrease [23]. Even though most studies have found that working long hours is bad for health, some studies still think that there is no significant relationship between working hours and health [24].

There are certain limitations to empirical research evaluating the impact of working hours on health. The first results from either reverse causation between hours and health or missing unobserved variables impacting both hours and health [7]. For instance, healthy workers often put in extra hours, yet working too much overtime harms their wellness [19]. The individuals who have left the workforce owing to health issues are challenging to observe. Second, working hours may indirectly impact health because they may influence money, significantly affecting health [7]. This leads to our first hypothesis:

H1. *Overtime work harms the health of migrant workers.*

According to the "resource compensation for health loss" mechanism, workaholics get more resources while working a lot of hours, and these resources prevent work from depleting their health [25,26]. Therefore, high income can reduce the health risks of workers. At the same time, there is a circular effect between income and health; that is, healthy workers can increase the labor supply and thus obtain more income, which will further improve their health status [27]. Therefore, income may play a positive role as a compensating factor for health, or it may regulate the process of health loss as an adjustment factor, making the loss process smoother. This leads to our second hypothesis:

H2. *High income is conducive to alleviating the deterioration of health caused by overtime work; that is, income has a compensatory effect on health.*

2.2. The Mutual Influencing Effect of Health, Income, and Working Time

According to the human capital theory, poor health status may adversely affect work performance and labor productivity, and overtime work affects the health status and then affects the income acquisition ability of migrant workers already at a low income level. For migrant workers who have health problems but still need to work, it is necessary to analyze the relationship between their health status and labor market performance and examine the impact mechanism of their health on changes in working hours and income. Mild health problems generally do not affect the labor participation of migrant workers. Instead, they may even increase their working hours due to the disease burden and the uncertainty of income caused by lower productivity, to relax income constraints. This is a self-protective behavior when workers face uncertainty [28,29].

However, increasing working hours due to illness will crowd out the investment in health and accelerate the loss of health. Most of the literature on the impact of health on employment focuses on whether health affects labor participation while ignoring its impact on labor market performance, such as research on the potential impact of working hours and income [30]. This leads to the third and final hypothesis:

H3. *Poor health has a negative influence on income, but its effect on working hours is ambiguous.*

H4. *Poor-health migrant workers may increase working hours to compensate for potential income loss resulting from productivity decline.*

To sum up, health, working hours, and income is interrelated, and this effect may form a virtuous circle, such as better health and higher income, which will lead to further improvement in health. However, circular effects do not necessarily exist, and the relationship between health, working hours, and income may not be significant. For example, when the health status of employed migrant workers is poor, the wage rate falls and the supply of preventive labor increases. On the other hand, it will also lead to the deterioration of health status, thus forming a vicious circle [31]. So, then, is there a circular effect among health, working hours, and income? Breaking the possible vicious circle between the three will help us think about how to consider the employment and physical health of migrant workers by improving the social security and labor market systems and providing a basis for public policy formulation.

3. Data and Measures

3.1. Data Source and Samples

The present study used data sourced from the China Family Panel Studies (CFPS), consisting of 25 cities, provinces, and autonomous regions. The CFPS was initiated in 2010 by the Institute of Social Science Survey (ISSS) at Peking University, and a follow-up survey is conducted every two years. In this paper, a cross-sectional analysis was conducted using 2018 adult data. We keep the employees with agricultural Hukou who work in non-agricultural jobs in urban areas and are aged between 18 and 65 as the sample of migrant workers for the later empirical analysis. After removing the unemployed, professional soldiers, and people who did not answer the questionnaire, a final sample of 2997 participants was obtained.

3.2. Empirical Model

Because of the mutual causality and decision simultaneity between migrant workers' health, working hours, and income, the simultaneous equation model and three-stage least squares (3SLS) method were used to analyze the data. 3SLS takes into account the simultaneous correlation between the random disturbance terms of each equation; it has better asymptotic efficiency than two-stage least squares estimation [32], and it is more effective than 2SLS and instrumental variable methods in large samples [33]. At most, the number of exogenous variables omitted by a structural equation must be greater than the number of endogenous variables. Hence, every equation has to be configured to be excluded by the variables of other equations. Therefore, the simultaneous equation models in our case are set as follows:

$$\begin{cases} Health = \alpha_0 + \alpha_1 Time + \alpha_2 Income + \alpha_3 C_i + \alpha_4 X_h + \varepsilon_1 \\ Time = \beta_0 + \beta_1 Health + \beta_2 Income + \beta_3 C_i + \beta_4 X_t + \varepsilon_2 \\ Income = \gamma_0 + \gamma_1 Health + \gamma_2 Time + \gamma_3 C_i + \gamma_4 X_i + \varepsilon_2 \end{cases} \quad (1)$$

In the equation, *Health*, *Time*, and *Income* represent the health, working hours, and income of migrant workers, respectively, which are endogenous variables of the simultaneous equations. The health determinant equation is constructed based on Grossman's health production function model, following the research of Haveman et al. (1989) [34] by adding working hours and income variables. The second line of Equation (1) is working time function. The income determination equation is an extended model of the classical Mincer (1974) [35] income function after adding health variables. C_i represents the common factors that affect health, working time, and income; X_h, X_t, and X_i represent the exclusion factors of the three functions, respectively; ε_1, ε_2, and ε_3 are the residual error terms of each function.

3.2.1. Endogenous Explanatory Variable

- Health

According to the CFPS questionnaire's design, participants were asked "What do you consider your health to be?" to evaluate their health using a five-point scale: "very healthy", "healthy", "relatively healthy", "fair" and "unhealthy", which were assigned a value of 5, 4, 3, 2, and 1, respectively.

- Measurement of Working hours

The CFPS questionnaire was designed to include a question that measures work hours, specifically, "How many hours every week does this job typically involve?" According to relevant Chinese and international studies and the Labor Law of China's working time limitations, individuals who worked more than 18 h a day were also removed if they exaggerated their circumstances. In this paper, we use monthly working hours multiplied by weekly working hours' times 4.3 since the average is 30 days per month, 7 days per week, or $30/7 \approx 4.3$ weeks/month.

- Measurement of the income

Income is the monthly income (material benefits, cash benefits, bonuses, wages, etc.) after tax, social insurance, and the housing fund. This paper uses the logarithm of monthly income and labor time in the empirical analysis.

3.2.2. Exogenous Variable

In the health determination equation, working hours and income are endogenous variables. As per Grossman's (1972) seminal work, depreciation is a crucial health attribute that distinguishes itself from other facets of human capital. Prolonged overtime work can result in a hastened decline of an individual's health capital, while the natural aging process can also contribute to the amortization of one's health capital stock. Simultaneously, health can be considered a commodity for investment purposes, and demand for it is subject to the influence of investment revenue and expenses. Consequently, the state of wellness is impacted by variables that influence both earnings and the value of spending on health. Higher-income workers mean that their ability to invest in health capital is also stronger. The number of years of education of workers affects healthy productivity; the working environment also impacts health investment and loss. We use "whether the main workplace is indoors" (yes = 1, no = 0) and respondents' satisfaction with work safety to measure the impact of environmental factors on individual health. Therefore, in addition to working hours and income as endogenous variables, the control variables of the health determination equation mainly include age, years of education, whether the main workplace is indoors, and satisfaction with work safety.

Health status and working hours are endogenous variables in the income determination equation. According to the classic Mincer income determination equation [35], individual income is affected by human capital. Human capital investment and accumulation are mainly affected by years of education, work experience, and health status. In addition, employment methods, gender, marital status, and regional differences are also important factors affecting the income of migrant workers. Since the sample in this paper only keeps employed migrant workers and omits self-employment, in the income determination equation, in addition to the endogenous variables, years of education, years in the current job, and its squared term, gender, marital status, and region factors are also controlled.

Income and health status are endogenous variables in the working hour's determination equation. However, years of education can affect working hours by improving individual labor proficiency; in addition, whether to sign a contract, marital status, gender, and regional differences will also affect the working hours of migrant workers; parents helping with housework has a positive effect on expanding an individual's working hours. Therefore, in the working hour's determination equation, in addition to income and health status as endogenous variables, years of education, whether parents help with housework, whether they signed a labor contract, gender, marital status, and regional dummy variables are also controlled.

To sum up, the exclusive exogenous variables of the health determination function are the workplace and job safety satisfaction; the exclusive variables of the income determination function are the number of years in the current job and its square term; and in the working time function, the unique exogenous variables are parents taking care of the housework and signing a labor contract. Finally, the common variables of the three functions are the years of education of migrant workers and the region dummy variables.

3.3. Data Processing and Statistical Analyses

The health variable used in this paper is self-rated health, divided into five levels. Table 1 shows that the health condition of the migrant workers in the sample is comparatively encouraging. The proportion of people reporting their health status as "healthy", "very healthy," or "very good" reached 81.95% in total, the average income was 3257.58 yuan/month, and the average weekly working hours were 55.94 h, far exceeding the 44 h stipulated by the law. Of all the 2997 migrant workers, about 77% worked more than 44 h per week, 59% worked more than 50 h per week, and 35% worked above 60 h per week. The average weekly working hours for males and females are 57.67 h and 53.04 h, respectively. The average education years in the sample are 9.6 years, and 39.74% of migrant workers have signed labor contracts.

Table 1. Descriptive statistics and variable definition.

Variable	Definition	Mean	SD.	Min	Max
SRH	Self-rated health, 1–5	3.2753	1.0780	1	5
Lntime	Log of monthly working hours	5.4207	0.3928	3.405	6.246
Lnincome	Log of monthly income for the main job	7.8611	0.7691	4.605	10.463
Weekly worktime	Weekly working hours	55.9361	17.1609	7	120
Monthly worktime	Weekly worktime × 4.3	240.5251	73.7919	30.1	516
Work Environment Satisfaction	very dissatisfied~very satisfied: 1~5	3.6917	0.9748	1	5
Work Environment	The primary workplace is indoors = 1, otherwise = 0	0.6713	0.4698	0	1
Age	18~65 year-old	39.4061	10.5490	18	65
Gender	Male = 1, Female = 0	0.6253	0.4841	0	1
Marriage	At the wedding = 1, otherwise = 0	0.8452	0.3618	0	1
Edu_y	Illiteracy = 0, primary school = 6, junior middle school = 9, high school/technical school = 12, junior college = 15, university = 16	9.0450	3.7998	0	16
Work Experience	Years in the current job (years)	4.9547	6.5626	0.0001	47.25
Contract	Has signed a work contract = 1, otherwise = 0	0.3974	0.4894	0	1
Help From Parents	In the past 6 months, a father or mother has helped with housework or taking care of children = 1, otherwise = 0	0.3273	0.4693	0	1
Main Income	Monthly income from main job, Yuan	3257.5830	2214.6760	100	35,000
Middle China		0.3170	0.4654	0	1
West China		0.1802	0.3844	0	1

Figure 3 illustrates the kernel density estimation of the sample's weekly working hours to show the working hours of migrant workers more intuitively. According to the Labor Law, the weekly working hours of workers shall not exceed 44 h, so with 44 h as the reference line (Middle red dotted line). It shows that most of the samples are distributed on the right side of the reference line; only 23% of the samples work less than 44 h a week, indicating that migrant workers generally work overtime.

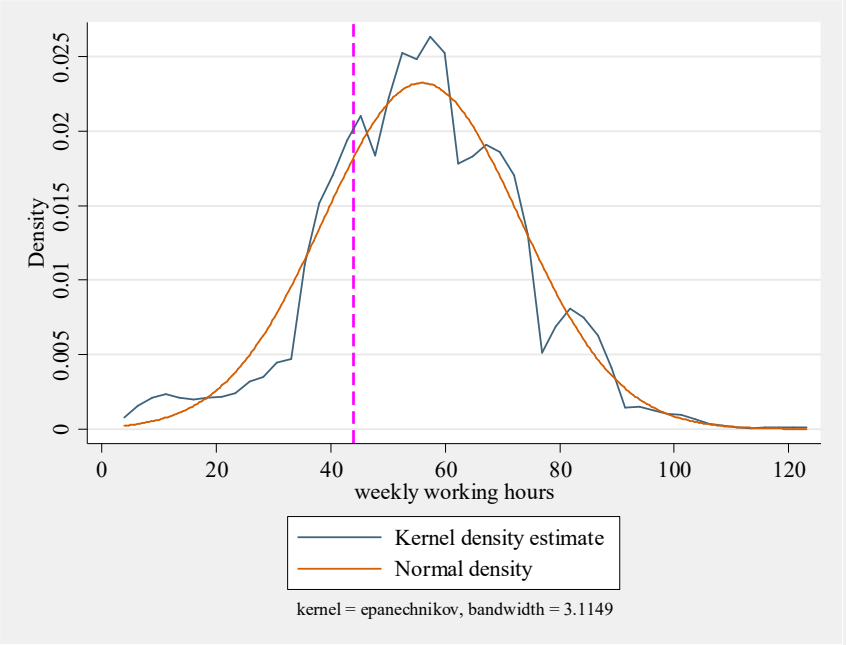

Figure 3. Kernel density estimation of weekly working hours of migrant workers.

Table 2 reports the average weekly labor hours of migrant workers with different health levels grouped by sex and the whole sample. It can be found that, first, most of the migrant workers are in good health, and the reported health status is "Relatively Healthy", "Healthy", and "Very Healthy" accounting for 81.95%. Second, in the same health category, working hours for men are higher than for women. Third, the sample group with the worst health has the longest working hours, and the relationship between health and working hours needs to be determined by empirical tests.

Table 2. Weekly working hours of migrant workers with different self-rated health levels.

Hours / SRH	Whole Sample			Female			Male		
	Sample	Mean	S.D.	Sample	Mean	S.D.	Sample	Mean	S.D.
Unhealthy	204	58.263	1.299	85	55.135	1.770	119	60.497	1.811
Fair	337	55.412	0.867	133	53.391	1.445	204	56.730	1.071
Relatively Healthy	1379	56.030	0.462	535	53.164	0.739	844	57.847	0.584
Healthy	584	54.693	0.710	219	51.833	1.221	365	56.409	0.857
Very Healthy	493	56.540	0.781	151	52.894	1.361	342	58.149	0.941

4. Empirical Results and Analysis

4.1. Estimation Results and Analysis

Stata 16.0 was used for empirical analysis. The three-stage least squares (3SLS) estimation result of the relationship between health, working time, and income is reported in Table 3. In the regression analysis, the working time and income are both in the form of the natural logarithm to eliminate any possible non-normality of the data.

Table 3. Relationship among health, hours of work, and income: findings of a simultaneous equation, n = 2997.

Variables	Health	Lntime	Lnincome
Health		−0.181 ***	0.500 ***
		(−0.0447)	(−0.0768)
Lntime	−0.810 **		1.845 ***
	(−0.4016)		(−0.3136)
Lnincome	0.535 ***	0.343 ***	
	(−0.0809)	(−0.0578)	
Education	−0.0366 ***	−0.0241 ***	0.0602 ***
	(−0.0093)	(0.0059)	(−0.0059)
Age	−0.0164 ***		
	(−0.0023)		
Safety	0.119 ***		
	(−0.0235)		
Environment	−0.0481		
	(−0.036)		
Gender		−0.0503 *	0.234 ***
		(−0.0287)	(−0.0467)
Marriage		−0.0619 ***	0.0835 *
		(−0.024)	(−0.0447)
Experience			0.0113 **
			(−0.005)
Square of experience			−0.000297 **
			(−0.0002)
Contract		−0.0215	
		(−0.0172)	
Help From Parents		0.00646	
		(−0.0099)	
Middle China	0.0521	0.0430 **	−0.138 ***
	(−0.0467)	(−0.0192)	(−0.0397)
Western China	0.0408	0.108 ***	−0.279 ***
	(−0.0636)	(−0.0241)	(−0.0502)
_Cons	4.011 *	3.595 ***	−4.480 ***
	(−2.1002)	(−0.3414)	(−1.7286)

Note: *, **, and *** indicate significance at levels of 10%, 5%, and 1%, respectively.

Each equation in the model has its own predetermined variables, which makes the model identifiable. Meanwhile, the *p*-value of the Hansen-Sargan overidentification test is 0.7925, failing to reject the null hypothesis and indicating no overidentification problem.

In the health determination equation, working time has a significant negative impact on health, as longer working hours can lead to stress and fatigue that deplete health capital, resulting in poorer health among migrant workers. This validates hypothesis 1. The positive effect of income on the health of rural migrant workers reflects a compensating effect, as higher income reduces health risks for workers, providing support for hypothesis 2. This effect works in both directions: healthy workers can increase labor supply to earn more income, and higher income can further enhance their ability to invest in health [36].

Then the impact of health on labor market performance is analyzed. In the working hour's equation, the coefficient of the Log of monthly income is significantly positive, indicating that higher income leads to a higher labor supply willingness among migrant workers under constant health conditions. But health showed a significant negative correlation with working hours, and one possible explanation is the labor market system. The prevalent

labor supply theory assumes that workers have complete autonomy in deciding their work time in the labor market, which only fully applies to "single-person economies" [34]. In reality, workers' choices about work time are not entirely self-determined once employed. Therefore, under highly institutionalized labor market conditions, when an unhealthy worker wishes to adjust their work time to accommodate their health status, there are only two choices: to continue working according to industry-standard work hours despite deteriorating health or to exit the labor market. That is, the impact of health on the working hours of migrant workers depends on the labor market system. If the labor market places fewer restrictions on workers' work time choices, the observed result should be that the better the health status, the longer the work time. Conversely, suppose the labor market places more restrictions on workers' work time choices; in that case, the decline in health status mainly affects migrant workers' labor participation decisions rather than reducing work time. In other words, when migrant workers experience declining health and cannot find suitable work, they may choose to exit the labor market or return to their hometowns. Instead, when health levels decline due to economic pressures, migrant workers will maintain their original work hours or even increase their work hours to obtain a higher income. This is consistent with hypotheses 3 and 4. The negative coefficient of health on working hours cannot be interpreted as "the worse the self-rated health, the more favorable it is for migrant workers to increase their work time", but migrant workers with poor health work longer. Therefore, in the decision-making process of migrant workers' working hours, income level and labor market institutions are more important factors than health.

The income determination equation shows that working time and health significantly impact income, consistent with the expected conclusion that migrant workers with better health have higher labor productivity and greater earning capacity.

4.2. Robustness Test

We conducted three sets of robustness tests. Firstly, we replaced self-rated health with whether the individual had been sick or uncomfortable in the past two weeks. Table 3 showed that longer working hours were associated with poorer health among migrant workers if this relationship remained consistent when using the sick indicator, suggesting that migrant workers continued to work overtime even when their health was compromised. Secondly, we examined whether the relationship between health, income, and working hours differed across subgroups with varying degrees of overtime work. Thirdly, we conducted regression analyses by gender groups because of the significant gender differences in working hours and health status. The results of the three robustness test sets are presented in Tables 4–6.

Table 4. The relationship among discomfort, working hours, and income.

Variables	Discomfort	Lntime	Lnincome
Discomfort		1.325 ***	−1.321 ***
		(4.03)	(−2.94)
Lntime	0.216		1.632 ***
	(1.33)		(5.02)
Lnincome	−0.172 ***	0.431 ***	
	(−5.22)	(6.84)	
N		2997	
p value of Hansan-Sargan		0.2822	

Note that the symbol *** indicates significance at level 1%. The model's estimation method and control variables are the same as those in Table 3.

Table 5. The relationship between health, working hours, and income in different groups by gender.

Variables	Male			Female		
	Health	**Lntime**	**Lnincome**	**Health**	**Lntime**	**Lnincome**
Health		−0.131 ***	0.431 ***		−0.234 ***	0.627 ***
		(−2.66)	(5.03)		(−2.98)	(4.32)
Lntime	−2.995 **		1.865 ***	−2.224 *		2.089 ***
	(−2.46)		(4.78)	(−1.92)		(5.11)
Lnincome	−0.0334	0.305 ***		0.532 ***	0.357 ***	
	(−0.08)	(4.32)		(3.10)	(4.45)	
N		1874			1123	
p value of Hansen-sargan		0.7008			0.4827	

Note that the symbols ***, **, and * denote 1%, 5%, and 10%, respectively. The model's estimation method and control variables are the same as those in Table 3.

Table 6. The relationship between health, working hours, and income over different overtime degree groups.

Variable	Weekly Working Hours ≤ 50			50 < Weekly Working Hours < 60			Weekly Working Hours ≥ 60		
	Health	**Lntime**	**Lnincome**	**Health**	**Lntime**	**Lnincome**	**Health**	**Lntime**	**Lnincome**
Health		−0.133 **	0.309 ***		−0.0088 **	0.413 **		−0.0099	0.431 ***
		(−2.20)	(2.98)		(−2.23)	(2.25)		(−0.45)	(3.40)
Lntime	−1.246 *		1.831 ***	−48.51 ***		−7.440	3.408		−4.062 *
	(−1.78)		(7.46)	(−2.73)		(−0.40)	(1.20)		(−1.93)
Lnincome	0.467 **	0.468 ***		0.648 ***	0.0055		0.521 ***	−0.0210	
	(2.40)	(6.14)		(3.14)	(1.13)		(4.41)	(−0.92)	
N		1199			527			1271	
p value of Hansen-Sargan		0.8916			0.3113			0.3204	

Note that the symbols ***, **, and * denote 1%, 5%, and 10%, respectively. The model's estimation method and control variables are the same as those in Table 3.

In Table 4, SRH (self-rated health) was replaced by "Discomfort" (During the past two weeks, if migrant workers felt physical discomfort, Discomfort = 1, otherwise = 0). The regression results are consistent with the theoretical analysis, showing that workers with poor health conditions increase their precautionary labor supply to cope with uncertainty by prolonging working hours. Short-term physical discomfort does not reduce the working hours of migrant workers but significantly increases them. However, physical discomfort reduces labor productivity and hurts income. The consistency between the results in Tables 3 and 4 also indicates the robustness of the model.

The results presented in Table 5 display the subgroup regression outcomes based on gender, revealing that the adverse impact of working hours on men's health is more significant than that on women's wellness. However, the significant effect of income on health only showed up in the female group. On the contrary, income has a negative impact on male migrant workers' health, while other variables are consistent with Table 3. One possible explanation is that migrant workers mainly increase their income by extending working hours, and male samples have more severe overtime work, which damages their health. Therefore, the compensatory effect of income on health is smaller than the damage caused by overtime work, resulting in a negative effect of income on health.

To further analyze this issue, we categorized the whole sample into three subsamples according to the severity of overtime work, combined with the definition of excessive labor in the Labor Law of the People's Republic of China and previous studies [37]. The sample was divided into three groups: standard working hours samples with weekly working hours below 50 h, mild overtime labor samples with weekly working hours between 50

and 60 h, and severe overtime labor samples with weekly working hours over 60 h. The results are shown in Table 6.

The incentive effect of income on labor supply and the positive interaction effect of increasing labor hours to increase income are only reflected in the normal labor time sample. Increasing labor hours in the heavy labor sample will reduce their income level. The effects of health and income on working hours are insignificant in the heavy labor sample. One possible explanation is that heavy laborers account for 42% of the total sample, with an average weekly labor time of 71.39 h, exceeding the legal labor time limit of 44 h by 62%. Their labor time has already reached the limit, so income increases can no longer continue to motivate them to extend labor hours. Those samples whose health has deteriorated due to heavy overwork continue to work long hours or have already withdrawn from the labor market. The observed sample shows no significant effect of health or income on their working hours.

5. Conclusions

Based on the 2018 CFPS survey data of employed rural-urban migrant workers in China, this paper explores the interrelationships between health, working hours, and income by constructing a three-equation simultaneous equation model using the 3SLS method. It found that migrant workers in China had good health. Overall, migrant workers engage in excessive overtime work to increase their income, despite the harm it causes to their health, and overtime work is more serious in the male groups. Income and labor market institutions are more important factors than health for migrant workers' labor supply decisions. If there are fewer restrictions on workers' work time choices and they can arrange their work more flexibly, the observed result should be that people with worse health should reduce their working time. So, the impact of health on the working hours of migrant workers depends on the labor market system. Income plays a compensatory role in the relationship between health and working hours and also serves as an incentive for workers to invest more time in their jobs. However, this effect is ineffective for workers who engage in excessive overtime work, where the health deterioration exceeds the compensatory effect of income on health. These findings enrich the literature on the interpretation of the relationship between health, welfare, and working hours among migrants.

The present study provides various implications concerning the regulations of working time and overtime policies aimed at safeguarding the health of migrant workers. In the immediate timeframe, extended work hours may prove advantageous for laborers in sustaining a particular income threshold and for employers in optimizing their organizations' financial gains. Extended periods of overwork can harm an individual's health, which is a crucial aspect of human capital for both personal and national well-being. The allocation of excessive time to work at the expense of investing in one's health can ultimately impede the long-term sustainability of the economy.

Given that the typical work hours of migrant workers surpass the upper limits stipulated by the Labor Law of China, our findings have several implications for policymakers to promote the health of Chinese rural-urban migrant workers. First, the departments of labor and social security should restrict illicit overtime work and clarify restrictions on employees' working hours and overtime pay. The policies and regulations governing working hours should be tailored to the particular work characteristics of various industries. Setting reasonable upper limits on working hours for various occupational categories, for instance. Second, the government should standardize overtime wage systems so as to ensure that employees are compensated fairly. Thirdly, policy support should be provided for routine health exams, psychological counseling, and fundamental health services for migrant employees in order to mitigate the health loss resulting from overwork and improve their health management. Lastly, continuously enhance the social security system and expedite the reform of the medical insurance system, empowering migrant workers to cope with health shocks.

The study presented certain constraints. Prior studies have posited the possibility of a non-linear connection between the number of hours worked and an individual's health [38,39], but it was outside the scope of this investigation. Second, as the unhealthiest individuals have dropped out of the labor market, an upward trend of health in the sample may be observed, which may be mistakenly attributed to income changes [40], both in cross-sectional survey and traceable individual panel data [41]. Further research is necessary to comprehend the underlying policies and mechanisms that could improve healthcare services for migrant laborers in China.

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