Institutional Design and Incentives for Migrant Workers to Participate in Social Insurance in China: Evidence from a Policy Experiment in Chengdu City

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Research

Abstract

Background: Rural-to-urban migration has increased rapidly in China since the early 1980s, with the number of migrants reaching 376 million in 2020 (National Bureau of Statistics [NBS], 2020). Despite this sharp trend and the significant contributions that the migrants have made to urban development, migrant workers have had very limited access to the social insurance that the majority of urban workers have enjoyed.

Methods: Based on the background of the social insurance system adjustment in Chengdu in 2011, we establish a difference-in-differences (DID) model to empirically test the impacts of change in social insurance policy contribution rates on migrant workers' social insurance participation rates, using the China Migrants Dynamic Survey (CMDS) data from 2009-2016.

Results: The social insurance participation rate of migrant workers was significantly reduced after they are incorporated into the urban worker insurance system. Meanwhile, there is no significant change in the wages of migrant workers, but the working hours became longer and the consumption level turned lower. That is to say, simply changing the social insurance model of migrant workers from "comprehensive social insurance" to "urban employee insurance" reduces the incentives for migrant workers to participate in the insurance and harm the overall welfares of migrant workers.

Conclusion: The design of the social security policy is an important reason for lower participation rate of migrants. Therefore, it is necessary to solve the problem of insufficient incentives through targeted social security policies. Specifically, the first is to formulate a social security policy contribution rate suitable for the migrants. The second is to establish a comprehensive social security policy and gradually integrate the social security system.

1. Introduction

In recent years, China's social insurance system has been gradually improved, and the social insurance coverage rate for urban workers has reached 54.01% by 2018. However, social insurance coverage for migrant workers still far behind other groups. Figure 1 depicts the participation of migrant workers in various insurance types. The number of migrant workers participating in social insurance has increased year by year, but the participation rates of pension and medical insurance are around 20%, while the participation rate of unemployment insurance is only 15%, and the highest participation rate of injury insurance is less than 30%. According to the data of China's Seventh Census in 2020, the number of migrant workers has reached as high as 376 million people, accounting for 26.63%. The migrant workers have made great contributions to urban development; however, they cannot enjoy the same benefits as local urban workers[1−4]. The general lack of protection for the migrant workers in terms of work injury, unemployment, medical care and pension will, on the one hand, undermine the labor rights and interests of migrant workers and weaken their resistance to risks; on the other hand, it will increase social inequality[5−7].

The causes of this low participation rate are summarized in the literature in three areas. Firstly, the social insurance system for migrant workers in China features poor portability and fragmentation[2]. The migrant workers suffer from institutional discrimination in the job market and has difficulty participating in local social insurance in the inflow city. In addition, it is difficult to transfer social insurance relations, for example, the medical insurance purchased by the migrant workers in their domicile cannot be used in the inflow city[2] [8−11]. Secondly, the demand characteristics of the migrant workers are also an important reason for their lower willingness to participate in insurance. The migrant workers are relatively less educated, they will underestimate their risk of illness and lack sufficient far-sightedness to consider the issue of obtaining pension in the future. Combined with the low income of the migrant workers, they will choose to increase their current income and give up participating in social security in the face of high social insurance premium rate[12−13]. Finally, the social insurance for employees is paid by both the firm and the employee in China, with the firm contributing about 80% of the premium. The social insurance cost of employees already accounts for more than 40% of the labor cost of Chinese firms, which is significantly higher than that of other Asian countries[14]. Most of the firms employing migrant workers are labor-intensive firms with relatively low profit margins. Social insurance costs increase the operating burden of firms. Therefore, many of these firms choose not to provide insurance for their employees[15−21].

With the improvement of the social insurance system, the institutional barriers faced by migrant workers to participate in social insurance have been gradually eliminated. However, the problem of insurance evasion by individuals and enterprises due to insufficient incentives for social insurance participation has become increasingly prominent. In fact, for the special group of migrant workers, what kind of trade-offs will they make when facing the cost and benefits of different social insurance patterns? What would they prefer between a low premium rate and a low social insurance benefit or a high premium rate and a high social insurance benefit? These questions are not well answered. Under the background of low participation rate of migrant workers in social insurance, it is very necessary to discuss the incentive problem of participation in social insurance from the perspective of social insurance patterns design. Only by fully considering the particularity of migrant workers and providing sufficient incentives to participate in the insurance can the coverage of social insurance be effectively expanded. The insurance incentive of migrant workers is more flexible, especially the setting of the policy premium rate is more sensitive, which needs further consideration.

At present, there are two main patterns of social insurance for migrant workers. One is the Urban Employee Basic Medical Insurance (UEBMI), which includes basic pension insurance, basic medical insurance, unemployment insurance, work injury insurance and maternity insurance, and most enterprises will buy complete insurance packages for their employees, but some enterprises only buy some types of insurance for their employees, in order to reduce the cost of enterprises. Another kind of insurance is the Comprehensive Insurance (CI), specially developed for migrant workers in some cities. CI packages some

important insurance, such as work injury insurance and medical insurance, etc. Compared with UEBMI, CI has a lower level of benefits, but the premium rate is also lower.

Table 1
Comparison of the two social insurance models

Social Insurance Patterns	Premium Rate	Social Insurance Benefit
Urban Employee Basic Medical Insurance	High	High
Comprehensive Insurance	Low	Low

In 2011, the social insurance pattern of migrant workers in Chengdu experienced a significant change from CI to UEBMI, which provides an opportunity to answer these questions. Until 2011, Chengdu provided CI for migrant workers, which included five types of insurance, including pension insurance and basic medical insurance. The premium for comprehensive reimbursement is 20% of the premium base, of which 14.5% is borne by enterprises and 5.5% by migrant workers. After 2011, Chengdu provided UEBMI for migrant workers, and although the insurance benefits were higher, it also made the burden of payment for both firms and migrant workers increase significantly. Meanwhile, this reform did not include migrant workers in the construction industry, who continued to be insured with CI. This provides a control group for the study in this paper. Based on the 2009–2016 China Migration Dynamics Survey data, this study uses the difference-in-difference (DID) method to empirically verify the impact of social insurance policy premium rate setting on migrant workers' insurance participation in Chengdu. We attempt to provide a strong complement to analyze the equity of social insurance participation and incentives to participate in insurance for the migrant workers in China.

2. Methodology

2.1 Data source

This study used the 2009–2016 data from China Migrants Dynamic Survey (CMDS) executed by National Health Commission P.R. China. The CMDS objects are migrant workers from 31 provinces, autonomous regions, municipalities and Xinjiang Production and Construction Corps, aged 16–59 with agricultural household registration, working as employees. These objects have lived in the place of inflow for more than one month and do not have local Hukou. This data has been surveyed annually since 2009, but is not balanced panel data because the sample is not the same from year to year. The data has a long-term span, strong representativeness, and a rich set of variables. It not only includes the basic characteristics of the migrants, but also their work, family members, and insurance participation.

2.2 Variables

The participation of migrant workers' injury insurance is the highest and most practical, so this paper mainly examines the participation rate of workers' injury insurance. The key dependent variable in our analysis relates to whether or not participate in injury insurance. Three indicators were utilized: first, whether to participate in injury insurance; second, whether to participate in either injury insurance or

medical insurance; and third, whether to participate in any one of injury insurance, medical insurance or pension insurance. Also, this paper verified the effects of premium rates on migrant workers' wages, work hours and consumption.

In the regression analysis, this paper also controlled for the variables of the nature of migrant workers' employment units, working years, gender, age, education level, and number of family members. Among them, the nature of unit is a dummy variable, which is equal to 1 if the migrant worker's unit is a state-owned firm, 2 if it is a private firm, 3 if it is a mixed operation firm, and 4 if it is of other nature. Working years refers to the time migrant workers have worked since they left their hometown.

2.3. Descriptive Statistics

As shown in Table 2, although the social insurance participation rate of the migrants increased with the years, its overall level of participation in insurance is still very low. Among them, the participation rates of the pension and medical insurance are about 20%; participation rate of unemployment insurance is less than 20%, and even the highest participation rate in injury insurance only averages about 30%. That number in maternity insurance and housing fund are even lower. Obviously, the proportion of migrant workers participating in UEBMI is still relatively low.

Table 2
Migrants' participation in social insurance from 2009 to 2016

Year	Pension	Medical insurance	Unemployment insurance	Injury insurance	Maternity Insurance	Housing fund
2009	0.259	0.276	0.096	0.461	0.062	0.019
2010	0.125	0.053	0.101	0.287	0.071	0.033
2011	0.229	0.269	0.141	0.313	0.103	0.052
2012	-	0.276	-	-	-	-
2013	0.223	0.214	0.185	0.321	0.069	0.066
2014	0.241	0.228	0.191	0.276	0.138	0.083
2015	-	0.254	-	-	-	-
2016	0.311	0.224	0.274	0.333	0.237	0.123

As shown in Table 3, migrant workers are mainly engaged in manufacturing, construction, wholesale and retail, catering services and social service industries. These industries often provide jobs with high labor intensity, low wages, high potential risks, and strong alternatives. Table 4 lists the social insurance

coverage of different industries based on the 2016 survey data, including five kinds of insurances and the housing provident fund. According to the results in the table, there are two obvious characteristics: First, there are huge differences in social insurance coverage among industries. Industries with the highest coverage rate of nearly 50% include mining, electricity, coal, water and heat supply, financial insurance, real estate, etc. However, there are very few migrant workers in these industries (see sample proportion); the relatively low coverage rate about 10% exists in agriculture, forestry, animal husbandry and fishing, construction, accommodation and catering, etc., and migrant workers in these industries account for a larger proportion. Secondly, the coverage rate of the five insurances and the housing provident fund is almost the same in different industries. That is to say, companies either provide five kinds of insurances and the housing provident fund at the same time, or do not provide them at all. Comparatively speaking, the coverage rate of provident fund is the lowest, and work injury insurance is the highest among the five insurances, followed by pension, unemployment and medical insurance.

Table 3
Industry distribution of migrants (%)

Industry	2009	2010	2011	2012	2013	2014	2015	2016
Agriculture	0.31	1.85	2.03	2.29	2.22	2.64	1.95	2.32
Mining	0.37	2.23	2.12	1.76	1.61	1.71	2.12	1.42
Manufacturing	44.34	35.88	36.50	34.64	34.37	31.40	35.61	30.18
Electric, coal and water production and supply	0.48	0.71	0.67	0.77	0.77	0.83	0.58	0.68
Construction	7.67	12.49	14.07	12.51	11.68	11.29	9.61	10.25
Transportation	3.24	4.44	4.35	4.36	4.00	4.31	4.04	4.92
Wholesale and retail	8.80	7.05	6.78	7.91	7.88	7.78	10.74	9.66
Accommodation	11.85	13.51	11.49	12.89	14.07	14.55	11.65	12.73
Financial, Insurance and Real Estate	1.06	0.83	1.22	1.31	1.42	2.05	1.93	3.12
Social service	15.52	14.47	11.32	10.84	11.35	18.66	16.81	18.62
Public administration	0.90	3.02	2.90	3.38	3.76	4.77	4.96	6.09
others	5.45	3.52	6.57	7.33	6.88	0.00	0.00	0.00

Table 4
Social insurance coverage of migrants by industry in 2016

Year	Pension	Medical insurance	Unemployment insurance	Injury insurance	Maternity Insurance	Housing provident fund
Agriculture	0.136	0.064	0.077	0.105	0.073	0.037
Mining	0.544	0.345	0.472	0.650	0.279	0.297
Manufacturing	0.426	0.310	0.386	0.504	0.331	0.157
Electric, coal and water production and supply	0.541	0.384	0.444	0.553	0.377	0.300
Construction	0.114	0.073	0.090	0.181	0.076	0.035
Transportation	0.306	0.234	0.268	0.299	0.217	0.113
Wholesale and retail	0.247	0.182	0.215	0.221	0.198	0.081
Accommodation	0.159	0.105	0.128	0.145	0.107	0.041
Financial, Insurance and Real Estate	0.438	0.338	0.400	0.442	0.371	0.244
Social service	0.292	0.205	0.261	0.281	0.229	0.127
Public administration	0.473	0.375	0.425	0.443	0.395	0.247

2.3 Estimation models

To study whether an increase in the contribution rate of social security policies will reduce the incentives for migrant workers to participate in insurance, it is necessary to compare the changes in the participation of migrant workers in social security before and after the increase. However, other factors affecting the participation of migrant workers in social security also changed during this period. For example, the implementation of the new *Social Insurance Law* in 2011 will also have a huge impact on the participation of migrant workers. Therefore, it is necessary for us to introduce a Difference-in-Difference (DID), which is very suitable for assessing policy effects. The specific method of setting the DID model is to construct an "treat group" that has experienced an increase in social security contributions and a "control group" that has not undergone this change. By controlling other factors, comparison can be made between the "treat group" and "control group" so as to test the effects of policy implementation. Chengdu's unique social security policy changes regarding the migrant population provide a good opportunity to build a DID model. The transformation of social security system of non-urban employees

in construction companies and other companies are of vast difference in Chengdu. First of all, those in non-construction enterprises experienced a significant change from "comprehensive insurance" to "urban employee insurance" in 2011, and their social security contribution ratio has greatly increased, which can be regarded as an treat group. The policy for non-urban household registration employees in construction enterprises have basically remained unchanged. Their social security contribution ratio has been stable at 4%, which can be regarded as a control group. We use the differences in social security policies of different industries in Chengdu around 2011 to construct a Difference-in-Difference model:

$$Insurance_{it} = \beta_0 + \beta_1 Time_{it} + \beta_2 Industry_{it} + \beta_3 Industry_{it} * Time_{it} + X_{it}\gamma + \varepsilon_{it} \quad (1)$$

In this equation, *Insurance* represents whether the migrant participates in basic social insurance and based on the importance and practicability of insurance, can be divided into 3 categories: first, participate in work injury insurance; second, participate in work injury or medical insurance; third, participate in work injury, medical or endowment insurance. *Time* represents the time of policy change, which is set to 1 in the year of 2011 and thereafter, and 0 otherwise. *Industry* represents the industry in which migrant workers are located and is divided into four categories according to the nature and scale of the work: construction, wholesale and retail and accommodation and catering, manufacturing, and other industries. In order to test the effects of policy reform, we set the cross-term *Industry * Time*, which is set to 1 only when both "treat group" and "reform time" are 1. In other cases, the cross-term is set to 0. In this way, the impact of reforms from "comprehensive insurance" to "urban employee insurance" can be measured.

Other control variables *X* include: the nature of the company, duration of employment, monthly income, gender, age, ethnicity, education, marital status, family size, number of children under 15 in the household, monthly household income, and monthly household expenditure.

In the section of robust check, a triple difference model (DDD) is also constructed in this paper. *Time* represents the time of change and is set to 1 when the year is 2011 and thereafter, otherwise 0. *Treat* represents the "treat group" and "control group" in different industries. The construction industry, as the control group, is set to 0. Combined with the analysis in the previous section, the wholesale and retail and accommodation and catering industries are more suitable as the "treat group" and the value is 1. *City* represents the "treat group" and "control group" divided by city. Here Chengdu has undergone policy reform, so the "treat group" is selected as the value 1, and the other cities as the "control group" are valued as 0. The cross-term coefficients of *Time*, *Treat*, and *City* represent the estimates obtained after the triple difference, reflecting the net effect of the policy on the social security participations of the migrants in Chengdu's wholesale and retail and accommodation and catering industries. This is the focus of the study. The triple difference model is as follows:

$$Insurance = \beta_0 + \beta_1 Time_{it} + \beta_2 Treat_{it} + \beta_3 City_{it} + \beta_4 Time_{it} * Treat_{it} + \beta_5 Time_{it} * City_{it}$$
$$+ \beta_6 Treat_{it} * City_{it} + \beta_7 Time_{it} * Treat_{it} * City_{it} + X_{it}\gamma + \varepsilon_{it} \quad (2)$$

3. Results

3.1 Impacts of social insurance premium rates on migrants' insurance participation

Table 5 reports the estimation results of the DID model. First of all, there is no significant difference in the participation rate of migrant workers in the construction industry before and after the reform, which means the reform does not change the social security contribution ratio of migrant workers in the construction industry. Second, migrant workers engaged in wholesale and retail, accommodation and catering, manufacturing, and other industries have significantly higher social security participation than construction. For construction workers, work injury and medical insurance are very necessary, because they have a higher operating environment risk and are more likely to be accidentally injured or suffer from various occupational and chronic diseases. But even so, their participation rates are still low. Thirdly, the coefficients of the cross terms are all significantly negative, which indicate that the industries affected by the policy have reduced the participation rates of migrant workers due to the increase in the social security policy contribution rate (from 20% to nearly 40%). On the one hand, the policy makes the household registration system no longer an obstacle to restrict the participation of migrants in social insurance, and allow migrants to enjoy the right to participate in social security on an equal basis, thereby achieving the integration of social security and reflecting the equity in this field. On the other hand, it has hindered the popularization of social security among migrant population groups. Migrants often need social insurance more, but due to their low wages, poor bargaining power, low education, and heavy living burden, higher rates will make them exclude. The main difficulty of current social security participation of migrants is the low coverage. We should first consider the special characteristics of this group and formulate social insurance coverage and social security payment ratios that are suitable for them and gradually promote integration with urban employees.

Among other control variables, the social security participation rates of migrant population working in party or government agencies, state-owned / collective / associated enterprises are significantly higher than that of other companies, but these companies or agencies just contain less than 10% of the total migrant population. Private enterprises and individual industrial and commercial entities have lower compliance with social insurance contributions, but they consist of more than 80% of the migrant population. The longer migrants stay in the local area, the better they can integrate into the local area, and the higher the social security participation rates. The higher salary, the better the job and the stronger the bargaining power in the company, the more likely to obtain the social security paid by their companies. Gender, age, ethnicity, and marital status have no significant effect on social security participation. The higher the education degree, the more likely they are to enter a more formal enterprise and enjoy better treatments, and at the same time, their own awareness of insurance participation is also stronger. The size of the family does not affect the participation in social security, but the more children there are in the family, the more the economic cost of children's education make them unable to afford

the insurance costs. The higher the household expenditure, the better the family benefits and the higher social security participation rate.

Table 5
Impacts of social insurance premium rates on migrants' insurance participation: DID estimates results

	insurance1	insurance2	insurance3
Time	0.0412	0.0117	-0.0139
	(0.0409)	(0.0371)	(0.0375)
lindustry2	0.336***	0.327***	0.361***
(Wholesale, Retail and Accommodation)	(0.0290)	(0.0295)	(0.0298)
lindustry3(Manufacturing)	0.348***	0.317***	0.313***
	(0.0280)	(0.0286)	(0.0290)
lindustry4	0.234***	0.221***	0.237***
(Other industries)	(0.0299)	(0.0307)	(0.0310)
Time*ind_2	-0.252***	-0.182***	-0.199***
	(0.0408)	(0.0363)	(0.0368)
Time*ind_3	-0.0854**	-0.108***	-0.104***
	(0.0435)	(0.0379)	(0.0383)
Time*ind_4	-0.118***	-0.0494	-0.0455
	(0.0419)	(0.0377)	(0.0382)
Unit1(Private enterprise)	-0.125***	-0.181***	-0.190***
	(0.0219)	(0.0181)	(0.0177)
Unit2(Foreign-owned enterprise)	0.0635	0.0496	0.0359
	(0.0465)	(0.0347)	(0.0341)
Unit3(Small business)	-0.404***	-0.469***	-0.486***
	(0.0221)	(0.0184)	(0.0180)
Unit4(Others)	-0.166***	-0.254***	-0.269***
	(0.0604)	(0.0440)	(0.0440)
Working year	0.00887***	0.0116***	0.0126***
	(0.00155)	(0.00136)	(0.00138)

Note: 1) Here, the construction industry/work in party and government agencies or state-owned, collective, associated enterprises/primary schools and below are set as the benchmark group;
2) ***, **, * represent the significant level of 1%, 5%, 10% respectively, and the numbers in parentheses are robust standard errors. Unless with specification, the following are the same.

	insurance1	insurance2	insurance3
Ln_income	0.0669***	0.0676***	0.0771***
	(0.0159)	(0.0138)	(0.0139)
Gender	-0.00707	-0.0102	-0.0164
	(0.0121)	(0.0105)	(0.0105)
Age	0.00110	0.000338	0.000672
	(0.000832)	(0.000721)	(0.000723)
Ethnic	-0.0154	-0.0245	-0.00816
	(0.0521)	(0.0474)	(0.0474)
Edu1(Junior)	0.0474***	0.0700***	0.0777***
	(0.0164)	(0.0143)	(0.0145)
Edu2(Secondary)	0.179***	0.210***	0.218***
	(0.0203)	(0.0175)	(0.0176)
Edu2(College degree and above)	0.318***	0.339***	0.337***
	(0.0289)	(0.0240)	(0.0239)
Married	0.0104	0.0101	0.0194
	(0.0300)	(0.0268)	(0.0269)
Family members	-0.00368	0.000208	-0.000863
	(0.00803)	(0.00711)	(0.00713)
Child	-0.0272**	-0.0248**	-0.0269***
	(0.0113)	(0.0101)	(0.0101)
Ln_family income	0.00535	-0.00945	-0.0123
	(0.0121)	(0.0112)	(0.0112)
Ln_family expenditure	0.0132*	0.0138*	0.0160**
	(0.00776)	(0.00736)	(0.00725)
Year fixed effect	Yes	Yes	Yes

Note: 1) Here, the construction industry/work in party and government agencies or state-owned, collective, associated enterprises/primary schools and below are set as the benchmark group;
2) ***, **, * represent the significant level of 1%, 5%, 10% respectively, and the numbers in parentheses are robust standard errors. Unless with specification, the following are the same.

	insurance1	insurance2	insurance3
Observations	5,890	7,994	8,010
R-squared	0.225	0.228	0.239
Note: 1) Here, the construction industry/work in party and government agencies or state-owned, collective, associated enterprises/primary schools and below are set as the benchmark group; 2) ***, **, * represent the significant level of 1%, 5%, 10% respectively, and the numbers in parentheses are robust standard errors. Unless with specification, the following are the same.			

3.2 Impacts of the social insurance premium rates on the wages, working hours, and household expenditures of the migrants

Besides, this study also examines the impacts of the policy on the wages, working hours and welfare of migrant workers. As shown in Table 6, after 2011, the wages and benefits of migrant workers in the construction industry have significantly improved and working hours have decreased. The wages of workers in the construction industry are higher than those of other industries, which are consistent with common sense, because construction workers are highly engaged in occupational work and have more risks. Therefore, they should receive higher compensation. However, the household consumptions of construction workers are significantly lower. Household consumption is an important indicator of family welfare. This shows that construction workers have a hard time making money, and they have a heavy burden, so their lives are very tight. The working hours of construction workers are similar to those of manufacturing enterprises, which are higher than those of wholesale and retail and accommodation and catering industries. The latter have more free and flexible working hours, and their labor intensity is often lower. The policy has not caused change in monthly wage income. This may be due to three possibilities after the social security policy contribution rate rises: First, companies maintain the state of participation and assume more social security fees. Thus, they choose to reduce the wages of migrant population; Second, companies stop paying social security for employees and may subsidize by increasing wages. Third, companies still not pay the social security and do not change the wage of employees. As a result, the overall monthly wages of migrant workers do not change significantly. However, the weekly working hours of the migrant population have risen significantly, which may be due to companies are passing on the burden of social security costs in disguise by increasing working hours. Combining these two indicators, the hourly wage of the migrant population has fallen, which has led to a reduction in household consumption. In addition, the decrease in household consumption may also be due to the uncertain expectations of migrant workers about the future employment environment.

In summary, for the migrants, an increase in the contribution rate of social insurance policy reduce their participations in social security. The wages of the migrants do not significantly change but working hours have become longer. Their hourly wages have reduced to compensate the increased social security burden of enterprises, resulting in a decline in their consumptions and welfares.

Table 6

Impacts of the social insurance premium rates on the wages, working hours, and household expenditures of the migrants: DID estimation results

	income	work hours	expenditure
Time	0.502***	-8.752***	0.290***
	(0.0354)	(1.400)	(0.0687)
lindustry2	-0.209***	-2.304**	0.183***
(Wholesale, Retail and Accommodation)	(0.0280)	(1.084)	(0.0569)
lindustry3(Manufacturing)	-0.175***	0.783	0.121**
	(0.0270)	(1.062)	(0.0525)
lindustry4	-0.261***	-2.262**	0.252***
(Other industries)	(0.0298)	(1.119)	(0.0643)
Time*ind_2	-0.0530	3.553***	-0.237***
	(0.0343)	(1.308)	(0.0604)
Time*ind_3	0.0248	4.094***	-0.214***
	(0.0349)	(1.346)	(0.0578)
Time*ind_4	0.00302	3.836***	-0.262***
	(0.0363)	(1.353)	(0.0679)
Observations	8,102	7,082	8,102
R-squared	0.558	0.134	0.461

Note: 1) The first column is monthly salary income; the second column is weekly working hours; the third column is monthly household expenditure.2) The control variables are consistent with model 1 and due to space limitations, there is no report here.

4. Discussion

Since the pre-reform period was only 2009 and 2010, effective parallel trend testing cannot be performed. In order to avoid the potential risk that the construction industry may have different trends from other industries, we further use the Difference-in-Difference-in-Difference model (DDD) for testing. CMDS also covers data about other cities that have not experienced this policy change or have not adopted different policy arrangements for construction and non-construction companies, which provides us with the opportunity to use the DDD model. The 2009 survey sample includes five cities: Beijing, Shanghai,

Shenzhen, Chengdu, and Taiyuan which share a similar development trend. The other four cities than Chengdu can be used as the control group.

Table 7 reports the DDD estimation results of the impact of social security policy contribution rate on the participations of the migrants. We focus on the coefficients of Time * Treat * City. Among the three columns of measuring the participations of the migrants, the policy has obviously negative effects on wholesale and retail and accommodation industries in Chengdu, which is consistent with the DID results. Therefore, the estimation results of the DDD model show once again that an increase in the contribution rate of social security policy will reduce the social security participations of migrant workers. At the same time, as shown in Table 8, the policy has no significant impact on the wages and incomes of the migrants, but it reduces the welfares level of the migrant population. Furthermore, cities similar to Chengdu are selected as the control group to carry out triple difference. First, in Shenzhen, the migrants have always followed the basic social insurance system for urban employees, and the social security policy on migrants has not changed around 2011. Second, Chongqing, a city which shares many similar features with Chengdu, also experienced integration policy in 2011, but does not implement different social security policies for different industries. As shown in Tables 9 and 10, a consistent conclusion is obtained after changing the control group. Therefore, for the migrants, an increase in the social security policy contribution rate will reduce the participation of the migrant population and their welfare level.

Table 7
Impacts of social insurance premium rates on migrants' insurance participation: DDD estimates results

	insurance1	insurance2	insurance3
Time	-0.00629	-0.102***	-0.0944***
	(0.0220)	(0.0202)	(0.0204)
Treat	-0.0210	0.0108	0.0241
	(0.0186)	(0.0187)	(0.0188)
City	-0.157***	-0.133***	-0.125***
	(0.0279)	(0.0288)	(0.0291)
Time*Treat	0.0216	0.0841***	0.0780***
	(0.0217)	(0.0200)	(0.0201)
Time*City	0.0850**	0.121***	0.117***
	(0.0406)	(0.0356)	(0.0360)
Treat*City	0.329***	0.291***	0.310***
	(0.0325)	(0.0335)	(0.0337)
Time*Treat*City	-0.265***	-0.262***	-0.275***
	(0.0461)	(0.0410)	(0.0414)
Year fixed effect	Yes	Yes	Yes
City fixed effect	Yes	Yes	Yes
Observations	11,168	18,174	18,245
R-squared	0.161	0.183	0.194

Note: 1) The control variables are consistent with Model 1. Due to space limitations, there is no report here.

Table 8
Impacts of the social insurance premium rates on the wages, working hours, and household expenditures of the migrants: DDD estimation results

	income	work hours	expenditure
Time	0.773***	-9.950***	-0.106**
	(0.0182)	(0.640)	(0.0471)
Treat	-0.158***	-1.511***	0.131**
	(0.0170)	(0.574)	(0.0550)
City	-0.0932***	0.511	-0.173**
	(0.0290)	(1.090)	(0.0678)
Time*Treat	0.00732	1.459**	-0.0958*
	(0.0182)	(0.622)	(0.0557)
Time*City	-0.0202	-0.300	0.360***
	(0.0356)	(1.296)	(0.0712)
Treat*City	-0.0602*	1.087	0.0876
	(0.0323)	(1.194)	(0.0814)
Time*Treat*City	-0.0488	1.194	-0.196**
	(0.0395)	(1.440)	(0.0847)
Year fixed effect	Yes	Yes	Yes
City fixed effect	Yes	Yes	Yes
Observations	18,931	16,006	18,894
R-squared	0.547	0.156	0.489

Note: 1) The control variables are consistent with Model 1. Due to space limitations, there is no report here.

Table 9

Impacts of social insurance premium rates on migrants' insurance participation: DDD estimation results using Shenzhen as a control group

Panel A	insurance1	insurance2	insurance3
Time*Treat*City	-0.221**	-0.172**	-0.179**
	(0.0900)	(0.0787)	(0.0802)
Observations	3,312	4,714	4,726
R-squared	0.248	0.242	0.255
Panel B	income	work hours	expenditure
Time*Treat*City	-0.0445	7.929***	-0.490**
	(0.0849)	(2.449)	(0.249)
Year fixed effect	Yes	Yes	Yes
City fixed effect	Yes	Yes	Yes
Observations	4,784	4,168	4,780
R-squared	0.554	0.154	0.501
Note: 1) The control variables are consistent with Model 1. Due to space limitations, there is no report here.			

Table 10
Impacts of social insurance premium rates on migrants' insurance participation : DDD estimation results using ChongQing as a control group

Panel A	insurance1	insurance2	insurance3
Time*Treat*City	-0.212***	-0.148**	-0.157**
	(0.0689)	(0.0720)	(0.0739)
Observations	3,893	6,234	6,235
R-squared	0.154	0.171	0.171
Panel B	income	work hours	expenditure
Time*Treat*City	0.260***	6.169**	-0.969**
	(0.0779)	(2.630)	(0.401)
Year fixed effect	Yes	Yes	Yes
City fixed effect	Yes	Yes	Yes
Observations	6,269	5,061	6,267
R-squared	0.476	0.133	0.363
Note: 1) The control variables are consistent with Model 1. Due to space limitations, there is no report here.			

Conclusions

At present, the social insurance participation of migrant workers in China is low and social insurance benefits are inequitable. The unreasonable design of the social insurance pattern is an important reason for this dilemma, which is mainly reflected in two aspects. First, the "fragmentation" feature of China's social insurance has made it very difficult for the migrant workers to transfer their social insurance across regions. Secondly, the premium rate of social insurance for the migrant workers is high, and the rate of social insurance premiums borne by the migrant workers in most regions is over 10%, which is a high cost for the migrant workers to participate in social insurance. Academics have devoted sufficient attention to poor social insurance portability, and this paper empirically examined the impact of social insurance policy premium rates on migrant workers' incentives to participate in insurance. Based on the data of migrant workers from 2009−2016, a DID model is established using the changes in social insurance policies for the migrant workers in Chengdu. The results showed that migrant workers preferred lower premium rates, and higher premium rates significantly reduced the participation rate of migrant workers in social insurance. Meanwhile, the salary of migrant workers did not change significantly, but their working hours became longer and their consumption decreased. With the increase of policy premium rate, the incentive of migrant workers to participate in social insurance decreased even if the social insurance benefits become correspondingly better. Therefore, it is necessary to solve the problem

of insufficient incentives for migrant workers to participate in social security by formulating localized social insurance policies.

First, formulate a social security policy premium rate suitable for the migrants. Incentives for the participation of the migrants have greater flexibility, especially the policy premium rate, and need to be appropriately dealt with. Considering the actual situation of the migrant population, the social insurance premium rate of the migrant workers should be reduced so as to be more practical and expand willingness purchasing the insurance. The burden of migrants can also be reduced by cutting the premium base, subsidizing or even exempting some social premium costs. In this way, these migrants can truly enjoy the benefits brought by social insurance, thereby increasing the enthusiasm of migrants to participate in insurance and maximizing social insurance coverage.

Second, establish a comprehensive social insurance policy. Gradually integrate CI, UEBMI and other insurance types into a unified insurance, fundamentally changing the "fragmented" characteristics of insurance system. A unified social insurance system with multi-level payment ratios and social insurance benefits that are suitable for different groups of people can truly realize the nationalization and flexibility of the social insurance system.

Abbreviations

CI
Urban Employee Basic Medical Insurance
UEBMI
Urban Employee Basic Medical Insurance
DID
Difference in differences
DDD
Triple difference

Declarations

Ethics approval and consent to participate

Not applicable

Consent for publication

Not applicable

acknowledgement

Not applicable

Availability of data and materials

The datasets generated and/or analyzed during the current study are not publicly available due to the data confidentiality agreement, but are available from the corresponding author on reasonable request

Competing interests

The authors declare that they have no competing interests

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Authors' contributions

SZ led the study. He designed the study, led the data collection, analysis, and interpretation. YC contributed to the study design, provided input into the data analysis, and wrote the first draft of the manuscript. YT contributed to the study design, reviewed the manuscript and helped the writing of the final draft manuscript. MZ contributed to the study design, reviewed the manuscript and helped the writing of the final draft manuscript. All authors read and approved the final manuscript.

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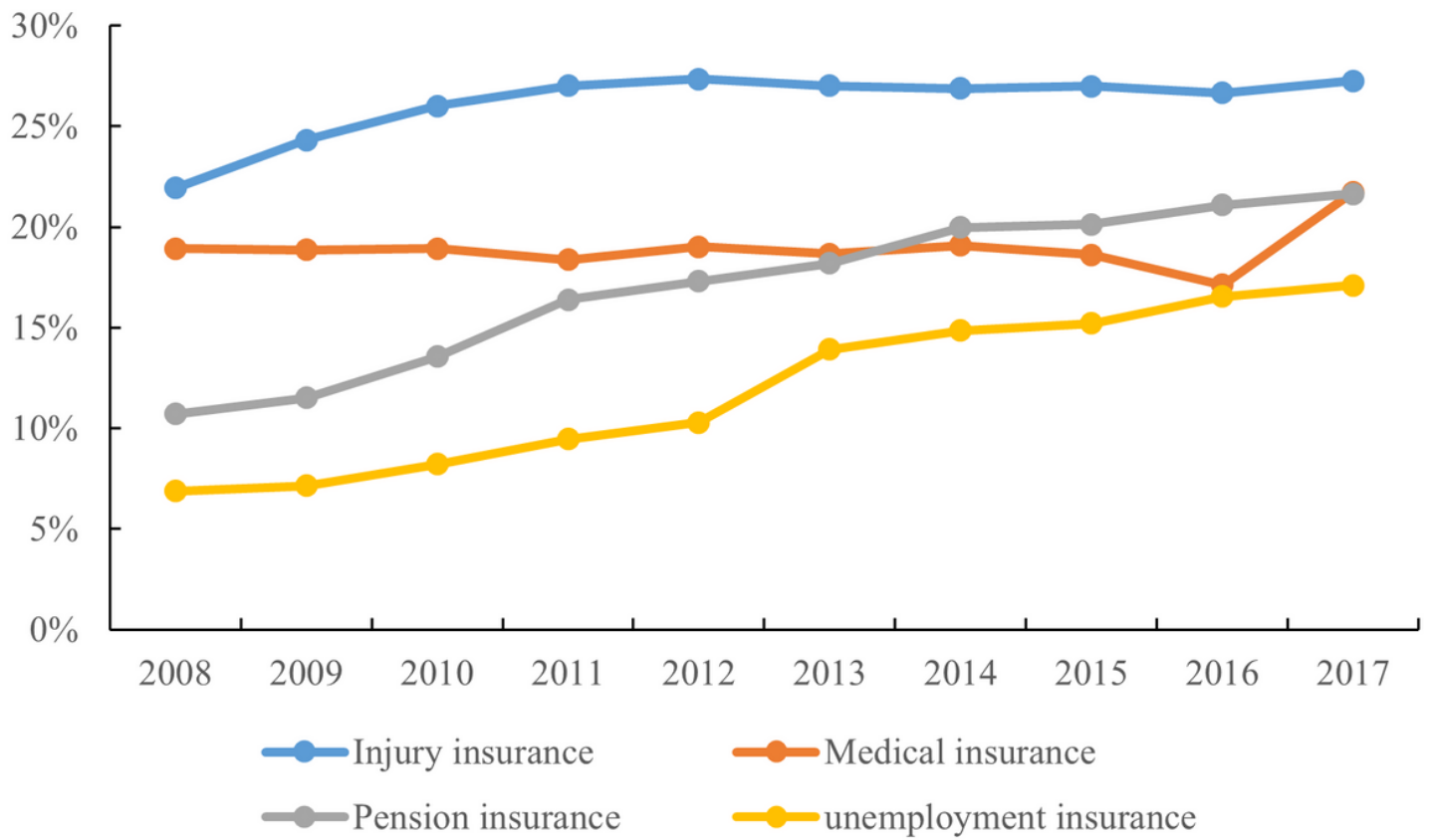
Figures

Figure 1

Proportion of migrant workers participating in urban basic social insurance Note: The data obtained from the Bulletin of Human Resources and Social Security Development Statistics (2008-2017)