Impact of Long Working Hours on Health in China

Haoyu Wang

University of Alberta

December 6th, 2024

Structure of Presentation

1. Motivation
2. Theory and Literature
3. Empirical Strategies
4. Results
5. Conclusions

Motivation

According to a report by the World Health Organization (WHO) and the International Labour Organization (ILO) in 2016, approximately 488 million people worldwide were engaged in long working hours, comprising 8.9% of the global population, and shockingly, long working hours contributed to 745,000 deaths from ischemic heart disease and stroke (Pega et al., 2021).

Motivation

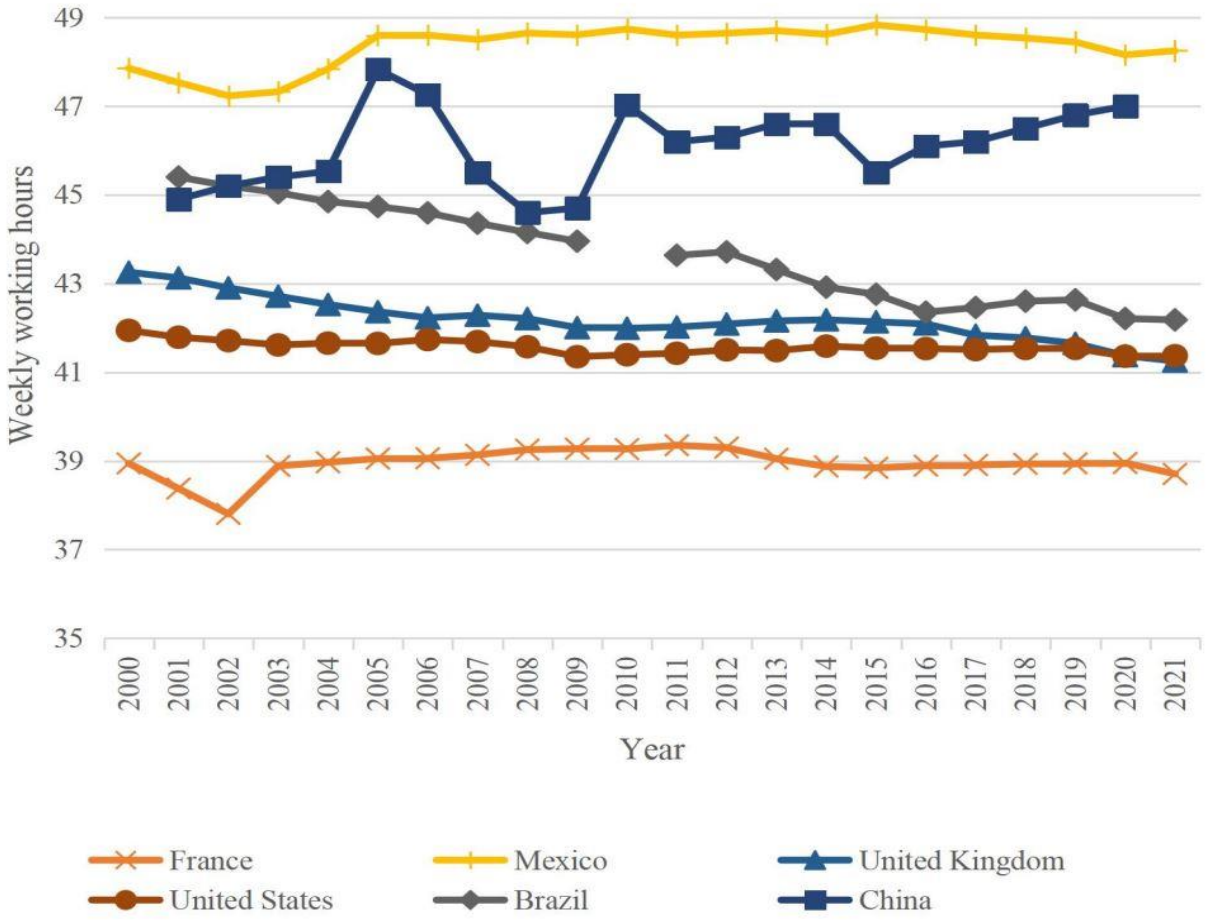


Figure 1 Average working hours in some countries of the world

Source: Data for China comes from the China Labor Statistics Yearbook, and data for other countries comes from the official website of the Organization for Economic Cooperation and Development (OECD).

Motivation

Table 1 Prevalence of chronic diseases in residents (‰)

Indicator		Total		
		2008	2018	Growth
	Total	157.4	342.9	118%
Gender	Male	142.1	336.1	137%
	Female	172.7	349.3	102%
Age	15～24	19.5	36.6	88%
	25～34	47	70.7	50%
	35～44	105.6	150.6	43%
	45～54	214.1	312.6	46%
	55～64	328.8	483.9	47%
	65 or above	467.8	623.3	33%
Category of diseases	Endocrine, nutritional and metabolic diseases	12.9	62.5	384%
	in which: diabetes	10.7	53.1	396%
	Circulation system	85.5	251	194%
	in which: heart disease	17.6	39	122%
	high blood pressure	54.9	181.4	230%
	cerebrovascular disease	9.7	22.9	136%
	Respiratory system	14.7	26.1	78%
	Digestive system	24.5	43.8	79%
	Urogenital system	9.3	16.3	75%
	Musculoskeletal connective tissue	31	58.6	89%
	in which: rheumatoid arthritis	10.2	11.6	14%

Source: China Health Statistics Yearbook

Motivation

Research Question:

How do long working hours affect workers' health outcomes in China?

Theory and Literature

The impact of working hours on workers' health

- Health demand model
  - Grossman (1972)
- Physical health
  - Chung and Kwon (2013), Sparks et al. (2021)
- Mental health
  - Haines et al.(2012), Afonso et al. (2017), Sato et al. (2020)
- Healthy worker effect
  - Sudden health problems or poor health conditions would cause workers to shorten the labor supply time (McMichael et al., 1976; Yang et al., 2006; Dinh et al., 2017)

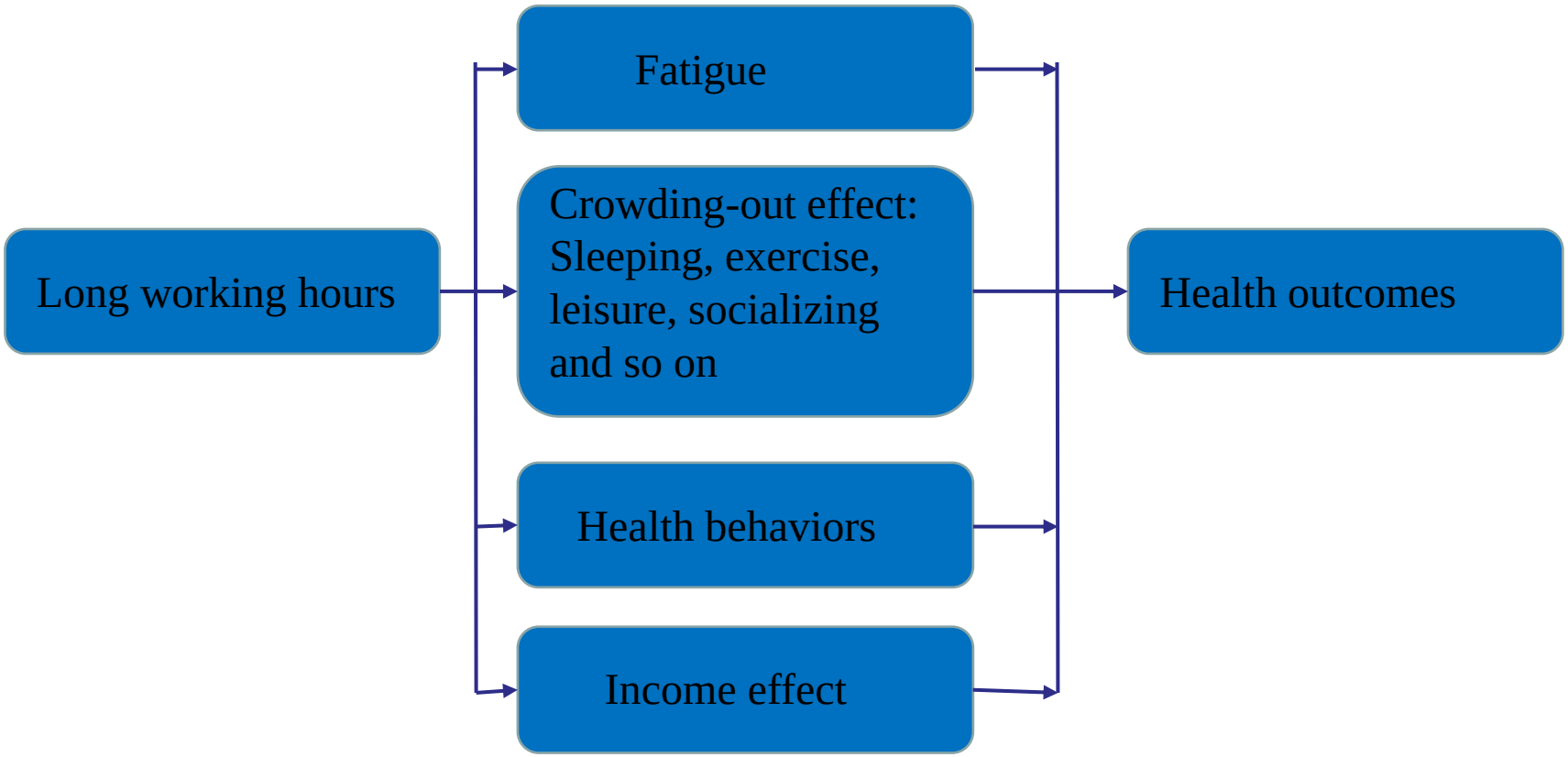
Theory and Literature

The heterogeneity of this impact among different groups of workers

- Women are more affected
  - Dinh et al. (2017), Ryu et al. (2018)
- Difference in occupations
  - Milner et al. (2015)
- Immigrant workers
  - W. Wu et al. (2019)

Theory and Literature

The channel and mechanism through which long working hours affect the health of workers



Theory and Literature

Research on long working hours and health in Chinese labor market

- Nie et al. (2015)
  - China Health and Nutrition Survey (CHNS): 1991-2009 waves
  - No evidence to support the impact
  - Reverse causality problem

- Chu (2021)
  - Chinese Family Panel Studies (CFPS): 2016 and 2018 waves
  - Instrumental variable methods
  - Negative effect, especially on male and high-educated group
  - Problems in samples
    - Gender distribution: Less than 30 percent of the samples were male
    - The absence of the wage and other relevant variables in CFPS 2016

Theory and Literature

Contributions

- 2018 data: Reflect the current labor market
- Instrumental variable method: Solve the problem of reverse causality
- Different groups
- The first study to explore mediating channels: Find the reason behind it

Empirical Strategies

Data

- Chinese Family Panel Studies (CFPS): 2018 wave
- Non-farm employed workers aged 18-65
- A total of 7,218 valid samples

Empirical Strategies

Variables selection

Table 2 Definition of variables

Variable	Definition
Working hours	Weekly working hours
LWH	Working hours dummy, 1 if weekly working hours are equal to or greater than 50, otherwise 0.
LWH2	Working hours dummy, 1 if weekly working hours are equal to or greater than 44, otherwise 0.
LWH3	Working hours dummy with considering commuting time, 1 if the total time are equal to or greater than 50, otherwise 0.
LWH4	Working hours groups, 1 if Working hours≤40, 2 if 40<Working hours≤ 50,3 if 50 <Working hours≤ 60,4 if Working hours>60.
IV_industry	Instrumental variable of WH, 1 if average working hours of industry are equal to or greater than 50, otherwise 0.
IV_occupation	Instrumental variable of WH, 1 if average working hours of this occupation type are equal to or greater than 50, otherwise 0.
Health	Self-rated health levels, 1=unhealthy, 2=fair, 3=relatively healthy, 4=healthy, 5=very healthy.
Health change	Self-rated health change, 1=worse, 3=no change, 5=better.
Unwell	1 if fell unwell in the past two weeks, otherwise 0.
Chronic	1 if had chronic diseases in the past six months, otherwise 0.
Gender	0 if male,1 if female.
Education	Education level, 1 low if junior secondary and below, 2 middle if senior secondary/technical school/vocational high school, 3 high if junior college and above.
Marriage	1 if married, otherwise 0.
Age	Age number.
Urban	1 if urban, 0 if rural.
Smoking	1 if smoking, 0 if non-smoking.
Drinking	1 if drinks three times a week or more in the past month, otherwise 0.
Insurance	1 if has health insurance, otherwise 0.
BMI	Body Mass Index, BMI=Weight(kg)÷Height(m)^2
Sleep	Sleeping hours in working days, 1 if sleep for 8 hours or more, otherwise 0.
Exercise	Exercising frequency, 1 if exercise at least once per week, otherwise 0.
Income	Log of annual personal income(CHY).

Empirical Strategies

Table 4 Mean of health indicators by cohorts

		Health	Working hours	Chronic	BMI	Sleeping hours	Exercise	Income
Gender	**Male**	3.3217	54.6208	0.0825	23.7376	7.4764	0.5120	10.5932
	Female	3.1995	50.2745	0.0933	22.1656	7.4657	0.4767	10.2591
Age	**18-35**	3.4726	52.5488	0.0504	22.3278	7.6386	0.4816	10.5194
	36-50	3.1272	53.4337	0.1006	23.6939	7.3651	0.4989	10.4729
	51-65	3.0389	52.4037	0.1572	23.9045	7.2490	0.5393	10.2514

Empirical Strategies

Part 1: Baseline model and IV model

- Baseline estimation: Order Probit Method (OPROBIT)

$$Health_i = \alpha_0 + \alpha_1 LWH_i + \alpha_2 X_i + \mu_i \qquad (7)$$

- IV estimation: Extended Regression Model (ERM)
  - IV_industry: 1 if average working hours of industry are equal to or greater than 50, otherwise 0.
  - IV_occupation: 1 if average working hours of this occupation type are equal to or greater than 50, otherwise 0.

Empirical Strategies

Average weekly working hours for different industries

Industry	Obs	IV_industry	Weekly working hours
Mining	86	1	54.7349
Manufacturing	2,158	1	55.9665
Production and supply of electricity, gas and water	147	0	48.0034
Construction	849	1	59.4723
Transportation, storage, post and telecommunication	432	1	54.1405
Information transmission, computer services and software	148	0	47.3514
Wholesale and retail	732	1	52.6398
Accommodation and catering	377	1	60.0592
Financial	205	0	41.8024
The real estate	203	0	49.6606
Rental and business services	200	0	48.6900
Scientific research, technical services and geological exploration	46	0	47.8044
Water conservancy, environment and public facilities management	110	0	48.7091
Residential services and other services	240	1	56.8833
Education	525	0	43.3514
Health and social security and social welfare	234	0	49.1303
Culture, sports and entertainment	95	0	47.8158
Public administration and social organization	431	0	42.8984

Average weekly working hours for different occupations

Occupation	Obs	IV_ occupation	Weekly working hours
Responsible persons of state organs, party and mass organizations, enterprises and institutions	463	0	49.6642
Professional technical personnel	1,211	0	45.3084
Clerical and related personnel	871	0	47.7115
Business and service personnel	1,757	1	53.0363
Production personnel in agriculture, forestry, animal husbandry, fishery and water conservancy	77	1	52.9870
Production and transportation equipment operators and related personnel	2,816	1	58.1434
military personnel	1	0	40.0000
No job holders	4	0	50.0000
Others	18	0	46.2222

Empirical Strategies

Part 2: Cohort heterogeneity by gender and age

- Male and female
- Aged 18-35, aged 36-50, and aged 51-65

Empirical Strategies

Part 3: Mediating effect test

- BMI, Sleep, Exercise, and Income
- Causal steps approach

$$Step\ 1: \quad Mediator_i = \beta_0 + \beta_1 LWH_i + \beta_2 X_i + \epsilon_i \tag{9}$$

$$Step\ 2: \quad Health_i = \alpha_0 + \alpha_1 LWH_i + \alpha_2 X_i + \mu_i \tag{7}$$

$$Step\ 3: \quad Health_i = \alpha_0' + \alpha_1' LWH_i + \alpha_m Mediator_i + \alpha_2' X_i + \mu_i' \tag{10}$$

Results

Part 1: Baseline model and IV model

Table 6 Impact of working hours on health: different time indicators

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
LWH	-0.0914***					-0.0902***					-0.234**
	(0.0262)					(0.0277)					(0.0914)
LWH2		-0.103***					-0.0995***				
		(0.0298)					(0.0305)				
LWH3			-0.114***					-0.113***			
			(0.0237)					(0.0238)			
LWH4B				-0.0897*					-0.0845*		
				(0.0498)					(0.0496)		
LWH4C				-0.109**					-0.107**		
				(0.0479)					(0.0489)		
LWH4D				-0.158***					-0.159***		
				(0.0272)					(0.0270)		
Working hours					-0.00278***					-0.00269***	
					(0.0007)					(0.0006)	
Gender	-0.128***	-0.128***	-0.131***	-0.130***	-0.129***	-0.112***	-0.111***	-0.114***	-0.113***	-0.112***	-0.128***
	(0.0414)	(0.0409)	(0.0414)	(0.0416)	(0.0418)	(0.0410)	(0.0408)	(0.0414)	(0.0415)	(0.0415)	(0.0413)
Education_Middle	-0.0459	-0.0417	-0.0446	-0.0507*	-0.0447	-0.0489*	-0.0449	-0.047	-0.0524*	-0.0478*	-0.0539*
	(0.0297)	(0.0301)	(0.0299)	(0.0294)	(0.0286)	(0.0289)	(0.0296)	(0.0293)	(0.0288)	(0.0284)	(0.0287)
Education_High	-0.103***	-0.0996***	-0.103***	-0.113***	-0.0980***	-0.117***	-0.113***	-0.116***	-0.124***	-0.113***	-0.124***
	(0.0296)	(0.0267)	(0.0276)	(0.0278)	(0.0278)	(0.0298)	(0.0276)	(0.0283)	(0.0288)	(0.0294)	(0.0257)
Marriage	0.00792	0.00923	0.0099	0.00836	0.00807	0.00705	0.00857	0.00934	0.00777	0.00722	0.00736
	(0.0387)	(0.0395)	(0.0394)	(0.0393)	(0.0386)	(0.0393)	(0.0400)	(0.0399)	(0.0398)	(0.0391)	(0.0387)
Age	-0.0220***	-0.0222***	-0.0222***	-0.0223***	-0.0221***	-0.0222***	-0.0223***	-0.0223***	-0.0224***	-0.0223***	-0.0222***
	(0.0014)	(0.0014)	(0.0014)	(0.0014)	(0.0014)	(0.0014)	(0.0014)	(0.0014)	(0.0014)	(0.0014)	(0.0014)
Urban	-0.0405	-0.0383	-0.0398	-0.0412	-0.0382	-0.0376	-0.0358	-0.0374	-0.0386	-0.0352	-0.0404
	(0.0360)	(0.0357)	(0.0361)	(0.0359)	(0.0356)	(0.0360)	(0.0357)	(0.0361)	(0.0357)	(0.0357)	(0.0360)
Smoking	0.0151	0.0162	0.0151	0.0148	0.015	0.0102	0.0115	0.0104	0.00993	0.0102	0.0156
	(0.0436)	(0.0433)	(0.0433)	(0.0438)	(0.0438)	(0.0437)	(0.0436)	(0.0436)	(0.0440)	(0.0440)	(0.0432)
Drinking	0.0973	0.0976	0.0985	0.0991	0.0969	0.0954	0.0959	0.0968	0.0971	0.0951	0.0982
	(0.0613)	(0.0617)	(0.0614)	(0.0612)	(0.0612)	(0.0621)	(0.0624)	(0.0622)	(0.0620)	(0.0619)	(0.0613)
Insurance	-0.107	-0.105	-0.106	-0.108	-0.107	-0.110*	-0.108*	-0.108*	-0.110*	-0.110*	-0.107
	(0.0675)	(0.0677)	(0.0678)	(0.0681)	(0.0682)	(0.0653)	(0.0654)	(0.0656)	(0.0659)	(0.0659)	(0.0671)
N	7218	7218	7218	7218	7218	7218	7218	7218	7218	7218	7218

Notes: Clustered standard errors are in parentheses; * p<0.1, ** p<0.05, *** p<0.01. The OPROBIT method is used. Province and workplace are controlled in all regressions, while in Columns (6)-(10), industry and occupation are also controlled.

Results

Part 2: Cohort heterogeneity by gender

Table 7 Impact of working hours on health among different gender cohorts

	Male		Female	
	(1)	(2)	(3)	(4)
LWH	-0.110***	-0.284**	-0.0618	-0.167
	(0.0284)	(0.1220)	(0.0519)	(0.1260)
Education_Middle	-0.0658	-0.0739*	-0.00868	-0.0162
	(0.0412)	(0.0394)	(0.0517)	(0.0569)
Education_High	-0.125***	-0.143***	-0.0716	-0.0921
	(0.0429)	(0.0433)	(0.0586)	(0.0662)
Marriage	0.0302	0.0293	-0.0429	-0.0431
	(0.0512)	(0.0512)	(0.0487)	(0.0487)
Age	-0.0206***	-0.0209***	-0.0250***	-0.0251***
	(0.0016)	(0.0017)	(0.0032)	(0.0032)
Urban	-0.0539	-0.0542	-0.00583	-0.00595
	(0.0400)	(0.0403)	(0.0568)	(0.0568)
Smoking	0.0214	0.0219	-0.365**	-0.357**
	(0.0405)	(0.0401)	(0.1610)	(0.1640)
Drinking	0.0883	0.0903	0.114	0.113
	(0.0618)	(0.0619)	(0.1710)	(0.1700)
Insurance	-0.0622	-0.0621	-0.167	-0.167
	(0.0568)	(0.0565)	(0.1080)	(0.1080)
N	4281	4281	2937	2937

Notes: Clustered standard errors are in parentheses; * p<0.1, ** p<0.05, *** p<0.01. For each group, the first column shows the OPROBIT results, and the second shows the ERM results. Province and workplace are controlled in all regressions.

Results

Part 2: Cohort heterogeneity by age

Table 8 Impact of working hours on health among different age cohorts

	18-35		36-50		51-65	
	(1)	(2)	(3)	(4)	(5)	(6)
LWH	-0.0982**	-0.362***	-0.132***	-0.221	0.0287	0.316
	(0.0466)	(0.1300)	(0.0451)	(0.1440)	(0.0828)	(0.2130)
Gender	-0.122*	-0.126**	-0.109*	-0.109*	-0.190**	-0.191**
	(0.0644)	(0.0635)	(0.0575)	(0.0572)	(0.0943)	(0.0924)
Education_Middle	-0.00538	-0.0176	-0.159***	-0.165***	0.02	0.0339
	(0.0443)	(0.0454)	(0.0503)	(0.0504)	(0.0601)	(0.0534)
Education_High	-0.0606	-0.0990**	-0.179***	-0.193***	-0.0872	-0.0643
	(0.0454)	(0.0455)	(0.0506)	(0.0535)	(0.1040)	(0.0914)
Marriage	0.0742	0.074	0.209***	0.208***	-0.116	-0.112
	(0.0612)	(0.0600)	(0.0762)	(0.0752)	(0.1110)	(0.1090)
Age	-0.0476***	-0.0475***	-0.0181***	-0.0182***	-0.00736	-0.00649
	(0.0055)	(0.0055)	(0.0047)	(0.0047)	(0.0089)	(0.0088)
Urban	-0.0425	-0.0443	0.0123	0.0123	-0.0111	-0.0132
	(0.0370)	(0.0371)	(0.0591)	(0.0590)	(0.0695)	(0.0689)
Smoking	0.0319	0.0319	0.0145	0.0156	-0.0219	-0.0227
	(0.0641)	(0.0633)	(0.0585)	(0.0581)	(0.0830)	(0.0831)
Drinking	0.0518	0.0565	0.0578	0.0573	0.210**	0.202**
	(0.0958)	(0.0948)	(0.0633)	(0.0630)	(0.0837)	(0.0846)
Insurance	0.0298	0.0304	-0.178	-0.178	-0.529***	-0.521***
	(0.0754)	(0.0737)	(0.1120)	(0.1120)	(0.1010)	(0.0961)
N	3335	3335	2674	2674	1209	1209

Notes: Clustered standard errors are in parentheses; * p<0.1, ** p<0.05, *** p<0.01. For each group, the first column shows the OPROBIT results, and the second shows the ERM results. Province and workplace are controlled in all regressions.

Results

Part 3: Mediating effect test

OPROBIT

Step 1:

$$BMI = \beta_0^1 - 0.228^{*} LWH + \beta_2^1 X$$

$$Sleep = \beta_0^2 - 0.198^{***} LWH + \beta_2^2 X$$

$$Exercise = \beta_0^3 - 0.279^{***} LWH + \beta_2^3 X$$

$$Income = \beta_0^4 + 0.057^{**} LWH + \beta_2^4 X$$

Step 2:

$$Health = \alpha_0 - 0.091^{***} LWH + \alpha_2 X$$

Step 3:

$$Health = \alpha_0^1 - 0.094^{***} LWH - 0.011^{*} BMI + \alpha_2^1 X$$

$$Health = \alpha_0^2 - 0.081^{***} LWH + 0.137^{***} Sleep + \alpha_2^2 X$$

$$Health = \alpha_0^3 - 0.078^{***} LWH + 0.130^{***} Exercise + \alpha_2^3 X$$

$$Health = \alpha_0^4 - 0.095^{***} LWH + 0.055^{***} Income + \alpha_2^4 X$$

ERM

$$BMI = \beta_0^1 - 0.379 LWH + \beta_2^1 X$$

$$Sleep = \beta_0^2 + 0.100 LWH + \beta_2^2 X$$

$$Exercise = \beta_0^3 - 0.760^{***} LWH + \beta_2^3 X$$

$$Income = \beta_0^4 - 0.061 LWH + \beta_2^4 X$$

$$Health = \alpha_0 - 0.234^{**} LWH + \alpha_2 X$$

$$Health = \alpha_0^1 - 0.238^{***} LWH - 0.011^{*} BMI + \alpha_2^1 X$$

$$Health = \alpha_0^2 - 0.238^{***} LWH + 0.138^{***} Sleep + \alpha_2^2 X$$

$$Health = \alpha_0^3 - 0.197^{**} LWH + 0.127^{***} Exercise + \alpha_2^3 X$$

$$Health = \alpha_0^4 - 0.231^{**} LWH + 0.054^{***} Income + \alpha_2^4 X$$

Conclusions

Summary

- Long working hours have a negative effect on health.
  - Different from Nie (2015), larger coefficient than Chu (2021)
- More significant for males and young and middle-aged groups.
- The impact of the four mediating indicators on health are all significant, but exercise is a significant mediator, and this effect is more significant in men and young people.