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Medical Insurance Benefits and Labor Decisions of Middle-Aged and Elderly People: Evidence from Rural China

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Abstract: Studying the influence of expanded medical insurance coverage on the labor decisions of rural middle-aged and elderly individuals is advantageous in addressing the consequences of population aging on the labor market. This study utilizes the China Health and Retirement Longitudinal Study (CHARLS) from 2015 and 2018, employs the Difference-in-Differences (DID) approach to empirically investigate the effect of improved medical insurance benefits on the labor decisions of rural middle-aged and elderly individuals. The findings suggest that the increase in medical insurance benefits significantly raises the labor participation rate, labor force participation time, and labor migration among rural middle-aged and elderly individuals, while reducing their willingness for endless labor. Further analysis reveals that the increase of medical insurance benefits directly affects labor decisions by reducing the burden of medical expenses and indirectly influences labor decisions by affecting health conditions. The impact of increased medical insurance benefits on labor supply is more pronounced for the elderly and women compared to middle-aged individuals and men. Based on these findings, this study suggests the continuous improvement of medical insurance benefits for rural residents, the expansion of the scope of medical insurance coverage, and the gradual relaxation of participation restrictions in the medical insurance program.

Keywords: medical insurance; rural; middle-aged and elderly people; labor supply; labor migration

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1. Introduction

Population aging is a significant challenge facing human society in the 21st century. As of 2021, the global population aged 65 and above accounts for 10% of the total population. Among 194 countries and regions worldwide with available statistical data, 106 are experiencing an aging society (World Bank Group, n.d.). China, with the world's largest elderly population, had a rural elderly population proportion of 49.04% by 2020. Population aging is widely observed due to its large scale, rapid pace, and distinct regional disparities (Zhou et al., 2023). The challenges posed by aging are multifaceted, primarily leading to an increase in social burdens and labor shortages (Yang et al., 2022; Huang et al., 2019). Meanwhile, due to the imperfect social security system in rural China, elderly individuals in rural areas often persist in labor due to economic conditions, resulting in a significant "willingness for endless labor"(Xue & Li, 2022; Kobayashi et al., 2024). This excessive labor, whether viewed from the perspective of increasing welfare for rural elderly individuals, reducing social burdens, or maintaining a balance between labor market supply and demand, is undoubtedly unsustainable (Nahid et al., 2023). Therefore, on one hand, there is a desire to increase labor supply among rural middle-aged and elderly individuals. On the other hand, it is essential to prevent the exacerbation of excessive labor among this demographic. Resolving this "paradox" requires China to gradually improve its rural social security system. A robust social security system allows those capable of working to do so while providing retirement security for those unsuitable for labor (George & Wilding, 1984; Deng et al., 2022).

In China, the New Rural Cooperative Medical Scheme (NRCMS), which targets rural farmers, was officially launched in 2003. However, it still faced issues such as a low level of medical insurance benefits and low portability of medical insurance rights. In January 2016, the State Council issued "Opinions on the Integration of Basic Medical Insurance Systems for Urban and Rural Residents," which unified the medical insurance benefits for urban and rural residents, establishing Urban and Rural Resident Medical Insurance (URRMI) (Figure 1). In comparison to the NRCMS, the URRMI possesses the following characteristics: Firstly, the integration of urban and rural medical insurance follows the principle of "higher benefits, lower premiums, and broader coverage."

This results in an increase in the level of medical insurance benefits and a reduction in the proportion of medical expenses borne by individuals. For example, concerning the hospital reimbursement rate, which experienced the most significant change, rural residents initially enjoyed under the NRCMS, where the hospitalization reimbursement rate was 56.6%, this rate increased to 69.3% after the implementation of the URRMI. Secondly, the NRCMS was originally organized at the county level, meaning that individuals could be reimbursed for medical expenses within their county, but if they sought medical care outside the county, they needed to follow specific procedures for approval and reimbursement rates were limited. In contrast, the URRMI operates at the city level, and individuals seeking medical care within the city face no restrictions. Furthermore, it encourages areas with the necessary conditions to implement provincial-level integration, thereby increasing the portability of medical insurance rights (Wang et al., 2019; Ren et al., 2022; Lin et al., 2024).

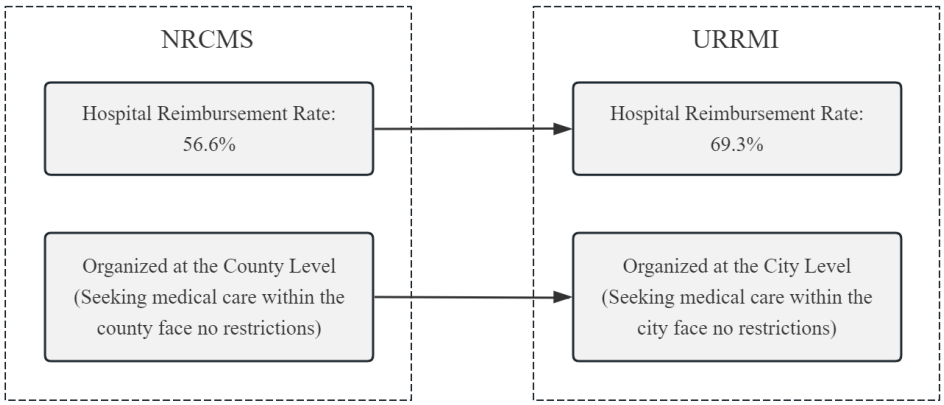

Figure 1. Changes in medical insurance benefits in rural China.

In the literature related to the impact of health human capital on labor market performance, numerous studies indicate that improving health human capital can promote labor force participation and reduce labor force exit (Bradley et al., 2013; Currie & Madrian, 1999; Bradley et al., 2007; Royalty & Abraham, 2005; Chłoń-Domińczak et al., 2024; Lu & Wu, 2023). Scholars have conducted extensive research on public health insurance in China. Shen et al. (2017) employed the Difference-in-Differences (DID) method to estimate the impact of the New Rural Cooperative Medical Scheme (NRCMS) on labor supply outcomes. The NRCMS had a positive influence on agricultural working hours and non-agricultural labor force participation rates, while reducing the likelihood of being unable to work due to illness and taking sick leave. After the integration of the NRCMS and the Urban Resident Basic Medical Insurance (URBMI) into the URRMI, a few scholars have evaluated the policy effects of the URRMI from the perspectives of improving health, increasing healthcare service utilization, promoting social integration, and social participation (Huang & Wu, 2020; Qin et al., 2021). For example, Zhou et al. (2023), based on 2018 data from the Dynamic Monitoring Survey of Migrant Populations, analyzed the impact of the URRMI on the labor supply of migrant workers. The study found that this medical insurance significantly enhanced the labor force participation rate of migrant workers and improved the quality of labor supply. Rui (2019), starting from the perspective of the accessibility of healthcare for migrant workers, found that migrant workers who participated in the URRMI reduced their weekly working hours by 8.45% compared to those who did not participate, leading to a significant reduction in overtime work among migrant workers.

From the existing research, empirical studies on the policy effects of medical insurance integration, especially regarding its impact on vulnerable rural populations, are relatively limited. Given this, this study takes the integration of urban and rural medical insurance as a point of entry to investigate the impact of increased medical insurance benefits on the labor decisions of rural middle-aged and elderly individuals. The innovation and practical value of this study, compared to previous research, lies in several aspects: First, it focuses on the impact of increased medical insurance benefits on the labor decisions of rural middle-aged and elderly individuals. Previous studies primarily focused on the establishment of medical insurance in rural China, and whether the improvement of medical insurance benefits would have a more profound impact on labor decisions has not been extensively explored. In China, most people already have basic medical insurance coverage. Hence, the impact of increased medical insurance benefits on labor decisions, in comparison to the mere possession of insurance, is a topic that warrants long-term research in the future. Second, the study addresses the issue of the "willingness for endless labor" among rural middle-aged and elderly individuals. Compared to the commonly studied labor hours in labor economics,

the notion of a willingness for endless labor is a more intriguing topic. This is particularly relevant in rural China, where residents have relatively low incomes and are compelled to engage in labor throughout their lives until they are physically unable to work. This situation has negative implications for the well-being of the elderly. Third, the study further examines the situation of rural middle-aged and elderly individuals engaging in labor migration. While urbanization in China is progressing rapidly, there remains a surplus of agricultural labor. How to facilitate the transition of surplus rural labor and study the impact of increased medical insurance benefits, especially the portability of such insurance, is a topic of significant practical importance.

2. Theoretical Analysis

2.1. Impact of Increased Medical Insurance Benefits on Labor Supply

In this paper, drawing upon the household production decision model, we elucidate the labor supply function through an optimization process, which determines the allocation of labor and leisure time, considering the constraints encountered by the household. It is assumed that the household utility function of a farmer has the following form:

$$U\ (T_O,\ T_L,\ Y) = 1, \tag{1}$$

In the above model, T_O denotes the time spent by individuals on working; T_L denotes the time spent by individuals on leisure consumption; Y denotes consumption of goods. Farmers face the following constraints on time and income budget:

$$T = T_O + T_L \tag{2}$$

$$P_Y Y = T_O\ W_O + V \tag{3}$$

In Equation (2), we delineated the temporal constraint faced by the farm household: T denotes the household's total time endowment, partitioned into the household's working time T_O and leisure consumption time T_L. Notably, T_L is influenced by its healthy capital stock H. Equation (3) is the household's income budget constraint, which indicates that the total household consumption expenditure is equal to the disposable income. This income specifically includes labor income and other non-labor income. P_Y denotes the market price of Y. W_O denotes the market wage rate for labor. V is the household's other non-labor income, such as government subsidies, contributions from friends and relatives.

Based on the household utility function of equation (1), incorporated the constraints detailed in Equations (2) and (3), the optimal Lagrangian function can be derived as follows:

$$Z = U(T_O, T_L, Y) + \lambda_1\ (T - T_O - T_L) + \lambda_2 [T_O\ W_O + V - P_Y Y] \tag{4}$$

The optimal solution for the labor supply is as follows:

$$T_O^* = T_O^* [W_O\ (H),\ T_L(H)] \tag{5}$$

According to Grossman's (1972) health demand theory, increased health investments, such as the medical service utilization, will enhance health capital stock and an improve health status. Moreover, the degree of medical service utilization is closely related to an individual's health insurance participation. Therefore, if health is considered as a product, the medical insurance serves as an input for the production of health. Consequently, the functional form of individuals' health production can be expressed as:

$$H = H\ [M\ (P_N)] \tag{6}$$

In the above equation, M denotes the individual's medical service utilization. As analyzed previously, individuals can enhance their health capital by increasing their medical service utilization, thereby improving their health status.

Consequently, medical service utilization has a positive effect on the production of health, ($\partial H/\partial M > 0$). P_N denotes the proportion of reimbursement by the medical insurance that individuals participate in, and the reimbursement proportion has a positive effect on the utilization of health services by individuals ($\partial M/\partial P_N > 0$). By substituting the health production function from Equation (6) into the labor supply equation in Equation (5), and solving for the partial derivatives with respect to medical insurance, the following expressions are obtained:

$$\frac{\partial T_O^*}{\partial P_N} = \left(\frac{\partial T_O^*}{\partial W_O} \cdot \frac{\partial W_O}{\partial H} + \frac{\partial T_O^*}{\partial T_L} \cdot \frac{\partial T_L}{\partial H}\right) \frac{\partial H}{\partial M} \cdot \frac{\partial M}{\partial P_N} \tag{7}$$

Given that both $\frac{\partial \mathrm{H}}{\partial \mathrm{M}}$ and $\frac{\partial \mathrm{M}}{\partial P_N}$ are non-negative, the impact of medical insurance on labor supply ultimately depends on $\frac{\partial \mathrm{T}_O^*}{\partial W_O} \cdot \frac{\partial W_O}{\partial \mathrm{H}} + \frac{\partial \mathrm{T}_O^*}{\partial T_L} \cdot \frac{\partial T_L}{\partial \mathrm{H}}$. where $\frac{\partial \mathrm{T}_O^*}{\partial W_O} \cdot \frac{\partial W_O}{\partial \mathrm{H}}$ denotes the health effect of medical insurance on labor supply through output, and since good health status promotes individuals' labor productivity, making $\frac{\partial \mathrm{T}_O^*}{\partial W_O} \cdot \frac{\partial W_O}{\partial \mathrm{H}}$ positive; $\frac{\partial \mathrm{T}_O^*}{\partial T_L} \cdot \frac{\partial T_L}{\partial \mathrm{H}}$ denotes the health effect of medical insurance on labor supply through leisure consumption. With improved medical insurance benefits, the increase of reimbursement ratio of rural residents makes the expected medical expenditure decrease and improve the health, according to the theory of precautionary savings, the participants will reduce the current savings, resulting in reduced labor time, making $\frac{\partial \mathrm{T}_O^*}{\partial T_L} \cdot \frac{\partial T_L}{\partial \mathrm{H}}$ negative.

Overall, individuals perceive that the marginal utility of improved medical insurance benefits for labor output exceeds the marginal utility for leisure consumption, they will increase their labor supply. Given the significant enhancement of medical insurance benefits, it is posited that farmers will increase their labor supply.

Based on the above analysis, this paper proposes the following hypothesis:

H1: Improved medical insurance benefits can promote the labor supply of middle-aged and elderly people in rural areas.

2.2. Impact of Increased Medical Insurance Benefits on Labor Migration

Traditional labor economics theory posits that the utility level an individual derives from choosing a particular job is primarily composed of two elements: the wage compensation of the job itself and the non-wage welfare benefits tied to it (Bonar, 1891; Conte, 1980; Swanson, 1994). Accordingly, this paper, drawing on the research by Hong and Ning (2020), and hypothesizes that the individual's mobility decision is a response to the difference in the level of utility between urban and rural employment. The utility function can be expressed as follows:

$$U_i\,(J^b)=\alpha\, W^b+\beta H^b-\delta I^b \tag{8}$$

In the above equation, W^b denotes the earnings of laborers working within the village; H^b denotes the expected benefits from the medical insurance for laborers employed locally; and I^b denotes the cost incurred for local medical treatments, including the transportation cost incurred for medical treatment and the loss of income due to reduced working hours during medical treatment. When the location of medical treatment is the same as the workplace, $I^b \geq 0$. α, β, and δ denote the unit level of utility generated by each benefit (cost), respectively, all of which are positive.

The utility function expression for laborers employed outside the village (J^a) can be articulated as follows:

$$U_i\,(J^a)=\alpha\, W^a+\beta H^a-\theta C^a-\delta I^a \tag{9}$$

In the above equation, W^a denotes the wage income of laborers employed outside the county, and under general circumstances, $W^a > W^b$. H^a denotes the expected benefits from the medical insurance for laborers employed outside the village, H^a depends on the medical insurance benefits' coverage extent and portability. Higher portability equates to better health insurance benefits for migrant workers and lower medical costs. C^a denotes the search costs for employment in towns or cities, with $C^a > 0$. I^a denotes the cost of medical treatment away from one's county, constrained by the NRCMS's reimbursement rules, the laborers who employed outside can only get a higher percentage of reimbursement compensation when they seek medical treatments within their county.

In the case of non-portability of medical insurance benefits, $I^a > I^b \geq 0$. α, β, θ, and δ denote the unit utility level generated by each benefit (cost), and α, β, θ, and δ are all greater than 0, respectively.

Based on the logic outlined, comparing the net utility levels of laborers choosing different employment locations:

$$D=U_i\,(J^a)-U_i\,(J^b)=[\alpha W^a+\beta H^a-\theta C^a-\delta I^a]-[\alpha W^b+\beta H^b-\delta I^b]=\alpha(W^a-W^b)+\beta(H^a-H^b)-\theta C^a-\delta(I^a-I^b) \tag{10}$$

Obviously, the laborers will choose migration if and only if $D \geq 0$. The condition of labor migration is:

$$\alpha(W^a-W^b)+\beta(H^a-H^b) \geqslant \theta C^a-\delta(I^a-I^b) \tag{11}$$

Equation (11) shows that the decision of labor migration is influenced not only by the wage differentials between urban and rural jobs but also by the extent to the portability of their medical insurance benefits across different employers and locations.

Before the integration of urban and rural medical insurance, rural laborers typically participated in the NRCMS at their registered residences. The NRCMS, managed at the county level, has led to a segmented and fragmented operation of China's rural medical insurance system between urban and rural areas. According to the regulations of the NRCMS, the medical insurance rights and benefits of highly mobile rural laborers could not be maintained or transferred with changes in employment location. Therefore, assuming all other conditions remain constant, the loss of medical insurance benefits ($\beta(H^a–H^b)$) and increased medical costs ($\delta(I^a–I^b)$) when working outside the county, could lead to a decrease, or even a negative net utility D, deterring laborers from choosing labor migration.

Compared with NRCMS, URRMI embodies stronger portability in terms of co-ordination level, medical treatment in places away from one's hometown, reimbursement catalogs and reimbursement benefits, and reduces the complex and cumbersome reimbursement applications and procedures. This may encourage rural laborers to engage in non-agricultural employment in prefecture-level cities.

Based on the above analysis, the following hypotheses are proposed in this paper:

H2: The integration of urban and rural medical insurance can promote labor migration of middle-aged and elderly people in rural areas.

3. Materials and Methods

3.1. Data Source

The data used in this study is derived from the China Health and Retirement Longitudinal Study (CHARLS). Given that the integration of urban and rural medical insurance mainly took place in 2016, the study uses the most recent data from the 2015 and 2018 CHARLS two-wave dataset. To accurately isolate the intensive marginal effects of the urban and rural medical insurance integration policy on health from other medical insurance programs, the following selection process was carried out: Firstly, individuals who participated in both 2015 and 2018 were selected, including those who participated in the NRCMS in 2015 and those who participated in both the NRCMS and the URRMI in 2018. Secondly, individuals without insurance coverage, participants in Urban Employee Medical Insurance (UEMI), participants in commercial medical insurance, and non-local insurance participants were excluded from the data. Lastly, data without identifiable insurance status were removed. Following this selection process, a balanced two-wave panel data set was created.

3.2. Description of Variables

3.2.1. Dependent Variable

In academic research on the mechanisms of medical insurance's impact on the labor force, specific measurement indicators for labor decisions can generally be categorized into two main types: one relates to labor supply (Flabbi & Mabli, 2018; Bradley et al., 2007; Coe et al., 2012), and the other pertains to labor location choice (Gong & Sims, 2023; Boschmann, 2011; Brown & Scott, 2012). Regarding labor supply, this study primarily considers labor participation, labor hours, and the willingness for endless labor. As for labor location choice, this study mainly focuses on labor migration.

Labor Participation and Working Hours. The CHARLS follow-up questionnaire inquired about the time spent on four types of work over the past year, including agricultural self-employment, employment, non-agricultural self-employment, and assisting with family business activities. To calculate the average weekly working hours for each type of work, we multiplied the number of working months for each category by 4.35, the number of working days per week, and the number of hours worked per day, then divided the result by 52. By summing the average weekly working hours for all categories, we obtained the overall average weekly working hours. Regarding labor participation, individuals with working hours greater than zero were considered to be participating in labor and were assigned a value of 1, while the rest were assigned a value of 0.

Willingness for endless labor. We used an indicator related to the anticipated age at which individuals plan to stop working, which was included in the CHARLS questionnaire. Respondents were asked, "At what age do you plan to stop working, meaning you will stop all money-earning activities and will no longer assist with family business activities, and you will not engage in work that is more physically demanding than leisure activities?" For the sample, individuals who indicated an age above 80 or those who planned to work until they were very old, such as "working until the end of life," were assigned a value of 1; otherwise, they were assigned a value of 0.

Labor migration. We primarily determined labor migration based on the CHARLS follow-up questionnaire, where respondents were asked, "Where do you work/do business most of the time?" If the response indicated a location outside the same village as the current place of residence, it was assigned a value of 1; otherwise, it was assigned a value of 0.

3.2.2. Independent Variable

Participation in rural middle-aged and elderly individuals' medical insurance types (MIT). Referring to the options for individual sample participation in medical insurance types in the CHARLS questionnaire, samples of rural middle-aged and elderly individuals who participated in the NRCMS and URRMI were retained. According to the characteristics of the difference in difference (DID) model, relevant dummy variables were set. The group dummy variable was set as follows: samples of rural middle-aged and elderly individuals who fully participated in both survey periods (participated in the NRCMS in 2015 and the URRMI in 2018) were designated as the "treatment group" and defined as 1, while samples that participated in the NRCMI in both 2015 and 2018 were designated as the "control group" and defined as 0. The time dummy variable was set as follows: 2015 was defined as 0, and 2018 was defined as 1. The "treatment group" consisted of a total of 2,890 individuals, while the "control group" consisted of 14,238 individuals.

3.2.3. Covariates

We select covariates from five levels. Individual characteristics, which include gender (female = 1, male = 0), age, marital status (married = 1, unmarried = 0), income, education, number of children. Personal health behaviors, which mainly include whether the individual smoking (smokes = 1, does not smoke = 0), exercise (exercises = 1, does not exercise = 1), and drinking (consumes alcohol = 1, does not consume alcohol=0). Personal health status, which is represented using Self-Assessment Health (very good = 1, good = 0.8, fair = 0.6, poor = 0.4, very poor = 0.2). Quality of medical institution services and medical costs, which are represented by the satisfaction level with medical institution diagnosis and treatment (referred to as Satisfaction).

The descriptive statistics of the variables can be found in Table 1.

Table 1. The descriptive statistics of the variables.

Variables	**2015**			**2018**			**2015–2018**
	(1) control	(2) treatment	(3) (2)−(1)	(4) control	(5) treatment	(6) (5)−(4)	(7) full sample
Labor Participation	0.659	0.595	−0.06***	0.707	0.709	0.002	0.678
Working Hours	16.456	15.494	−0.962	18.620	20.607	1.987***	17.625
Willingness for Endless Labor	0.608	0.667	0.060***	0.028	0.014	-0.014	0.331
Labor Migration	0.278	0.297	0.019	0.304	0.344	0.040*	0.296
Gender	0.538	0.546	0.008	0.536	0.544	0.007	0.538
Age	60.763	60.332	-0.431	63.737	63.307	−0.430	62.186
Marital Status	0.831	0.844	0.013	0.808	0.825	0.017	0.822
Income	5.442	6.008	0.566***	8.007	8.1666	0.158*	6.7840
Education	3.762	3.963	0.201*	3.762	3.963	0.201*	3.796
Number of Children	3.144	2.833	−0.311***	3.125	2.829	−0.296***	2.656
Smoking	0.290	0.261	−0.029	0.279	0.248	−0.031	0.279
Exercise	0.954	0.931	−0.023***	0.895	0.892	−0.002	0.922
Drinking	0.337	0.327	−0.010	0.312	0.317	0.005	0.324
Self-Assessment Health	0.594	0.609	0.015**	0.567	0.598	0.031***	0.584
Satisfaction	2.664	2.583	−0.080**	2.677	2.580	−0.097***	0.616

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

3.2.4. Research Model

The transition from NRCMS to URRMI provides a natural experiment for studying the specific impact of the medical insurance system on labor in this research. Therefore, we employ the Difference-in-Differences (DID) method. Following the fundamental steps set by the DID model, two sets of dummy variables are constructed. First, the "treatment group" and the "control group" dummy variables. The treatment group consists of residents who participated in the NRCMS in the base year 2015 and chose to participate in the URRMI during the experimental period. In contrast, the control group includes residents who were already part of the NRCMS in 2015 but did not join the URRMI during the experimental period. Second, policy time dummy variables. By comparing the differences in labor conditions between the treatment group and the control group, the study systematically analyzes the impact of improved medical insurance benefits on rural middle-aged and elderly individuals. Based on the analysis above, the regression model for the DID method is as follows:

$$Y_{it}=\beta_0+\beta_1 DID_{it}+\beta_2 Treat_i+\beta_3 Time_t+\delta X_{it}+\epsilon_{it} \quad (12)$$

$$DID_{it}=Treat_i \times Time_t \quad (13)$$

In the equation, subscript i represents the individual, and t represents the time period. Y_{it} is the dependent variable, which refers to the labor-related index of individual i in period t. DID_{it} is the core independent variable. The coefficient β_1 has an economic interpretation, signifying the extent to which the improvement in rural residents' medical insurance benefits after the integration of urban and rural medical insurance impacts the labor of rural middle-aged and elderly individuals. $Treat_i$ is the group dummy variable. If individual i belongs to the treatment group, $Treat_i$ is defined as 1. Otherwise, if i belongs to the control group, $Treat_i$ is defined as 0. $Treat_t$ is the time dummy variable. If the individual is in the experimental period after the implementation of the integrated medical insurance (in 2018), $Treat_t$ is set to 1. Otherwise, if the individual is not in the experimental period, $Treat_t$ is set to 0. ϵ_{it} represents the error term. The selection of covariates variables X_{it} is based on Grossman's (1972) theory of health capital demand and relevant literature.

4. Results

4.1. Regression DID

As labor participation, willingness for endless labor and labor migration are all binary variables, Probit regression is employed for models (1), (3), and (4), while the classical Ordinary Least Squares (OLS) regression is used for working hours in model (2). The regression results and marginal effects can be found in Table 2.

The increase in medical insurance benefits increases the log odds of labor participation among rural middle-aged and elderly by 0.185. As a marginal effect, it results in a 5.69% increase in labor participation rate, which is statistically significant at the 1% level. The increase in medical insurance benefits significantly increase the working hours for rural middle-aged and elderly by 3.076 hours. This indicates that the integration of urban and rural medical insurance indeed stimulates the labor supply of rural middle-aged and elderly individuals, not only in terms of labor participation but also by significantly increasing the working hours.

The increase in medical insurance benefits reduces the willingness for endless labor of rural middle-aged and elderly individuals. The integration of urban and rural medical insurance lowers the log odds of endless labor willingness by 0.452. As a marginal effect, it leads to a 9.48% decrease in the willingness for endless labor, which is statistically significant at the 5% level.

The increase in medical insurance benefits promote rural middle-aged and elderly individuals' engagement in labor migration. The integration of urban and rural medical insurance increases the log odds of labor migration by 0.167. As a marginal effect, it results in a 3.10% higher probability of engaging in labor migration, which is statistically significant at the 10% level.

Table 2. The results of the DID (Difference-in-Differences) regression.

Variables	(1) Labor Participation	(2) Working Hours	(3) Willingness for Endless Labor	(4) Labor Migration
DID	0.185***	3.076***	-0.452**	0.167*
	(0.0584)	(0.954)	(0.200)	(0.101)
Treat	−0.166***	−1.352**	0.102	−0.160*
	(0.0432)	(0.686)	(0.0796)	(0.0871)
Time	0.289***	2.640***	−2.368***	0.0175
	(0.0269)	(0.417)	(0.0752)	(0.0496)
Gender	−0.179***	−3.693***	0.0931	−0.308***
	(0.0299)	(0.476)	(0.0768)	(0.0593)
Age	−0.0329***	−0.495***	−0.0151***	−0.0282***
	(0.0015)	(0.0231)	(0.0044)	(0.0034)
Marital Status	0.300***	4.360***	0.0332	−0.183***
	(0.0289)	(0.421)	(0.0884)	(0.0635)
Income	0.0211***	0.661***	−0.0106	0.0339***
	(0.0039)	(0.0600)	(0.0092)	(0.0085)
Education	−0.0196***	−0.0612	−0.0167**	−0.00794
	(0.0030)	(0.0479)	(0.0070)	(0.0057)
Number of Children	−0.0015	0.170	0.0522**	0.0183
	(0.0082)	(0.127)	(0.0263)	(0.0212)
Smoking	0.0721**	0.661	−0.0282	−0.0137
	(0.0306)	(0.482)	(0.0677)	(0.0533)
Exercise	0.642***	4.479***	0.00483	0.0414
	(0.0398)	(0.588)	(0.126)	(0.0971)
Drinking	0.266***	2.963***	−0.0564	0.0458
	(0.0273)	(0.439)	(0.0630)	(0.0498)
Self-Assessment Health	0.732***	9.340***	0.00722	0.0418
	(0.0571)	(0.871)	(0.143)	(0.109)
Satisfaction	−0.0050	0.115	0.0558**	0.0345*
	(0.0103)	(0.162)	(0.0261)	(0.0208)
Marginal Effect	0.0569***		−0.0948**	0.0513*
Provincial Fixed Effects	YES	YES	YES	YES
N	15975	15981	3775	4558
Adjust R^2	0.1230	0.1207	0.4016	0.1198

4.2. Robustness Checks

4.2.1. Parallel Trends Test

Parallel trends are a prerequisite for the Double Difference (DID) method to correctly identify causal effects. To test this, we employ an event study method to assess the parallel trends. By testing whether the regression coefficient is significantly different from 0, it indirectly verifies whether the pre-existing parallel trend is met. Figure 1 shows that coefficient is not significant in the periods before the policy intervention (i.e., in 2011 and 2013), indicating that the pre-existing parallel trend is satisfied:

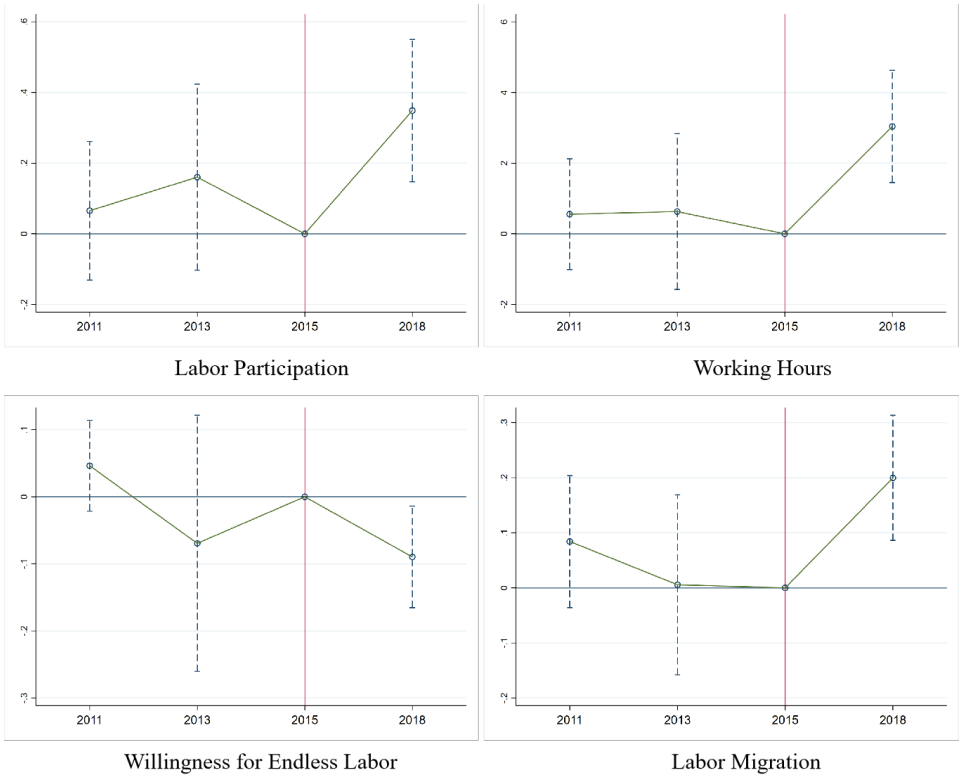

Figure 2. Results of the Parallel Trends Test.

Note: 95% confidence intervals are represented by short dashed lines. In the years preceding the policy shock (2015), the regression coefficients fall within the 95% confidence intervals that include zero. This demonstrates that there were no significant differences between the treatment groups and the control groups before the implementation of the policy, indicating no systematic bias and fulfilling the basic premise of the parallel trends test necessary for DID analysis.

To rigorously assess the robustness of our regression findings, we employed both the Propensity Score Matching-Difference in Differences (PSM-DID) approach and placebo tests for validation. The outcomes from these methods are consistent with those obtained from the baseline Difference in Differences (DID) regression analysis. Detailed regression results are provided in the Supplementary Materials.

4.3. Regression DID

In order to examine the mechanisms through which an increase in medical insurance benefits resulting from the integration of urban and rural medical insurance affects labor decisions, intermediate variables were selected. Figure 4 presents a diagram of the pathways involved, which includes four main paths:

(1) Direct path: increase in medical insurance benefits leads to changes in labor decision-making.

(2) Indirect Path 1: increase in medical insurance benefits affects labor decision-making through changes in medical burden.

(3) Indirect Path 2: increase in medical insurance benefits affects self-assessment health by influencing the medical burden, which, in turn, leads to changes in labor decision-making.

(4) Indirect Path 3: increase in medical insurance benefits affects labor decision-making through changes in self-assessment health.

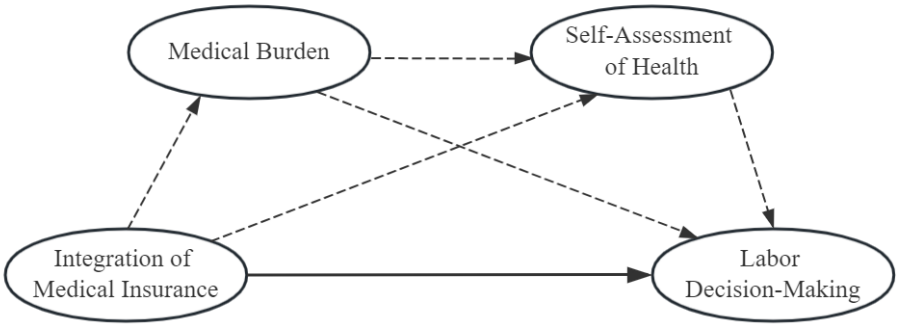

Figure 3. The impact pathways of increased medical insurance benefits on decision-making.

Note: Solid lines represent the direct pathway through which increased medical insurance benefits affect labor decision-making, while dashed lines represent the indirect pathways through which these benefits influence labor decision-making.

Table 3 presents the empirical results of the impact mechanisms of increased medical insurance benefits on rural middle-aged and elderly individuals' labor decisions following the integration of urban and rural residents' medical insurance. From the results, it can be observed that the impact of increased medical insurance benefits on labor decision-making is primarily achieved through a reduction in the medical burden.

In terms of labor participation and working hours, increased medical insurance benefits significantly reduce the medical burden. This reduction in the medical burden may lead to increased demand for leisure, thereby decreasing working hours. However, the reduced medical burden also significantly improves health, which, in turn, enhances labor productivity, leading to a significant increase in working hours.

Regarding the willingness for endless labor, the decrease in the medical burden reduces the economic pressure on farmers, lowers their concerns about the future, and makes them more willing to retire in the future. This results in a significant decrease in the willingness for endless labor. On the other hand, the reduction in the medical burden also improves health, which may make farmers more willing to work endlessly. However, overall, the improved medical insurance benefits significantly reduce the willingness for endless labor.

Regarding labor migration, increased medical insurance benefits significantly increase the likelihood of engaging in labor migration. This may be due to the fact that medical insurance integration reduces the medical burden, leading to improved health. Improved health, in turn, makes rural middle-aged and elderly individuals more willing to engage in labor migration.

Table 3. The results of the DID (Difference-in-Differences) regression.

Panel A	Medical Burden	Self-Assessment Health	Labor Participation
DID	−0.0344**	0.0082	0.0422**
	（0.0153）	（0.0092）	（0.0201）
Medical Burden		−0.0970***	−0.0260**
		（0.0053）	（0.0117）
Self-Assessment Health			0.2070***
			（0.0193）
Panel B	Medical Burden	Self-Assessment Health	Working Hours
DID	−0.0344**	0.0082	2.1907**
	(0.0153)	(0.0092)	(1.0141)
Medical Burden		−0.0970***	−1.9604***
		(0.0053)	(0.5910)
Self-Assessment Health			8.6251***
			(0.9736)
Panel C	Medical Burden	Self-Assessment Health	Willingness for Endless Labor
DID	−0.0260**	0.0108	−0.0632**
	(0.0130)	(0.0065)	(0.0284)
Medical Burden		−0.1079***	0.0294*
		(0.0046)	(0.0176)
Self-Assessment Health			0.0099
			(0.0302)
Panel D	Medical Burden	Self-Assessment Health	Labor Migration
DID	−0.0267*	0.0109	0.0403
	(0.0150)	(0.0083)	(0.0329)
Medical Burden		−0.1030***	0.0091
		(0.0045)	(0.0196)
Self-Assessment Health			0.0565*
			(0.0338)

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

4.4. Heterogeneity Analysis

Regressions are conducted for different age and gender groups (Table 4).

Panel A presents the regression results based on age groups. We divide individuals into middle-aged (Age < 60) and elderly (Age ≥ 60) groups, using the age of 60 as a dividing point. In terms of labor participation and working hours, the impact of increased medical insurance benefits on labor supply in rural middle-aged individuals is greater than that on elderly individuals.

As for the desire for willingness for endless labor, elderly individuals exhibit a significantly lower willingness compared to middle-aged individuals, possibly because aging makes elderly people value rest and leisure more and their physical capacity cannot support strenuous work. Retirement desires are stronger among the elderly.

However, concerning the impact on labor migration, the impact is more significant for elderly individuals than middle-aged individuals. The reason may be that most elderly individuals work within their own villages, and the improvement in their health makes them more willing to work outside. Most middle-aged individuals already work outside the village, so the impact of medical insurance on them is less pronounced.

Panel B shows the results of the gender-based regressions. In terms of labor participation and working hours, the impact of increased medical insurance benefits on the labor supply of female is greater than that on male. This is likely due to the generally lower health status of women in rural middle-aged and elderly populations (in this study, the mean self-assessment health for men and women are 0.6027 and 0.5686, respectively). The improvement in women's health caused by the enhanced medical insurance benefits makes them more capable of engaging in labor. Additionally,

since women generally have lower health statuses and the increased medical insurance benefits reduce the medical burden, women may have a stronger desire to retire.

Table 4. Heterogeneity Analysis by Age and Gender.

Groups	N	Labor Participation	Working Hours	Willingness for Endless Labor	Labor Migration
			Panel A		
Middle-Aged（Age<60）	7068	0.2489***	3.0987**	0.0972	0.1021
		（0.0926）	（1.5814）	（0.0737）	（0.1298）
Elderly（Age≥60）	9716	0.0780	2.7475**	−0.4875*	0.3501*
		（0.0786）	（1.1582）	（0.2597）	（0.1908）
			Panel B		
Male	7905	0.1507*	2.1000*	−0.3913	0.1467
		（0.0778）	（1.2631）	（0.2831）	（0.1716）
Female	9223	0.2347***	4.3514***	−0.5153*	0.1869
		（0.0890）	（1.4475）	（0.2895）	（0.1318）

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

5. Discussion

5.1. Discussion

The increase in medical insurance benefits on labor supply can be attributed to two main effects: economic effect and health effect (Cameron & Trivedi, 1991; Hadley, 2003; Liu & Hu, 2022; Alfrey, 2024; Wang et al., 2024). The increase in medical insurance benefits, characterized by increased reimbursement rates and expanded coverage, reduces the medical burden on individuals, leading to a rise in relative income, which represents the economic effect of medical insurance. An increase in the economic effect may reduce precautionary savings and decrease labor supply. Conversely, the health effect generally stimulates labor supply because improved health conditions are likely to enhance labor productivity, resulting in higher labor rewards and, consequently, increased labor supply.

The research findings that increase in medical insurance benefits can promote the labor participation and working hours of rural middle-aged and elderly individuals. Simultaneously, it reduces their willingness for endless labor, which not only boosts societal labor supply but also prevents middle-aged and elderly individuals from overworking, allowing them to enjoy their later years. This is because, after the enhancement of medical insurance benefits, the reflection in terms of working hours shows that the health effect outweighs the income effect, leading to an increase in labor supply. However, regarding the willingness for endless labor, the income effect surpasses the health effect, resulting in a decreased willingness for endless labor. This confirms the initial premise that desire to increase labor supply among rural middle-aged and elderly individuals. On the other hand, it is essential to prevent the exacerbation of excessive labor among this demographic. It both elevates the level of societal labor supply and provides more leisure time for rural middle-aged and elderly individuals, thus enhancing their welfare. These findings underscore the significant policy implications, suggesting that future steps should involve further increasing the annual maximum payment limit and reimbursement rates for medical expenses, while reducing the deductible threshold. Additionally, efforts should be made to advance the unified planning of basic outpatient services under the URRMI, expand the coverage of chronic disease protection, and gradually shift from disease-based protection to expense-based protection. This will promote the level of outpatient treatment for chronic and severe illnesses to align with that of inpatient treatment.

The transition from the NRCMS to the URRMI also involves a change in the hierarchical level of medical insurance (Yip et al., 2019). The NRCMS generally only allows rural residents to seek medical care within their county, with many restrictions on seeking care outside of the county. URRMI extends the coverage area to the city level, allowing unrestricted access to medical care within the entire city. Traditional labor economic theory suggests that an individual's choice of work is influenced by the utility derived from two main components: the monetary rewards associated with the job and the non-wage benefits linked to it (Bonar, 1891; Conte, 1980; Swanson, 1994). Medical insurance is one such non-wage benefit. Under the NRCMS, for highly mobile rural

labor, NRCMS benefits cannot be maintained or transferred as their employment location changes. In the framework of the URRBMI system, the insurance features enhanced portability in terms of pooling level, out-of-region healthcare, reimbursement directories, and reimbursement benefits, and simplifies the complex application and reimbursement procedures that rural households faced under the NRCMS. With the integration of the urban and rural medical insurance systems, the medical insurance benefits enjoyed by rural labor when working in different regions are becoming closer to those of locally employed individuals, which promotes labor mobility. The next step should involve raising the level of medical insurance pooling and implementing provincial or nationwide insurance pooling. Removing all restrictions on migrant workers participating in medical insurance at their place of employment would fill the social security gap for rural migrant workers and effectively improve their social security benefits.

Heterogeneity findings suggest that increase in medical insurance benefits has a relatively larger impact on labor decisions for traditionally vulnerable groups, such as the elderly and women (Cutler & Zeckhauser, 2000). This is likely because the marginal effect of increasing medical insurance benefits on labor decisions is greater for individuals with relatively lower levels of health. From this perspective, continuing to enhance medical insurance benefits is likely to increase labor supply and labor migration for those with lower levels of health, ultimately increasing their income. This, in turn, could help reduce income inequality resulting from differences in health status, contributing to a more equitable society.

5.2. Limitations

This study has certain limitations. Due to variations in the implementation progress, integration models, financing levels, and medical insurance benefits across different cities in the country, it was challenging to conduct a detailed analysis of policy intricacies due to constraints in the survey data. Subsequent research could explore the impact of urban-rural resident medical insurance integration on the labor decisions of rural middle-aged and elderly individuals from different regional and integration model perspectives, shedding light on the deeper institutional factors behind these effects.

Furthermore, we utilized data from 2015 and 2018 to analyze the policy impact differences. However, it is widely recognized that evaluating policy effects often requires a longer timeframe of three years or more. Data from 2015 and 2018 may not be sufficient for a comprehensive assessment of medical insurance policies. Therefore, future research should consider using a longer time span to more accurately assess the long-term effects of policies

6. Conclusions

The increase in medical insurance benefits significantly boosted the labor participation rate, working hours, and labor migration of rural middle-aged and elderly individuals, while reducing their willingness for endless labor. Regarding the mechanism of these effects, the increase in medical insurance benefits directly impacted labor decisions by reducing the medical burden. Furthermore, it influenced labor decisions indirectly by improving health conditions. In terms of heterogeneity, the impact of increased medical insurance benefits was more pronounced for the elderly and women compared to middle-aged individuals and men. Based on these findings, this study suggests the continuous improvement of medical insurance benefits for rural residents, the expansion of the scope of medical insurance coverage, and the gradual relaxation of participation restrictions in the medical insurance program.

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Supplementary Materials

Robustness Checks

1. Propensity Score Matching Difference-in-Differences (PSM-DID) Method

The PSM-DID method employs propensity score matching (PSM) to control for sample imbalances in observed characteristics. Specifically, we use the previously mentioned covariates to estimate propensity scores and perform a 1:1 K-nearest neighbors matching with replacement. The results show that the data matching quality is good (as shown in Figure 1). This minimizes significant differences between the treatment and control groups before policy implementation, reducing endogeneity concerns stemming from selective biases in residents' choices at the time of policy implementation. After matching, the impact of the increased medical insurance benefits on the labor decisions of rural middle-aged and elderly individuals is consistent in significance and coefficient size with the baseline regression results (as shown in Table 1).

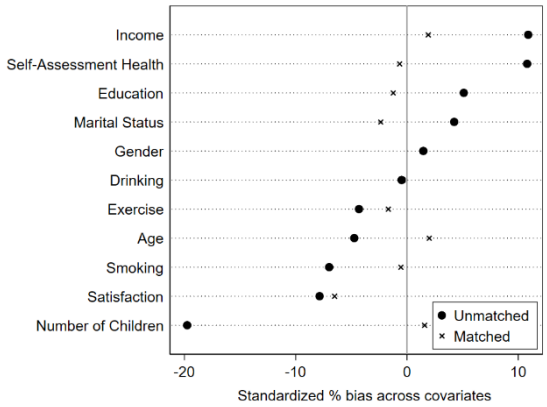

Figure 1. Results of Balance Test.

Table 1. PSM-DID Results.

Variables	Labor Participation	Working Hours	Willingness for Endless Labor	Labor Migration
PSM-DID	0.1565 **	3.0232***	−0.7503***	0.1731*
	(0.0787)	(0.7512)	(0.2555)	(0.0977)
Covariates	YES	YES	YES	YES
N	4872	4847	1240	1269
Adjust R^2	0.1187	0.1157	0.4287	0.1286

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

2. Placebo Test

We employ a placebo test to eliminate estimation biases caused by changing heterogeneity features over time. Two periods of data, prior to the 2013 and 2015 policy interventions, are selected. Assuming that the policy intervention occurred in 2014, the DID method is reevaluated using the data. If the policy's impact is driven by heterogeneity factors that change over time, then this impact should persist, and similar effects should be observed in the placebo test results. If no policy impact is observed in the placebo test results, it indicates a low likelihood of the existence of time-varying heterogeneity effects. Table 2 shows that when the policy timing is shifted, the results are all insignificant, supporting the conclusion that the trend changes between the treatment group and control group are caused by the integration of urban and rural residents' medical insurance.

Table 2. Placebo Test Results.

Variables	Labor Participation	Working Hours	Willingness for Endless Labor	Labor Migration
DID	−0.0040 (0.0833)	−0.0767 (1.4548)	0.0974 (0.1536)	−0.2244 (0.1586)
Covariates	YES	YES	YES	YES
N	8765	8769	2446	2583
Adjust R^2	0.0521	0.0560	0.0564	0.0819

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

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