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Article

The impact of urbanization and economic development on health insurance performance: Evidence from China

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Abstract: Many previous studies find no significant effect of health insurance on health outcome in rural areas of China. Many researchers believe this could be because of the characteristics of health care provision in those areas. In this paper, we aim to examine if urbanization will change the situation. Our research question focuses on if urbanization will change the participation and performance of health insurance on health outcome in a positive direction. Using a longitudinal sample drawn from the China Health and Nutrition Survey (CHNS), we employed multiple estimation strategies for multiple waves to handle the potential selection bias. We find that urbanization factors such as population density, transportations and housing are associated with probability of insurance participation. That is, urbanization related factors tend to increase people's willingness of insurance participation. We also conclude that urbanization improves the performance of insurance on self-reported health outcome. Results show that the health insurance has a significant positive impact on health production in urbanized areas. Health insurance in general increases the probability of health care utilization for all areas. However, it does not lead to a significant improvement in the health outcomes in under urbanized areas because of the health provision quality or characteristics of health insurance coverage in those areas.

Keywords: urbanization; economic development; health insurance; health care utilization; health economics

1. Introduction

China initiated it health reform in rural areas in 2003. The medical insurance project was called New Rural Cooperative Medical System (NCMS). Before NCMS, the old medical system introduced in 1950s collapsed as a result of the disappeared communes thanks to its economic reform in 1980s (Qiu, 2012). As a consequence, most people in rural areas of China are not insured, which increased the mortality and morbidity rates dramatically especially for the low income households. Therefore, the goal of NCMS is to relief the financial burden caused by medical treatment, to reduce the health care expense paid out of pocket by the rural population and to increase the overall health outcome in rural areas. NCMS is the most important health insurance nowadays in rural areas of China and the central and local government subsidized the system by paying 80% of the annual premium per capita and the rural residents pays 20% of premium (The Ministry of Health, China, 2012). The NCMS benefit packages are different in different regions. Different local governments are able to implement different reimbursement packages. NCMS benefits focuses more on inpatient services based on a formula with thresholds, co-payment and maximums payment. Outpatient services are paid by the individual medical savings accounts with a maximum. Given the objectives of NCMS to

improve the overall health outcome of the populations, many researchers have investigated the effectiveness of NCMS benefits and results have been either mixed or inconsistent, which may because of the characteristics of different rural regions, social classes or age group.

In this paper, we aim to examine and compare the overall effectiveness of health insurance on health production in urbanized, under urbanized and NCMS implemented areas based on a comprehensive longitudinal survey of China. We investigate if urbanization will change the participation and performance of health insurance on health outcome in a positive direction. Many previous studies find no significant or positive effect of health insurance or NCMS on health outcome in rural areas of China. This is probably because of the structure of rural health insurance plans or the quality of health care provision and health facilities in those areas. In this paper, we study if urbanization will change this situation. Our research question focuses on if urbanization will change the participation and performance of health insurance on health outcome in a positive direction.

2. Literature review

2.1. Health insurance and health outcomes in rural areas of China

The goal of health insurance or New Rural Cooperative Medical System (NCMS) in China is to improve the overall health outcome of the rural population. Many researchers have investigated the effectiveness of NCMS benefits and identified the relationship between NCMS and health outcomes. These studies in geographical distribution covered most of the provinces in the mainland of China. The results have been either mixed or inconsistent, which may because of the characteristics of different regions, social classes or age group.

A few previous studies found no significant positive effect of health insurance on health outcome in rural areas of China. Lei and Lin (2009) explored the impact of the NCMS by using a longitudinal sample drawn from the China Health and Nutrition Survey and employed multiple estimation strategies. They find the NCMS neither decreases out-of-pocket expenditure nor increased utilization of formal medical service nor improves health status. Despite the wide expansion of coverage, the impact of the NCMS was still limited. Chu (2010) explored that no significant effect was found between NCMS members and internal controls. Sickness or injury in the past four weeks was decreased among NCMS members compared with external controls. Li and Yang (2008) and Miao and Zhang (2008) found that it was no significant differences of sickness or injury in the past two weeks between the NCMS and non-NCMS members. Meng et al. (2009) believed there was no effect of NCMS on sickness or injury in the past four weeks between NCMS and non-NCMS members.

The above studies found no significant positive effect of health insurance on health outcome in rural areas of China. Many researchers believe this could be because of the structure of rural health insurance plans or the quality of health care provision or facilities in those areas.

Some previous studies found there was a positive effect of health insurance on health outcome in rural areas of China. Lipow (2010) discovered through research

that the individuals participating in the NCMS reduced the probability of being sick or injured in the past four weeks in Heilongjiang, Shandong and Hunan province. Feng (2009) found the members participating in the NCMS reduced the probability of being sick or injured in the past two weeks in Hubei and Sichuan province. On the other hand, some other studies find there was a negative effect of health insurance on health outcome in rural areas of China. Shen and Jiang (2008) discovered that the individuals participating in the NCMS increased the probability of being sick or injured in the past four weeks. Overall health status among NCMS members became worse compared with non-NCMS (Statistical information center, Ministry of Health, China, 2007).

Cheng et al. (2015) investigated the effects of NCMS on health outcomes and healthcare expenditure of the elderly in rural China. Results show that the NCMS has significantly improved the elderly enrollees' activities of daily living and cognitive function. They get more from NCMS participation in terms of health outcomes and perceived access to health care and NCMS helped reduce health inequalities among the rural elderly, but NCMS has not led to better self-assessed general health status and there is no evidence that the NCMS has reduced their out-of-pocket spending.

A few studies measured the self-reported health. Lei et al. (2009), Chu (2010) and Wu et al. (2010) used the DD method and PSM estimation and showed no improvement or very limited improvement of self-reported health after NCMS. In addition, Miao et al. (2008) and MOH (2007) found no effect or worse health outcome after NCMS, and the two cross-sectional studies without controlling any confounding factors showed 73.2% of the NCMS members and 74.7% of controls were assessed ‘‘very good’’ or ‘‘good’’ by themselves.

2.2. Health insurance and health service utilization in rural areas of China

Ma and Cen (2017) investigated the impact of the NCMS on health service utilization in Chinese rural region. Results showed that individual characteristic factors, enabling factors, health care need factors, and lifestyle factors affect health service utilization. NCMS does not affect health service utilization of individual when ill and it does not improve either health service utilization for patients or preventative health care for rural residents in China.

2.3. Health insurance and household catastrophic health expenditure

Some studies measured the household catastrophic health expenditure, which set 40% or 50% of household income as the catastrophic threshold proportion and focused on the relationship between NCMS and alleviating catastrophic health expenditure. Wagstaff et al. (2007) find NCMS appeared to have increased the incidence of catastrophic household out-of-pocket payments, at least where the catastrophic threshold is 20% or less of income. MOH suggested no effect (Statistical Information Center, Ministry of Health, China, 2007).

Yan et al. (2009) and Sun (2005) reported that NCMS reduced the incidence of catastrophic health expenditure. Sun (2005) utilized cross-sectional design and indicated that 6.23% of NCMS members faced catastrophic health spending, which

was lower than 13.10% for non-NCMS members.

Liang et al. (2012) had systematically searched and reviewed available evidence to estimate the effects of NCMS on health outcomes and on alleviating catastrophic health expenditure. They still had no clear evidence that NCMS improved the health outcomes and decreased the alleviating catastrophic health expenditure of the China's rural population. NCMS should be improved in provider payment method reforms, benefit package and information systems around in the future.

2.4. The impact of urbanization on health

Van de Poel et al. (2012) used community and individual-level longitudinal data from the China Health and Nutrition Survey (CHNS) to estimate the net impact of China's unprecedented urbanization. They found that urbanization raised the probability of reporting of poor health and that a greater degree of urbanization has a larger effect. The effect may be attributable to changed health expectations and also to operate through health behavior.

There is a growing body of literature regarding the effect of NCMS on health outcomes and alleviating catastrophic health expenditure. However, the results from these studies were in conflict: individual studies indicated that NCMS had positive, negative, or no effect on health outcomes and the incidence of catastrophic health payments, respectively. In this study, we try to examine the overall effectiveness of health insurance including NCMS on health production in different urbanized areas and examine if urbanization will change the situation.

3. Methods

We are interested in elevating the effect of insurance on health care access and self-reported health outcome in different case scenarios. More specifically, our objective is to identify the average treatment effect on the treated (ATT) with respect to the self-reported health given different levels of urbanization. Because the participation of health insurance is voluntary, there exists selection bias due to the unobserved heterogeneities between the insured and the uninsured. Our methodology is to employ difference-in-difference estimation with propensity score matching (PSMDD) to handle the selection bias between the treated and control groups on observed and unobserved heterogeneities that are constant over time or have a common time trend. According to Heckman (1999, 2009), this methodology compares differences between the pre- and post-treatment outcomes of the treated with those of the controlled by using the propensity score matching. Propensity score matching (PSMDD) is best used to control for selection bias, endogeneity, and heterogeneity issues. Therefore, it can generate robust and effective results between two waves, given the limited number of waves that we have in our survey of CHNS. By using the baselines and follow-ups before and after 2003, which is the year of the launch of the New Cooperative Medical Care System (NCMS), we will be able to estimate the effectiveness of NCMS.

Based on our longitudinal data with two or more waves, in theory, the average treatment effect on the treated could be described as:

$$\mathrm{ATT} = E\left(Y^1_{i,\mathrm{post}} - Y^1_{i,\mathrm{pre}} \middle| X^1_i, U^1_i, D_i = 1\right) - E\left(Y^0_{i,\mathrm{post}} - Y^0_{i,\mathrm{pre}} \middle| X^1_i, U^1_i, D_i = 1\right) \quad (1)$$

where Y_i^1 and Y_i^1 are treatment and non-treatment outcomes of an individual *i* before and after the treatment. We use subscripts (post, pre) to indicate the treatment stages. X_i^1 is a set of observed individual characteristics of the insurance participant *i*. U_i^1 represents a group of unobserved characteristics of *i*. D_i represents an indicator reflecting whether *i* is in the treatment group or, in other words, an insurance participant. Because $E\left(Y_{i,\text{post}}^0 - Y_{i,\text{pre}}^0 \middle| X_i^1, U_i^1, D_i = 1\right)$ is not observed, which is referred to a counterfactual variable that is not realized in our observed sample, it is usually assumed that participation status can be treated as random if the treated and control groups are matched on the observed characteristics $X_i^1 = X_i^0 = X$ (Rosenbaum and Rubin, 1985), such that $E\left(Y_i^0 \middle| X_i, U_i^1, D_i = 1\right) = E\left(Y_i^0 \middle| X_i, U_i^0, D_i = 0\right)$, so we get the following:

$$\text{ATT} = E\left(Y_{i,\text{post}}^1 - Y_{i,\text{pre}}^1 \middle| X_i, U_i^1, D_i = 1\right) - E\left(Y_{i,\text{post}}^0 - Y_{i,\text{pre}}^0 \middle| X_i, U_i^0, D_i = 0\right) \quad (2)$$

here, the unobserved U_i is the time-invariant or is time-variant but has the same time trend between participants and non-participants, as a results, the difference in the U_i can be eliminated by taking double differences. Based on assumption of the conditional independence that the potential outcomes are independent of participation status conditional on the covariates *X* (Rosenbaum and Rubin, 1983), we can estimate the ATT conditional on the propensity score, $P(D_i = 1|X_i)$. Then Equation (2) can be rewritten as

$$\begin{aligned}\text{ATT} = E\left(Y_{i,\text{post}}^1 - Y_{i,\text{pre}}^1 \middle| P(D_i = 1|X_i), D_i = 1\right) \\ - E\left(Y_{i,\text{post}}^0 - Y_{i,\text{pre}}^0 \middle| P(D_i = 1|X_i), D_i = 0\right)\end{aligned} \quad (3)$$

To implement the difference-in-difference estimation with propensity score matching (PSMDD), we first use a logit regression model to obtain the propensity score which is the probability of being in the treatment group given the observed covariates *X* in our sample. The outcome is an indicator variable reflecting whether the individual is in the treatment group or in the control group. Our covariates include age, gender, marital status, education, individual income, health behaviors such as smoking and drinking and urbanization indexes. We select individuals in the common support of the estimated propensity score. We match each individual in the treatment group with one or more individuals in the control group with close propensity scores. More specifically, we choose the kernel matching technique and use the weighted average of all comparable individuals in the control group to build the counterfactual outcome for each treated individual. The kernel function and bandwidth parameters are used to determine the weights. In this paper, we use the Gaussian kernel with default bandwidth of 0.06 specified by Stata.

Figures 1 and **2** give us the histograms of the estimated propensity scores for the treated and control groups before matching for the samples we selected in CHNS. For the purpose of robustness check, we created three samples with a different baseline year and follow up year for the difference-in-difference estimations. Our first and second sample features the baseline year of 1997 and follow up years of 2004 and 2006, and the third sample's baseline and follow up years are 2000 and 2004. The reason why we choose these three samples is because New Cooperative Medical Care System (NCMS) was introduced in the year of 2003. By using the baselines and follow-ups before and after 2003, we will be able to estimate the

effectiveness of NCMS. **Figures 1** and **2** features the baseline years of 1997 and 2003 for the treated and control groups before matching. As observing from the figures, we are able to perform the matching over the region of common support because the distributions of propensity score for the two groups overlap sufficiently.

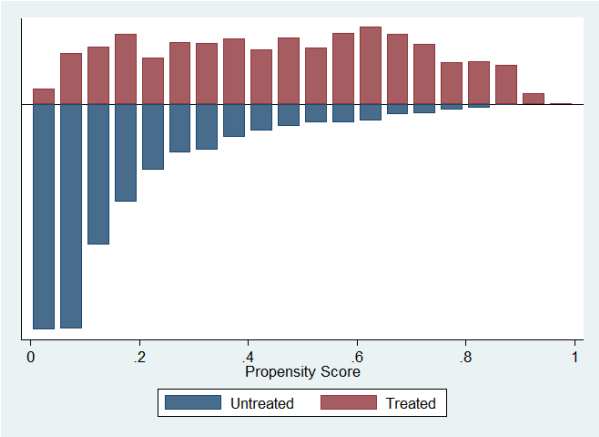

Figure 1. Histogram of the estimated propensity scores for the treated and control groups 1997.

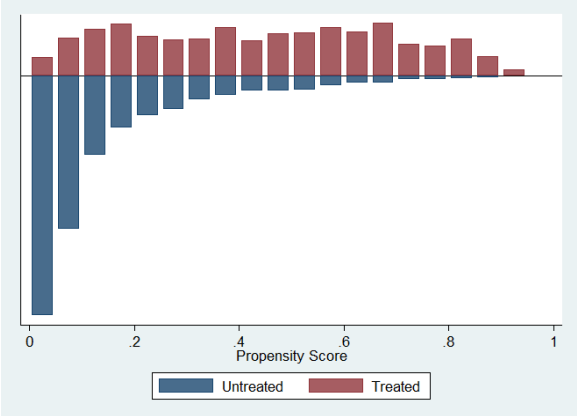

Figure 2. Histogram of the estimated propensity scores for the treated and control groups 2000.

Tables 1 and **2** report the results of balancing tests based on propensity score matching for two baseline years. The tables show the balancing property for each observed variable between the treated and control groups and the reduction in bias after we perform the matching. In these tables, the means of each variable for the treated and control groups were firstly reported, and then we check the significance of the difference between means by the two-sample *t*-test before and after matching respectively. Columns 3 and 4 report the standardized difference in means before and after matching for the treated and control groups, and column 6 reports the percentage reduction in the bias through matching. The results indicate that through the matching, most covariates' characteristics are balanced well between the treated and control groups. *T*-statics are highlighted in bold and indicate that the initial differences in the two groups are reduced considerably and become statistically insignificant after we perform the matching.

Table 1. Balancing test for samples 1 and 2 (Baseline, 1997).

	Unmatched	**Mean**			**% Reduction**	***t*-test**	
Variable	**Matched**	**Treated**	**Control**	**% Bias**	**Bias**	***t***	***p* > |*t*|**
Age	**U**	**43.636**	**40.050**	**22.0**		**8.67**	**0.000**
	M	43.636	43.576	0.4	98.3	0.12	0.905
Gender	**U**	**1.462**	**1.512**	**−10.1**		**−4.06**	**0.000**
	M	1.462	1.479	−3.4	66.1	−1.13	0.259
Elementary school	**U**	**0.177**	**0.299**	**−29.0**		**−11.13**	**0.000**
	M	0.177	0.191	−3.3	88.6	−1.18	0.239
High school	**U**	**0.154**	**0.259**	**−26.1**		**−10.01**	**0.000**
	M	0.154	0.156	−0.3	98.7	−0.13	0.900
College and above	U	0.306	0.322	−3.5		−1.40	0.162
	M	0.306	0.313	−1.5	57.2	−0.49	0.621
Married	**U**	**0.798**	**0.708**	**20.8**		**8.11**	**0.000**
	M	0.798	0.767	7.2	65.2	2.47	0.013
Smoking	U	0.308	0.303	1.1		0.44	0.657
	M	0.308	0.304	0.9	18.3	0.30	0.766
Drinking	**U**	**0.412**	**0.324**	**18.3**		**7.40**	**0.000**
	M	0.412	0.401	2.3	87.3	0.74	0.457
Waiting time	**U**	**21.163**	**14.472**	**27.2**		**11.57**	**0.000**
	M	**21.163**	**24.135**	**−12.1**	**55.6**	**−3.17**	**0.002**
Health care cost	**U**	**30.102**	**19.075**	**35.8**		**15.69**	**0.000**
	M	30.102	31.102	−3.2	90.9	−0.85	0.395
Calorie intake	**U**	**2242.100**	**2336.700**	**−13.9**		**−5.44**	**0.000**
	M	2242.100	2242.600	−0.1	99.5	−0.02	0.981
Household size	**U**	**3.805**	**4.301**	**−35.1**		**−13.70**	**0.000**
	M	3.805	3.818	−0.9	97.5	−0.30	0.765
Urban density	**U**	**6.273**	**5.536**	**54.9**		**22.01**	**0.000**
	M	6.273	6.226	3.5	93.7	1.13	0.260
Economic score	**U**	**5.914**	**3.450**	**83.6**		**34.59**	**0.000**
	M	5.914	5.973	−2.0	97.6	−0.62	0.533
Housing score	**U**	**6.956**	**4.641**	**92.4**		**37.24**	**0.000**
	M	6.956	6.913	1.7	98.1	0.57	0.568
Transportation score	**U**	**6.498**	**4.940**	**63.5**		**24.46**	**0.000**
	M	6.498	6.610	−4.5	92.9	−1.58	0.113
Urban markets score	**U**	**5.578**	**3.641**	**63.1**		**24.94**	**0.000**
	M	5.578	5.575	0.1	99.8	0.04	0.969
Northern provinces	**U**	**0.105**	**0.135**	**−9.1**		**−3.55**	**0.000**
	M	**0.105**	**0.084**	**6.6**	**27.8**	**2.39**	**0.017**
Central provinces	U	0.122	0.118	1.0		0.41	0.681
	M	0.122	0.118	1.1	−11.5	0.38	0.707
Southern provinces	**U**	**0.112**	**0.147**	**−10.4**		**−4.04**	**0.000**
	M	0.112	0.119	−2.2	78.7	−0.76	0.446
Eastern provinces	**U**	**0.065**	**0.097**	**−11.6**		**−4.46**	**0.000**
	M	0.065	0.058	2.9	75.1	1.08	0.281
Western provinces	**U**	**0.104**	**0.160**	**−16.8**		**−6.43**	**0.000**
	M	0.104	0.112	−2.5	85.2	−0.88	0.377

Table 2. Balancing test for sample 3 (Baseline, 2000).

	Unmatched	**Mean**			**% Reduction**	***t*-test**	
Variable	**Matched**	**Treated**	**Control**	**% Bias**	**Bias**	***t***	***p*** **>** **|*t*|**
Age	**U**	**46.060**	**41.914**	**25.4**		**8.92**	**0.000**
	M	46.060	45.445	3.8	85.2	1.07	0.284
Gender	**U**	**1.456**	**1.524**	**−13.7**		**−4.86**	**0.000**
	M	1.456	1.432	4.7	65.5	1.35	0.178
Elementary school	**U**	**0.151**	**0.237**	**−21.9**		**−7.42**	**0.000**
	M	0.151	0.151	0.0	100.0	0.00	1.000
High school	**U**	**0.131**	**0.264**	**−33.8**		**−11.22**	**0.000**
	M	0.131	0.120	3.0	91.1	1.01	0.313
College and above	**U**	**0.271**	**0.357**	**−18.5**		**−6.45**	**0.000**
	M	0.271	0.284	−2.7	85.5	−0.79	0.432
Married	**U**	**0.820**	**0.735**	**20.4**		**6.98**	**0.000**
	M	0.820	0.794	6.1	69.9	1.83	0.068
Smoking	U	0.316	0.299	3.8		1.35	0.177
	M	0.316	0.294	5.0	−31.3	1.41	0.157
Drinking	**U**	**0.409**	**0.321**	**18.4**		**6.63**	**0.000**
	M	0.409	0.399	2.1	88.8	0.57	0.566
Waiting time	**U**	**17.165**	**10.864**	**26.8**		**9.63**	**0.000**
	M	17.165	17.470	−1.3	95.2	−0.35	0.723
Health care cost	**U**	**47.478**	**26.420**	**51.0**		**19.48**	**0.000**
	M	47.478	48.703	−3.0	94.2	−0.72	0.471
Calorie intake	U	2259.100	2267.000	−1.2		−0.42	0.675
	M	2259.100	2276.800	−2.7	−125.1	−0.79	0.430
Household size	**U**	**3.640**	**4.073**	**−30.8**		**−10.80**	**0.000**
	M	3.640	3.695	−3.9	87.4	−1.15	0.248
Urban density	**U**	**6.560**	**5.626**	**70.2**		**24.84**	**0.000**
	M	6.560	6.602	−3.1	95.6	−0.90	0.370
Economic score	**U**	**6.574**	**3.983**	**83.5**		**30.12**	**0.000**
	M	6.574	6.434	4.5	94.6	1.30	0.195
Housing score	**U**	**8.048**	**5.395**	**120.4**		**40.82**	**0.000**
	M	8.048	8.018	1.4	98.9	0.43	0.670
Transportation score	**U**	**6.588**	**5.555**	**44.8**		**14.93**	**0.000**
	M	6.588	6.502	3.8	91.6	1.21	0.227
Urban markets score	**U**	**5.790**	**4.388**	**44.9**		**15.37**	**0.000**
	M	5.790	5.903	−3.6	91.9	−1.09	0.276
Northern provinces	**U**	**0.063**	**0.123**	**−20.8**		**−6.84**	**0.000**
	M	0.063	0.040	7.9	61.9	2.94	0.003
Central provinces	**U**	**0.056**	**0.112**	**−20.1**		**−6.60**	**0.000**
	M	0.056	0.052	1.6	92.2	0.54	0.587
Southern provinces	**U**	**0.089**	**0.114**	**−8.1**		**−2.79**	**0.005**
	M	0.089	0.084	1.8	77.2	0.56	0.573
Eastern provinces	U	0.068	0.074	−2.5		−0.86	0.388
	M	0.068	0.058	3.9	−56.7	1.16	0.247
Western provinces	**U**	**0.072**	**0.137**	**−21.3**		**−7.03**	**0.000**
	M	0.072	0.089	−5.5	74.2	−1.75	0.080

4. Data

Our paper uses the data from China Health and Nutrition Survey (CHNS) to perform the study of the effectiveness of health insurance in the different areas with different urbanization levels. The survey was conducted by the Carolina Population Center at the University of North Carolina at Chapel Hill and the National Institute for Nutrition and Health at the Chinese Center for Disease Control and Prevention. The first round of the CHNS was collected in 1989 and six subsequent surveys were conducted in 1991, 1993, 1997, 2000, 2004, and 2006. Since 1997, new households in original communities were also added to replace households no longer participating in the study. Also since 1997, new communities in original provinces have been added to replace sites no longer participating. There are about 4400 households in the overall survey, covering some 19,000 individuals. We uses sample drawn from the wave 1997, 2000, 2004 and 2006 to perform three difference-in-difference analysis. There are nine provinces included in CHNS with substantial variations with respect to geography, demographics, health, nutrition and socioeconomic factors such as income, employment, education, and modernization. The sample is diverse. There are four counties surveyed in each province including both rural and urban areas which covered both under developed and developed locations. Randomly selected households with different income and educational levels are included in the sample.

Our key outcome variables are health outcome and health care utilization. health outcome variable “good health” is derive from the self-reported health in the questionnaires of the survey, in which 0 stands for the poor and fair health and 1 represents the good and excellent health. Health care utilization includes the utilization of formal and preventive medical services in the past four weeks such as general physical examination other types of examinations for specific conditions hearing and vision examinations. Our samples are categorized into two types: urbanized areas and under urbanized areas. CHNS documents an urban index that indicates the urbanization level of each community. The maximum value of the urban index in our data is 106, and we use the median value 53 as a threshold for the urbanized and under urbanized areas. **Table 3** describes the summary statistics of our samples. As we can see from the table, the individuals in different areas differ in several aspects. People living in urbanized areas have higher probability of reporting good health. The percentage of people using medical services and participating health insurance is higher in urbanized areas. For example, the probability of participating health insurance is 20.3 percentage points higher in the urbanized areas. Those who live in the urbanized are generally more educated, less likely to smoke, with longer waiting time and higher health care costs. In addition, people living in urbanized areas have higher development scores with respect to economy, population density, housing, transportation, etc.

Table 3. Summary statistics for China.

	All areas	**Under urbanized areas**	**Urbanized areas**
Good health	0.655	0.663	0.648
	(0.475)	(0.473)	(0.477)

Table 3. (*Continued*).

	All areas	**Under urbanized areas**	**Urbanized areas**
Health service utilization	0.0280	0.0197	0.0359
	(0.165)	(0.139)	(0.186)
Insurance	0.287	0.184	0.387
	(0.452)	(0.387)	(0.487)
Age	37.30	35.07	39.53
	(19.58)	(18.96)	(19.93)
Gender	1.506	1.497	1.516
	(0.500)	(0.500)	(0.500)
Years of education	7.846	6.872	8.821
	(4.076)	(3.614)	(4.275)
Married	0.684	0.662	0.704
	(0.465)	(0.473)	(0.456)
Smoking	0.295	0.305	0.286
	(0.456)	(0.460)	(0.452)
Drinking	0.317	0.312	0.321
	(0.465)	(0.464)	(0.467)
Waiting time	11.76	8.693	14.86
	(20.88)	(18.13)	(22.92)
Health care quantity	1.533	1.564	1.502
	(0.699)	(0.701)	(0.696)
Medicine available	0.986	0.985	0.986
	(0.118)	(0.121)	(0.116)
Health care cost	33.22	21.97	44.79
	(47.32)	(29.00)	(58.43)
Calorie intake	2142.5	2192.9	2095.4
	(717.1)	(735.0)	(696.8)
Household size	3.945	4.181	3.708
	(1.545)	(1.515)	(1.539)
Urban density	5.791	5.159	6.423
	(1.380)	(1.190)	(1.262)
Economic score	5.118	3.000	7.233
	(3.234)	(2.151)	(2.708)
Housing score	6.019	4.108	7.927
	(2.596)	(1.609)	(1.898)
Transportation score	5.584	4.324	6.842
	(2.548)	(2.347)	(2.075)
Urban markets score	4.449	2.351	6.544
	(3.116)	(2.315)	(2.295)
N	66422	33189	33233

5. Results

From **Table 4**, based on the results of fixed effect logit regressions between 1997 and 2006, we investigate the factors that affect the insurance participation. We find that individual factors such as age, health behaviors such as smoking, drinking and calorie intake are significantly associated with probability of insurance participation for both males and females. The individual income is positively associated with insurance participation, which indicates that government subsidies may increase the likelihood of the insurance participation. Quantity of health care facilities and health care cost also positively predict the participation of the health insurance. In addition, urban development factors with respect to population density, economy, housing, transportation and market access significantly influence the probability of participating health insurance in a positive direction. Urbanization plays an important role in people's willingness of insurance participation.

Table 4. Fixed effect logit estimation for health insurance.

	Model A	**Model B (male)**	**Model C (female)**
Insurance			
Age	0.153***	0.134***	0.178***
	(0.0239)	(0.0315)	(0.0367)
Age2	0.0357	0.0690	−0.0453
	(0.234)	(0.310)	(0.357)
Education	−0.0107	−0.0118	−0.0107
	(0.0079)	(0.0122)	(0.0105)
Log (1 + income)	0.142***	0.177***	0.112**
	(0.031)	(0.044)	(0.043)
Smoking	0.136	0.0297	0.802***
	(0.0906)	(0.0967)	(0.263)
Drinking	0.203***	0.219**	0.138
	(0.0724)	(0.0875)	(0.129)
Waiting time	−0.00143	−0.00158	−0.00161
	(0.00136)	(0.00182)	(0.00207)
Health care quantity	0.163***	0.150***	0.181***
	(0.0377)	(0.0538)	(0.0531)
Medicine available	0.225	0.293	0.124
	(0.247)	(0.325)	(0.382)
Health care cost	0.172***	0.211**	0.142*
	(0.0591)	(0.0884)	(0.0793)
Calorie intake	0.172***	0.197***	0.134**
	(0.0389)	(0.0512)	(0.0604)
Household size	−0.0186	−0.0217	−0.0222
	(0.0273)	(0.0378)	(0.0394)
Urban density	0.325***	0.322***	0.315***
	(0.0572)	(0.0810)	(0.0812)
Economic score	0.0974***	0.0938***	0.100***
	(0.0116)	(0.0164)	(0.0166)
Housing score	0.0988***	0.0839**	0.112***
	(0.0288)	(0.0403)	(0.0414)
Transportation score	0.0445***	0.0274*	0.0649***
	(0.0117)	(0.0165)	(0.0167)

Table 4. (*Continued*).

	Model A	**Model B (male)**	**Model C (female)**
Urban markets score	0.0371*** (0.0127)	0.0348** (0.0176)	0.0429** (0.0185)
N	10,789	5291	5498

Standard errors in parentheses: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Tables 5 and **6** reports the average treatment effect on the treated (ATT) of health insurance on health outcomes and health care utilizations in different areas by using difference-in-difference estimation (DID) and difference-in-difference estimation with propensity score matching (PSMDID) respectively. Results are consistent in these two tables. From the results of **Tables 5** and **6**, the ATT is either negative or insignificant in under urbanized areas. That is to say, after we control for the selection bias, the health insurance plans in under urbanized areas does not lead to a significant improvement on individuals' health outcomes; while, in urbanized areas, health insurance is more effective when it comes to the health improvement. This is probably because of the different health provision quantity and quality or characteristics of health insurance coverage between urbanized and under urbanized areas. For example, in under urbanized areas, most people are insured under local government medical insurance or New Cooperative Medical Care System (NCMS) which only covers basic health care examinations and screening. As a result, in the row 7 of both tables, we also examined the ATT of health insurance for those insured under the NCMS in under urbanized areas. As consistent to most previous literatures, the NCMS is not effective in producing good health. In the rest part of the tables from row 9, we also report the ATT of health insurance on health care utilization. In both urbanized and under urbanized areas, the health insurance significantly increases the probability of medical care utilization.

Table 5. Result of treatment effect of health insurance based on DD.

	Sample 1	**Sample 2**	**Sample 3**
Good health (all areas)	−0.0243 (0.0136)	0.00766 (0.0143)	0.0450*** (0.0156)
Observations	21,688	22,060	20,897
Good health (under urbanized areas)	−0.0838*** (0.0222)	−0.0459* (0.0251)	0.0389 (0.0323)
Observations	10,357	11,196	9747
Good health (urbanized areas)	**0.00688 (0.0180)**	**0.0432** (0.0185)**	**0.0389** (0.0191)**
Observations	11,331	10,864	11,150
Good health (NCMS areas)	−0.129*** (0.0230)	−0.106 (0.0262)	−0.0388 (0.0312)
Observations	7836	5693	5051
Medical use (all areas)	0.00987** (0.00448)	0.0254*** (0.00484)	0.01000** (0.00486)
Observations	24,775	25,119	25,980
Medical use (under urbanized areas)	0.0181*** (0.00619)	0.0188*** (0.00676)	0.0473 (0.00748)

Table 5. (*Continued*).

	Sample 1	**Sample 2**	**Sample 3**
Observations	12,142	13,035	12,779
Medical use (urbanized areas)	**0.00697 (0.00662)**	**0.0225*** (0.00734)**	**0.0259*** (0.00691)**
Observations	12,633	12,084	13,201
Medical use (NCMS areas)	0.0149 (0.00921)	0.0137 (0.0116)	0.0392 (0.0134)
Observations	8630	6311	5954

Standard errors in parentheses: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 6. Result of treatment effect of health insurance based on PSMDD.

	Sample 1	**Sample 2**	**Sample 3**
Good health (all areas)	−0.00507 (0.0196)	0.0377** (0.0169)	0.0702*** (0.0189)
Observations	15,903	14,854	13,559
Good health (under urbanized areas)	−0.0765* (0.0309)	−0.0174 (0.0222)	0.0608 (0.0282)
Observations	7697	7439	6070
Good health (urbanized areas)	**0.0766*** (0.0281)**	**0.0861*** (0.0265)**	**0.0684** (0.0266)**
Observations	7872	6928	7114
Good health (NCMS areas)	−0.0736* (0.0396)	−0.0155 (0.0351)	0.00345 (0.0445)
Observations	5632	3566	2851
Medical use (all areas)	0.0222*** (0.00741)	0.0339*** (0.00666)	0.0130* (0.00717)
Observations	18,046	17,030	16,469
Medical use (under urbanized areas)	0.0195* (0.0110)	0.0236*** (0.00743)	0.0358*** (0.0109)
Observations	8951	8771	7754
Medical use (urbanized areas)	**0.0243** (0.0112)**	**0.0503*** (0.0112)**	**0.0228** (0.0103)**
Observations	8712	7718	8279
Medical use (NCMS areas)	0.0270* (0.0153)	0.0625*** (0.0146)	0.0464** (0.0195)
Observations	6224	3958	3354

Standard errors in parentheses: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

6. Conclusion

In this paper, we examine the factors determining the participation and performance health insurance in China. We study the overall effectiveness of health insurance on health outcome and health care utilization of individuals who live in urbanized areas and under urbanized areas. We conclude that urbanization is favorable for health insurance participation. We also find that health insurance in rural areas has either weakly negative or no significant effects on health status, even after the introduction of the New Cooperative Medical Care System (NCMS).

However, the effects turn into positively significant in urbanized areas, which suggest that urbanization may be one of the important factors that affect the effectiveness of health insurance. One explanation could be that urbanization increases not only the quantity but also the quality of health care provision indicated by more experienced and specialized doctors, more advanced medical devices and more detailed examinations process, etc. Another explanation of the different results between the urbanized and under urbanized areas may be because of the different coverage characteristics in those areas, such as different copayment, coinsurance, maximum out of pocket, and maximum doctor visits, etc. In CHNS, we do not observe the detailed health insurance coverage characteristics, which may limit our results. In the future, more detailed work could be given a more detail information of health insurance. The lack of detailed information on health insurance coverage characteristics in CHNS may limit the results; however, as the newer waves of the CHNS come out with more detailed survey questions regarding the increase in health insurance coverage, we will be able to get more accurate estimation results in the future.

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