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Original Article

Empowering the Aging Workforce: The Impact of Medical Insurance on Labor Decisions in Rural China

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Abstract

Background: Understanding how enhanced medical insurance benefits influence labor decisions of rural elderly individuals is crucial for addressing the challenges posed by population aging on labor market. This study investigated the effects of enhanced welfare levels resulting from medical insurance integration on labor decisions of rural elderly individuals. The objective was to offer policy recommendations to the government to mitigate the decline in the working-age population and sustain the momentum and vibrancy of economic and social development.

Methods: This study conducted an empirical analysis, utilizing two waves of data from the China Health and Retirement Longitudinal Study (CHARLS) collected in 2015 and 2018. This analysis employed the Difference-in-Differences (DID) approach, treating the enhancement of medical insurance benefits for rural residents, due to China's medical insurance integration as a quasi-natural experiment.

Results: Enhancing medical insurance benefits increased the labor supply of older rural individuals, as evidenced by higher labor participation rates and increased hours of work. It also facilitates migrant work while decreasing the willingness to work indefinitely. Medical insurance benefits indirectly influence labor decisions by alleviating healthcare burdens and improving the health status. Notably, the effect is more pronounced among females, higher-income groups, and individuals with poorer health status.

Conclusion: The enhancement of medical insurance benefits resulting from China's medical insurance integration increased the social labor supply and reduced the necessity for elderly individuals to continue working indefinitely. The integration provides disadvantaged groups with improved social security, thereby allowing them to enjoy their later years more fully.

Keywords: Medical insurance; Labor supply; Labor migration; Elderly people; Rural China

Introduction

Population ageing constitutes a widespread global challenge. Among 194 countries and regions, 106 are facing the issue of an aging society (1). As the country with the largest elderly population, China reported 297 million individuals aged 60 and above as of 2023. Notably, this percentage rose to 23.81% in rural areas, surpassing that of urban regions by 7.99% points (2). Ageing is a major

factor contributing to increased social burdens and labor shortages (3). The number of working-age individuals in China has been declining since 2012. To align with demographic trends and optimize human resource utilization, the Standing Committee of the National People's Congress (NPC) decided in Sep 2024 to gradually postpone the statutory retirement age (4). Due to the inadequacy in China's rural social security system, older adults often continue to work under financial pressure, demonstrating a willingness to work indefinitely (5). Such overwork is detrimental to the personal welfare of rural older individuals, increases societal burdens, and disrupts maintaining a balance between supply and demand in the labor market (6). Therefore, in the context of aging, it is essential to prevent overwork among the rural elderly while simultaneously providing them with employment opportunities. Resolving this contradiction necessitates enhancing the quality of life and economic security for individuals residing in rural areas, and fortifying the social security system within these communities (7).

The medical insurance system is a critical social security system for alleviating healthcare costs and promoting social equity (8). China's New Rural Cooperative Medical Scheme (NRCMS) for the rural population was officially launched in 2003. Although it has provided some protection for rural residents' healthcare needs, the system faces challenges, including low insurance coverage and limited benefits portability. To address these issues, China merged the basic medical insurance systems for urban residents (URBMI) and the NRCMS in 2016. This merger established a unified Urban and Rural Resident Medical Insurance (URRMI), ensuring equal treatment for all. Compared to the NRCMS, the URRMI has several distinctive characteristics. First, insurance benefits have been enhanced. URRMI benefits are structured according to the following principles: benefits are based on the higher of the two, premiums on the lower, and coverage on the broader of the two. Second, the URRMI allows individuals to access medical services within the city without restrictions. In addition, well-resourced regions can implement provincial integration to enhance the portability of health insurance benefits (9). The integration has significantly enhanced the welfare of rural residents (10). For instance, the increase in the medical reimbursement rate has effectively alleviated the financial burden of healthcare (11), while the expansion of resources available for medical services has encouraged individuals to seek medical care (12). Consequently, the overall health of the population has improved (10), particularly among vulnerable groups, such as the elderly in rural areas (13).

Enhancing health human capital can increase labor supply (14-16). Shen et al. (17) employed the DID approach to analyse the effects of NRCMS on labor supply. The results indicate that the NRCMS positively influenced agricultural labor supply, while reducing the probability of unemployment due to sickness. Following the integration of NRCMS and URBMI into URRMI, several scholars have assessed the impact of the URRMI from different dimensions, including health improvement, increased utilization of healthcare services, and enhanced social integration and participation(18). For instance, Zhou et al.(19) used the MPDMS data to investigate the effect of URRMI on labor decisions of migrant workers. The findings reveal that URRBMI increased the labor force participation and improved labor quality. Similarly, Deng R. (20), focusing on healthcare accessibility for migrant workers, found that those enrolled in the URRMI had a significant reduction in their weekly working hours.

While existing studies have explored the effects of medical insurance integration (MII), research on its impact on rural vulnerability remains limited, particularly in China, where the rural population is significant and the issue of ageing is pronounced. Further investigation into the effects of the integration on these groups remains essential. This study examined medical insurance integration and its impact on the labor decisions of rural older adults. The innovation is reflected in three key aspects: first, it focuses on the vulnerable group of rural elderly individuals; second, it addresses the issue of older adults' willingness to

work indefinitely; and third, it further investigates the labor migration patterns of rural elderly adults.

Materials and Methods

Data source

The study utilizes the data from 2015 and 2018 waves of the China Health and Retirement Longitudinal Study (CHARLS). To accurately isolate the intensive marginal effects of MII, the analysis focused on elderly individuals aged 60 and above who participated in both 2015 and 2018. This study retained a sample of individuals who participated in the NRCMS in 2015 and either continued with the NRCMS or enrolled in the URRBMI in 2018. Participants enrolled in Urban Employee Medical Insurance (UEMI), non-local insurance, commercial health insurance and those without identifiable insurance were excluded.

Variables

Dependent variable

Previous research has typically measured labor decisions along two dimensions: labor supply(21) and labor location choice(22). This study used *Participation*, *Working Time*, and *Willingness to Work Indefinitely* as indicators of labor supply, while *Migrant Work* served as an indicator of labor location choice.

Participation and Working Time: The questionnaire investigated the sample on hours spent in self-employment, employment, and home-based businesses over the past year. We aggregated the hours worked across all categories and calculated the total average weekly hours. Individuals who work more than zero hours are classified as active participants and were coded as *Participation* =1; otherwise, they were coded as 0.

Willingness to Work Indefinitely. Select the question in the questionnaire: "At what age do you intend to stop working, engaging in money-earning activities, or physically labor?" In this study, samples reporting an age of 80 or older, or indicating an intention to work indefinitely, were coded as *Willingness to Work Indefinitely* = 1; otherwise, they were coded as 0.

Migrant Work. Select the question in the questionnaire: "Where do you work most of the time?" Responses indicating a location outside the respondent's village of residence, were coded as *Migrant Work* =1; otherwise, they were coded as 0.

Independent variables

The integration of medical insurance (MII). MII is defined as the cross product of the group variable and the time variable. Group variable: Samples enrolled in NRCMS in 2015 and URRBMI in 2018 were "treatment group", coded as *treat* = 1. Samples enrolled in the NRCMS in both 2015 and 2018 were "control group", coded as *treat* = 0. Time variable was defined such that 2018 was coded as 1, while all other years were coded as 0.

Covariates

This study selected covariates across four dimensions (23). Personal characteristics include gender, age, marital status, income, education and number of children. Personal health behaviours encompass smoking, exercise, and drinking. Health status is measured through self-assessed health (the values range from 0 to 1, with higher scores reflecting better health status). The quality of healthcare services is assessed based on satisfaction with the treatment provided by the facility.

Research model

This study employed the Difference-in-Differences (DID) method (24) to systematically analyze the impact of MII on labor decisions. The model is as follows:

$$Y_{it} = \beta_0 + \beta_1 MII_{it} + \beta_2 Treat_i + \beta_3 Time_t + \delta X_{it} + \epsilon_{it} \quad (1)$$

$$MII_{it} = Treat_i \times Time_t \quad (2)$$

In the equation, subscript "i" denotes the individual, "t" represents the time. Y_{it} denotes the labor decisions of individual "i" in period "t". MII_{it} is the core independent variable. The coefficient "β_1" indicates the extent to which the increase in benefits for rural elderly individuals,

following integration, influences their labor decisions. $Treat_i$ is the group dummy variable, $Time_t$ is time dummy variable, and the criteria for its value are described in the independent variables section. ϵ_{it} represents the error term.

Results

Description of variables

Table 1 summarizes the characteristics of the variables for each sample group. The overall labor participation rate is 62.5%, with an average of 14.25 hours worked per week, a 32.4% willingness to engage in continuous labor, and a 23.6% rate of participation in labor migration. Notably, there are significant differences across all dependent variables between the control and the treatment groups, with treatment group showing a significantly higher labor supply and a greater likelihood of working outside the home compared to the control group.

Table 1: Descriptive statistics of the variables

Variables	N	Mean			Treatment - Control
		Full sample	Control	Treatment	
Participation	9206	0.625	0.621	0.643	0.022* (-0.331)
Working Time	9206	14.253	14.050	15.320	1.27** (-2.131)
Willingness to Work Indefinitely	1440	0.324	0.314	0.364	0.05** (-2.44)
Migrant Work	1280	0.236	0.237	0.251	0.014* (0.24)
Gender **(female = 1, male = 0)**	9206	0.521	0.5189	0.5348	0.0159 (-1.105)
Age	9206	69.522	69.55	69.34	-0.210 (1.069)
Marital Status **(married = 1, unmarried = 0)**	9206	0.772	0.768	0.791	0.023* (-1.87)
Income	9206	3.148	6.512	6.736	0.224** (-2.478)
Education	9206	3.753	2.654	2.545	-0.109 (1.009)
Number of Children	9206	3.698	3.742	3.464	-0.278*** (5.497)
Smoking **(smoking = 1, non-smoking = 0)**	9206	0.446	0.282	0.237	-0.045*** (3.468)
Exercise **(exercise = 1, no exercise = 0)**	9206	0.301	0.902	0.884	-0.018** (2.07)
Drinking **(Drinking = 1, non-drinking = 0)**	9206	0.313	0.314	0.310	-0.004 (0.293)
Quality of healthcare services	9206	1.139	2.582	2.442	-0.14*** (4.197)
Self-Assessment Health	9206	0.560	0.556	0.579	0.023*** (-3.705)
Medical Burden	9206	0.451	0.454	0.435	-0.019** (2.332)

Note: *, **, *** indicate significance at 10%, 5%, and 1% levels, respectively. Values in parentheses are *t*-Values

Baseline results

The results and marginal effects are presented in Table 2. The labor decision-making indicators in models (i), (iii), and (iv) are binary variables; therefore, probit regressions are employed. Ordinary least squares (OLS) regressions are employed in model (ii). The *MII* coefficients captured the impact of MII on labor decisions, *treat* specified as a group dummy and *time* as a period dummy variable (Table 3).

Table 2: The results for MII on labor decisions

Variables	(i)	(ii)	(iii)	(iv)
	Participation	Working Time	Willingness to Work Indefinitely	Migrant Work
MII	0.145*	2.859**	-0.442**	0.447**
	(0.088)	(1.143)	(0.253)	(0.101)
Treat	-0.036	-1.051	0.080	-0.276
	(0.0744)	(0.997)	(0.1475)	(0.1841)
Time	0.127***	0.554	-2.316***	0.010
	(0.0398)	(0.492)	(0.0752)	(0.0496)
Marginal Effect	0.0407*		-0.0854**	0.1275**
	(0.0178)		(0.0420)	(0.0310)
Regional Fixed Effects	YES	YES	YES	YES
N	9206	9206	1440	1280
Adjust R^2	0.2455	0.2094	0.4189	0.1686

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

Table 3: Mechanisms of MII on labor decision

Result Ⅰ	Burden	Health	Participation
MII	-0.0273** (0.0152)	0.0057 (0.0092)	0.0378** (0.0197)
Burden		-0.0968*** (0.0053)	-0.0207** (0.0111)
Health			0.2125*** (0.0182)
Result Ⅱ	Burden	Health	Working Time
MII	-0.0273** (0.0152)	0.0057 (0.0092)	2.3390** (1.0163)
Burden		-0.0968*** (0.0051)	-1.5285*** (0.5910)
Health			8.3881*** (0.9381)
Result Ⅲ	Burden	Health	Willingness to Work Indef-
MII	-0.0290**	0.0067	-0.0577*
Burden		-0.0985***	-0.0469**
Health			0.0186
Result Ⅳ	Burden	Health	Migrant Work
MII	-0.0286*	0.0064	0.0644*
Burden		-0.0924***	-0.0556***
Health			0.0904*

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

Enhancing medical insurance benefits raises their participation rate log odds by 0.145, and extends their working time by 2.859 hours, underscoring the positive impact of MII on labor supply of rural elderly individuals. It also diminishes the willingness to work indefinitely by lowering the log odds by 0.442. Simultaneously, it encourages migrant work by increasing the log odds by 0.447.

Robustness checks

The condition for correctly identifying of causal effects by the DID method is that the sample data satisfy the parallel trends assumption (25). By testing whether the regression coefficients are significantly different from zero before and after policy implementation, the validity of the pre-existing parallel trends assumption can be assessed, thereby verifying the robustness of the regression results. The blue dotted line in Fig. 1 represents the 95% confidence interval. Prior to Medicare integration (in 2011 and 2013), the confidence intervals all include zero, indicating that the coefficients are not significant. However, following Medicare integration in 2018, the coefficients become significant, suggesting that pre-existing parallel trends assumption is satisfied.

We also conducted a series of robustness tests to verify robustness of the results, including the PSM-DID method and a placebo test. The outcomes from both methods were consistent with the baseline regression findings. Detailed results can be found in the Supplementary Material.

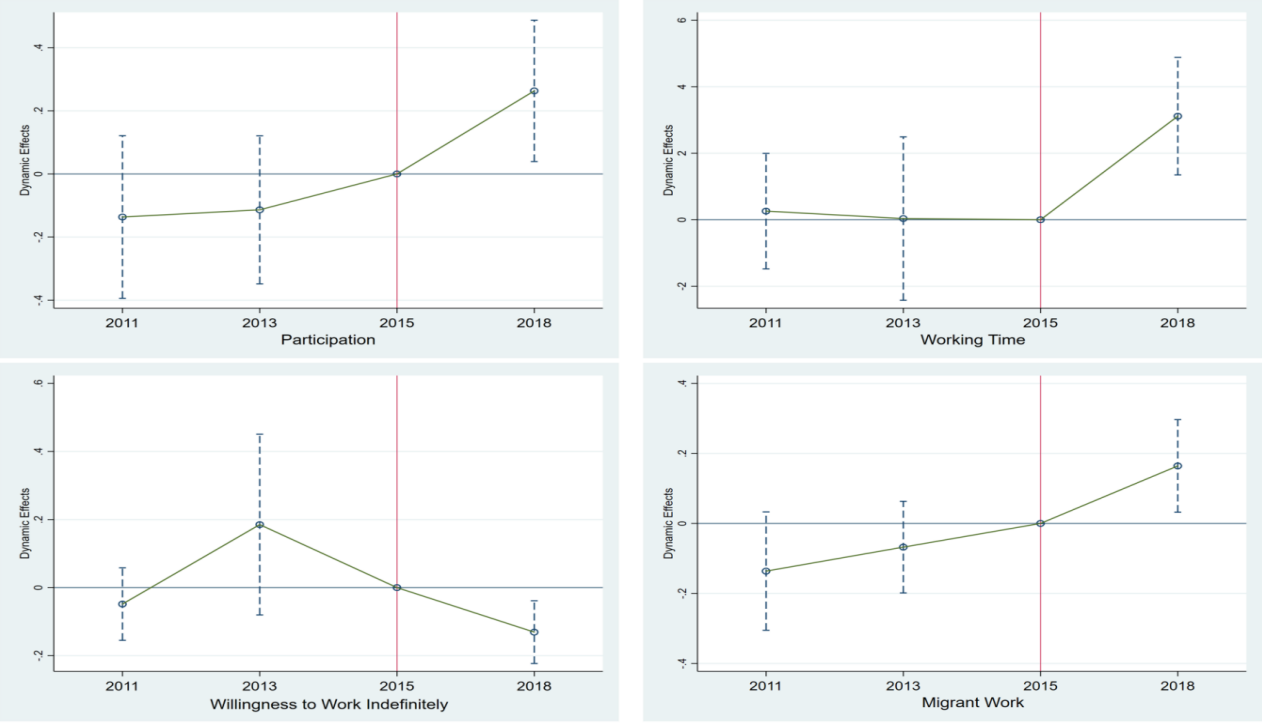

Fig. 1: Parallel trends test

Mechanism analysis

Based on previous theoretical analyses and the literature review, the integration of medical insurance significantly impacts residents' welfare, which may, in turn, influence their health status and labor decisions. To verify the theoretical analyses and hypotheses in the previous section, we selected *medical burden* (the ratio of annual healthcare consumption to total annual consumption) and *self-assessed health* as intermediate variables for analysis.

The influence mechanism is illustrated in Fig. 2. The blue path represents the direct effect of increased medical insurance benefits on labor decisions. There are three indirect paths: (i) increased medical insurance benefits influence labor decisions by alleviating the medical burden; (ii) they affect health by reducing medical burdens, which in turn impacts labor decisions; (iii) they affect labor decisions through changes in health.

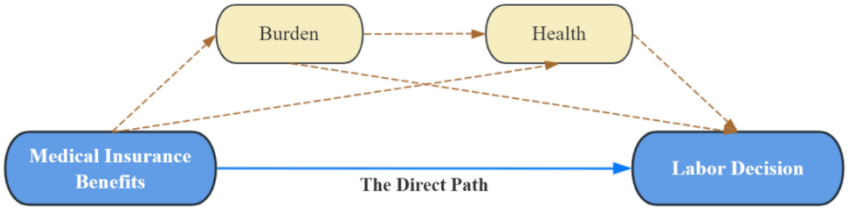

Fig. 2: The pathways of increased medical insurance benefits on labor decision

Table 3 indicates that increased medical insurance benefits significantly alleviate the medical burden on rural elderly adults. This reduction in the burden, on one hand, increases the demand for leisure, resulting in decreased working hours. On the other hand, it enhances health status, thereby increasing labor supply. Additionally, a lower medical burden relieves financial pressure on rural elderly individuals, significantly diminishing their willingness for endless labor, despite the fact that improved health status might encourage such work. Furthermore, higher medical insurance benefits make elderly individuals more inclined to pursue labor migration by alleviating medical burdens and enhancing health.

Heterogeneity analysis

To analyze the differences in the effects of the medical insurance benefits on the labor decision-making of rural elderly with different characteristics, we categorized the individuals based on gender, income, and health status (Table 4).

Table 4: The result of heterogeneity analysis

Groups	N	Participation	Working Time	Willingness to Work Indefinitely	Migrant Work
Panel A: Gender Group Regression					
Male	4800	0.1525 (0.1201)	1.9081 (1.4678)	-1.9415** (0.9195)	0.5594 (0.4243)
Female	4406	0.1913 (0.1347)	4.0307** (1.8478)	0.1799 (0.4700)	0.3943 (0.1530)
Panel B: Income Group Regression					
High-Income	4599	0.4026*** (0.1341)	5.7085*** (1.8414)	-0.5657** (0.2961)	0.7685* (0.4614)
Low-Income	4607	-0.3310** (0.1485)	-2.9660** (1.5431)	-0.4185 (0.5489)	0.6343** (0.3136)
Panel C: Health Status Group Regression					
High-Health	5951	-0.1342 (0.1074)	-0.9696 (2.0742)	-0.4079 (0.1431)	0.6380*** (0.2392)
Low-Health	3255	0.0711 (0.1795)	4.1084*** (1.4807)	-0.7039 (0.2775)	-0.6632 (1.0104)

Notes: Values in the first row of the table are regression coefficients. *, **, *** indicate significance at 10%, 5%, and 1% levels, respectively. Values in parentheses are standard errors.

The criteria for grouping income, and health levels are as follows: individuals with values equal to or greater than the sample median are classified into the high group, otherwise it is classified in the low group

Panel A shows that the impact of MII on women's working time is more pronounced. Following an increase in medical insurance benefits, which provide them with greater protection and resources, women significantly increase their working time and exhibit a higher tendency to engage in continuous labor.

Panel B shows that MII has a more significant effect on the labor supply among higher-income groups. After the integration, this group benefits from improved healthcare coverage, leading to significant increases in both labor participation rate and working time, as well as a higher likelihood of working outside the home. However, their higher incomes generally lead them to avoid engaging in continuous labor.

Panel C shows that MII significantly influences the labor supply among the poorer health group. Integration increases access to health care for low-health groups, resulting in increased working time. Healthier individuals tend to seek employment outside the home, as they have access to a wider array of job opportunities facilitated by improvements in medical care.

Discussion

This study provides valuable insights into the impact of medical insurance benefits resulting from MII on labor decision-making in rural China. The increase in medical insurance benefits impacts labor supply through two primary mechanisms: economic and health (26). Enhanced medical insurance benefits increased the labor supply among rural elderly individuals, while reducing their willingness to work indefinitely. This is because the health effect of improved benefits outweighs the income effect, leading to increased labor supply (8, 10). Conversely, the income effect prevails, resulting in decreased willingness to work indefinitely (27). The results are consistent with the initial hypothesis that older adults want to increase their labor supply, while also highlighting the need to prevent excessive labor in this demographic. The findings offer valuable insights for reforming current health insurance policies. In the future, reform measures should focus on increasing the reimbursement rates and the ceiling, reducing the deductible threshold. Additionally, emphasis should be placed on advancing the unified planning of outpatient services, expanding the coverage of the chronic disease, and accelerating the shift from disease-based to cost-based medical reimbursement.

Reforms must also enhance the standards of pooling insurance benefits (28). Currently, NRCMS benefits are limited to the local area of enrollment. In contrast, URRBMI offers enhanced portability and flexibility, allowing rural residents to access to out-of-region medical services and broader reimbursement coverage (11, 13). Consequently, the medical insurance benefits available to rural laborers working in different regions are increasingly comparable to those of locally employed individuals, thereby promoting labor mobility and balancing labor supply and demand. To fully develop and utilize rural human resources, reforms should prioritize improving medical insurance pooling and implementing provincial or nationwide insurance pooling. The aforementioned reform measures have contributed to reducing the social security gap for the rural population and have enhanced their overall welfare.

The effects of increased medical insurance benefits vary significantly among different populations (29), with more pronounced impacts on labor decisions observed in lower-health groups and among women. Rural low-health elderly and women are a more vulnerable group with a high medical burden and an urgent need for healthcare services (30). Improving medical insurance benefits will alleviate the medical burden, enhance access to high-quality healthcare resources, and help reduce inequalities arising from health status differences (31). This enhancement will increase labor opportunities and facilitate mobility for vulnerable groups, contributing to a fairer society.

Therefore, in reforming the medical insurance system, China should prioritize the protection of vulnerable populations, such as the elderly and rural women. Establishing a welfare-oriented medical insurance system tailored to these groups and incorporating the costs of health guidance and chronic disease screening into the coverage provided by the medical insurance fund is essential.

While this study offers valuable insights into empowering the ageing workforce, it has some limitations. First, the indicators utilized, such as self-reported health status and working time, may be prone to reporting bias. Future research could enhance the robustness of findings by integrating data from comparable databases. Additionally, this study does not sufficiently account for the role of informal employment. In rural China, many older adults engage in informal labor, and the participation rates may not be accurately captured, potentially underestimating the overall labor force participation.

Conclusion

The increase in medical insurance benefits resulting from MII significantly enhanced participation, working time, and migrant work among rural elderly individuals, while simultaneously reducing their willingness to work indefinitely. This enhancement directly influenced labor decisions by alleviating the medical burden and indirectly by improving health conditions. The impact was particularly pronounced among individuals in poorer health and women.

Journalism Ethics considerations

Ethical issues (Including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc.) have been completely observed by the authors.

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Conflict of interest

The authors declare that there is no conflict of interests.

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