The Expansion of Public Health Insurance and the Demand for Private Health Insurance in Rural China

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Abstract

This paper examines the impact of the New Cooperative Medical Scheme (NCMS) on private health insurance purchasing decisions in rural China, using longitudinal data from the China Health and Nutrition Survey (CHNS, 2000-2006). A Difference-in-difference (DID) approach is employed to estimate NCMS effects. The overall effects of NCMS were modest, but differed for adults and children. We find that adults were 2.1 percent more likely to purchase private health insurance when NCMS became available. NCMS had a larger positive effect on adult private coverage in higher income groups and in communities with a preexisting health care financing system, known as the Cooperative Medical Scheme (CMS). We also find evidence suggesting that NCMS crowded out child private health insurance, especially in lower income groups. However, this finding is not robust to controlling for other covariates including household characteristics and availability of private insurance in the community. For both adults and children, risk preferences and socio-economic status, including income and education, are important predictors of private insurance take-up. We find no evidence for adverse selection in the demand for private health insurance.

JEL Classification: I1; D1; H4

Keywords: New Cooperative Medical Scheme; Private health insurance; Rural China

1. Introduction

Since the initiation of market reforms in the 1980s, China's growing economy has resulted in an extraordinary reduction in poverty, lifting approximately 500 million of people out of poverty (World Bank, 2002). The sharp decline in the rural poor accounted for 75 to 80 percent of the drop in the national poverty rate during the period 1981-2001 (Ravallion & Chen, 2007). Nevertheless, the development of China's health care system lagged far behind its economic growth (World Bank, 1997; Eggleston et al., 2008). Inadequate government investment in the health care sector, combined with rapidly escalating medical costs, increased the burden of individual out-of-pocket health expenditures from 23.2 percent of total medical expenditures to 49.3 percent by 2006 (China Statistical Yearbook, 2008). Moreover, over 90 percent of the 0.9 billion rural population were uninsured in 1998 (Liu, 2004a). Soaring out-of-pocket medical expenses have not only become a direct financial threat to low-income rural residents, but also created a financial barrier to health care access, thus contributing to the cycle of poverty associated with poor health (Liu, Rao, & Hsiao, 2003; Hennock, 2007; Yip & Hsiao, 2009).

To address this problem, in 2003 the Chinese government began to re-establish the health care system in rural China, implementing a nationwide project known as the New Cooperative Medical Scheme (NCMS). The NCMS replaced the old village-based rural health financing system, known as the Cooperative Medical Scheme (CMS). The NCMS was first implemented in 304 pilot rural counties from 31 provinces, then expanded to 620 counties (about 22 percent of all rural counties) in 2005 (Liu, 2004b; World Bank, 2005), and aims at covering all rural counties by the end of 2010.

The NCMS seeks to provide low-cost basic health care services, including inpatient, catastrophic, and some types of outpatient care, but it cannot finance full health protection for the entire rural population (Central Committee of CPC, 2009). Additional diversified supplemental medical insurance, such as private health

insurance programs, are required to satisfy different medical care needs beyond those covered by the NCMS (Bhattacharjya & Sapra, 2008).

Since its launch in the 1980s, the private health insurance industry has remained relatively small. Although private health insurance premiums amounted to 23.9 billion RMB in 2003, it only accounted for 3.6 percent of national health care expenditures (Guo & Duan, 2007). There are nearly 100 private insurers of different size and complexity, offering over 700 health insurance products in the market (Guo & Duan, 2007; Bhattacharjya & Sapra, 2008). However, these private health insurance products mainly focus on inpatient care and catastrophic coverage, and typically do not include long-term care coverage and disability income insurance (Wang, 2009). In 2003, only 6 percent of urban and 8 percent of rural residents were covered by private health insurance (Swiss Re, 2007).

The expansion and development of the rural public health insurance system poses a tremendous challenge as well as an opportunity for private health insurance, which the government has identified as an important component of China's "multi-level health insurance system" (Central Committee of CPC, 2009；Blomqvist，2009). As part of this initiative, public health insurance is being developed as the main health insurance system, with private health insurance serving an important supplementary role to satisfy diverse health care needs.

However, research has shown that the role and function of private health insurance differ depending on a country's specific economic, social and institutional development (Liu & Chen, 2002; Savedoff & Sekhri, 2005; Drechsler & Jütting, 2007), and its potential overlap with public insurance may significantly impact the entire system's effectiveness (Swiss Re, 2007). Unfortunately, very few studies have empirically investigated the relationship between public and private health insurance in the evolving Chinese rural health care protection system. Moreover, there is no evidence about the impacts on the private health insurance market brought about by the rapid expansion of NCMS.

To shed light on these issues, this paper empirically examines the impact of NCMS on private health insurance purchasing decisions in rural China, using longitudinal data from the three most recent waves of the China Health and Nutrition Survey (CHNS: 2000, 2004 and 2006). A difference-in-difference (DID) approach is employed to estimate the impact of NCMS by comparing private health insurance coverage in treated groups to control groups, before and after the implementation of NCMS. We also investigate the role of other factors, especially individual traits, associated with the purchase of private health insurance. Separate estimates are provided for children and adults. The demand for private health insurance may vary by income class and as a result, the expansion of NCMS may work differently by income group. To investigate this, we also stratify the sample by mean income and perform separate estimates by income groups.

The remainder of this paper is divided into six parts. Section 2 briefly describes the history of public health insurance in rural China. Section 3 reviews the relevant literature. Section 4 describes our estimation strategy. Data and variables are discussed in Section 5 and the results are presented in Section 6. Section 7 concludes.

2. Public Health Insurance in Rural China

During the 1950s through the 1970s, a village-based health care financing system, known as the Cooperative Medical Scheme (CMS), provided health care coverage for most of the Chinese rural population. As an integrated part of the overall collective system for agricultural production and social services in China, the CMS was primarily financed by the collective welfare fund and ensured access to basic health care services, mainly preventive and outpatient care (Feng et al., 1995; Liu, 2004b; You & Kobayashi, 2009). With the launch of market economic reforms in 1978, there was a transition from the collective system to what is termed the "household responsibility system". As a result, the CMS lost its funding base, and collapsed in

most rural areas which led to rapidly-escalating medical expenditures as well as barriers to basic health care access (Dong, 2009). During the 1990s, there were numerous efforts to re-establish some form of rural CMS on a pilot basis, supported by the government and international organizations (Carrin et al., 1999; Wagstaff & Yu, 2007). However, most of these efforts failed to remain financially viable or to provide needed coverage, especially in poor rural areas, due to "inadequate funding, dwindling political interest and poor management" (You & Kobayashi, 2009, p.2).

The New Cooperative Medical Scheme (NCMS) differs from the old CMS in many aspects such as the nature of financing, the degree of risk pooling, government management responsibilities and covered services (You & Kobayashi, 2009). More specifically, the NCMS is a government-run voluntary insurance program operated at the county level, financed by low household contributions and high government subsidies shared between central and local governments. In contrast, the old village-based CMS did not enjoy any subsidies from other government entities.

Participation in the NCMS is determined at the household level, in contrast to the individual level for the old CMS. To enroll in the NCMS, the household has to pay 10 RMB per person in annual premiums, supplemented by a local government subsidy of 10-20 RMB per person, and a central government subsidy 10-20 RMB per person in the poorer central and western regions. The subsidies from both central and local governments increased to 40 RMB per person in 2006, and the minimum requirement for household contribution was also raised to 20 RMB per person.

The benefit package and coverage levels vary considerably across counties having different local income levels. However, due to limited financing, most counties usually restrict the coverage to inpatient services for catastrophic illness, and typically don't cover outpatient services at all or cover them only partially (You & Kobayashi, 2009; Wagstaff et al., 2009a). The reimbursement levels for inpatient costs are often extremely low, reflecting large deductibles, low ceilings, and high coinsurance rates. Studies on the impact of NCMS show that it has improved access

to and utilization of inpatient and outpatient health care, but has not reduced out-of-pocket medical spending, especially catastrophic health expenditure risk (Wagstaff et al., 2009a; Wagstaff et al., 2009b; You & Kobayashi, 2009; Lei & Lin, 2009).

3. Literature Review

Private health insurance plays an important role in the health care financing system in both developed and developing countries (Pauly et al., 2006). A number of studies, primarily focusing on developed countries, have examined how the availability and adequacy of a public health insurance system impacts private health insurance coverage. In particular, these studies have examined whether and to what extent public insurance acts as a substitute or complement for private insurance. The results of these studies have been mixed. Research on the Medicaid program consistently finds that the expansion of Medicaid eligibility has significantly crowded out private insurance coverage, suggesting that public and private health insurance are substitutes, at least among low-income individuals and families in the US (Cutler & Gruber, 1996; Dubay & Kenney, 1997; Shore-Sheppard, Buchmuellar, & Jensen, 2000).

In contrast, other studies show that private coverage may supplement existing public health insurance systems (Propper, 1989; Savedoff & Sekhri, 2005), especially in low- and middle-income countries with low quality and access barriers under publicly-funded coverage (Drechsler & Jütting, 2007). Moreover, others find no significant relationship between public and private insurance coverage. For example, Liu and Chen (2002) find no evidence that the private and public health insurance systems in Taiwan act as either substitutes or complements. Finkelstein (2004) finds a similar result; namely, that the US Medicare program has no significant effect on private insurance coverage for expenditures that are not covered by Medicare.

There are very few formal studies on the relationships between public and private health insurance in developing countries such as China. Although considerable attention has been directed at the issue of private health insurance in China, most of this has come in the form of commentary or analytical essays about "the alternative premium structures, supporting policies from governments, insurance administration, and risk pooling" (Wang & Rosenman, 2007, p.374).

Several recent economic studies have attempted to empirically analyze the demand for private health insurance in urban and rural China. Ying et al. (2007) find that urban Chinese are more likely to purchase private insurance for major catastrophic disease and inpatient services than for outpatient services. Liu et al. (2003) study the impact of China's urbanization on health insurance coverage among the rural population during the period 1989-1993. Due to data limitations, they have only a single measure of total health insurance coverage, making no distinction between public health insurance coverage and private health insurance coverage. Wang and Rosenman (2007) find that rural Chinese, who perceive a need for private health insurance, may nonetheless forego purchasing this coverage due to inadequate financial resources. They use survey data collected in 2003 before the launch of NCMS and therefore don't take it into consideration.

To our knowledge, there has been no formal study of the effect of the New Cooperative Medical Scheme on the demand for private health insurance in rural China. In this paper, we contribute to the literature by examining the impact of NCMS on the demand for private health insurance, and by identifying the other important determinants of individual purchases of private health insurance among rural Chinese residents.

4. Empirical Methods

We seek to identify the effect of the New Cooperative Medical Scheme (NCMS) on individual demand for private health insurance in rural China. Our strategy is to

track the individual probability of purchasing private health insurance before and after the introduction of NCMS into the community, and then compare these changes with the corresponding changes for individuals living in non-NCMS communities that were never exposed to the NCMS.

Prior to the NCMS, the old village-based universal cooperative medical scheme (CMS) collapsed in the majority of rural communities, but still persisted in a number of areas. Given different prior experience with CMS, rural residents may respond differently to the new insurance program (NCMS). Therefore, we define three pairs of treatment and control groups based on the prior existence of CMS in the communities, and examine these pair wise differences. Our first comparison group is restricted to only those communities without any CMS before and after NCMS (Group I). Control group I thus includes communities where the old CMS and NCMS were never implemented. Treatment group I consists of communities where old CMS was never implemented but NCMS was.

Our second comparison is restricted to only those communities where CMS was in place in both periods (Group II). Control group II thus consists of communities that had the old CMS in both periods but never had NCMS, while Treatment group II consists of communities that had the old CMS in the first period and also had NCMS in the second period.

Group III combines groups I and II. Treatment and control groups for each of the three comparisons are shown in Appendix Table A1.

Multiple pairwise comparisons of the outcomes between the treated and the control groups not only test the robustness of the estimated effect of NCMS, but also test for heterogeneous effects from implementing NCMS in communities with different exposure to the old CMS. Existing studies of the effects of NCMS on health care utilization and expenditures have not considered whether the effects of NCMS differ according to prior exposure to CMS (Wagstaff et al., 2009a; Lei & Lin,

2009). That is, these studies consider only Group III treatment and control comparisons, and make no distinction between Groups I and II.

The difference-in-differences (DID) estimator may be expressed as:

$$\Delta_{NCMS} = (\overline{Y}_{post}^{treatment} - \overline{Y}_{pre}^{treatment}) - (\overline{Y}_{post}^{control} - \overline{Y}_{pre}^{control}) \qquad (1)$$

where Δ_{NCMS} indicates the effect of NCMS on the outcome, individual purchasing probability of private health insurance, and $\overline{Y}^{treatment}$ and $\overline{Y}^{control}$ represent, respectively, the sample averages of the outcome for the treatment and control groups before and after the treatment, as denoted by the subscripts. The estimator in equation (1) assumes that, were it not for the expanded coverage of NCMS, the time trend of individual demand for private health insurance would have been the same for the treatment and control groups.

To control for other observables that may affect the outcome variable in both periods before and after NCMS, we estimate the following regression model using the pooled 2000-2006 sample of control and treatment groups:[1]

$$Y_{it}^{*} = \beta_0 + \beta_1 Post_{jt} + \beta_2 Treat_{jt} + \beta_3 Post_{jt} * Treat_{jt} + \beta_4 x_{it} + \beta_5 \omega_{jt} + \beta_6 \tau_k + \beta_7 \upsilon_t + \varepsilon_{it}$$

$$Y_{it} = 1 \text{ if } Y_{it}^{*} > 0; \quad Y_{it} = 0 \text{ if otherwise.} \qquad (2)$$

In equation (2), i indexes individuals, t indexes time, j indexes community, and k indexes province. Y^{*} is the probability of purchasing private health insurance; *Post* is a binary indicator variable marking the time period after the introduction of NCMS in the community; *Treat* is a binary variable identifying the experimental communities (treatment group); x is a vector of observable individual characteristics; ω_{jt} is an indicator reflecting the availability of private health insurance in the community; τ_k is a specific provincial effect; υ_t is a fixed wave effect; and ε is a random error term.

[1] Similar DID estimation has been widely adopted, for example by Chou, Liu & Hammitt (2003) and Lei and Lin (2009).

The coefficient β_1 on the variable *Post* represents the common time-series changes in the outcome for control and treatment groups. The coefficient β_2 on *Treat* measures the time-invariant difference between treatment and control groups. The coefficient β_3 on the interaction is our estimator of primary interest, capturing the impact of NCMS defined in Equation (1).

In the case when the observed outcome is a binary variable, *Y*, indicating whether or not private health insurance is purchased, we use a Probit model specification. However, as Ai and Norton (2003) note, the coefficient on the interaction term may not be a reliable estimator of the true interaction effect in nonlinear models. Following the estimation procedure suggested by Ai and Norton (2003), we obtain consistent estimates of the interaction effect (IE) by computing cross differences, as shown in Equation (3), and calculate standard errors using the Delta method:

$$\text{Estimated IE} = [\Phi(Treat = 1, NCMS = 1 \mid X, \hat{\beta}) - \Phi(Treat = 1, NCMS = 0 \mid X, \hat{\beta})]$$
$$- [\Phi(Treat = 0, NCMS = 1 \mid X, \hat{\beta}) - \Phi(Treat = 0, NCMS = 0) \mid X, \hat{\beta})] \quad (3)$$

where $\Phi(\cdot)$ is the standard normal cumulative distribution; *X* indicates the other independent variables, including *x*, ω, τ and υ; and $\hat{\beta}$ is the Probit estimator of β in Equation (2).

5. Data and Variables

5.1 Data

The data for this study are taken from the China Health and Nutrition Survey (CHNS). The CHNS is a longitudinal survey providing rich data allowing one to study social and economic changes in Chinese society, and their effects on the economic, demographic, health and nutritional status of the population.

A multistage, random cluster sampling procedure was employed to draw the sample from nine provinces (Guangxi, Guizhou, Heilongjiang, Henan, Hubei, Hunan,

Jiangsu, Liaoning, and Shandong) that differ considerably in geography, economic development, public resources, and health indicators. In each sample province, counties were initially stratified by income level, and then four counties were randomly selected based on a weighted sampling scheme. Villages and townships were selected randomly within the counties, and urban and suburban neighborhoods within the cities. There are approximately 200 primary sampling units in each wave, referred to as "communities" in the CHNS as well as in this paper. The content of the survey is comprehensive, covering a wide range of individual, household and community characteristics. The household/individual survey collects detailed data on use of medical care, health status, health insurance, health behaviors, economic status, and socio-demographic characteristics for each member of the sampled households. The community survey, interviewed with a community head or community health workers, provides unique information on public facilities, infrastructure, health care provision and insurance coverage at the community level.

The CHNS survey has seven waves to date (1989, 1991, 1993, 1997, 2000, 2004, and 2006), but only the three most recent waves asked respondents about their purchases of private health insurance. For the purpose of this study, we use CHNS 2000-2006 and restrict the sample to rural residents, including adults (age 18 and older) as well as children (younger than 18). We exclude approximately 7 percent of sample observations with missing values for health insurance status at the community level. We obtain study samples from 119 rural communities in 2000, 140 in 2004, and 145 in 2006. The adult sample consists of 6,584 observations in 2000, 6,289 in 2004, and 6,427 in 2006. The child sample includes 1,738 observations in 2000, 1,426 in 2004, and 1,232 in 2006. To track individual respondents longitudinally, we restrict the sample to those interviewed in two consecutive waves of CHNS. The final study sample consists of 17,716 adult observations and 3,079 child observations.

5.2 Dependent Variable and Key Independent Variables

The dependent variable is a binary measure indicating individual purchase of private health insurance. Adult respondents were asked whether they had private (commercial) health insurance coverage in each wave of CHNS 2000-2006. The child survey asked parents whether their children had private health insurance in each wave. It is coded as 1 if the response is "yes" and 0 otherwise.

We need to specify two main independent variables: one indicating the time period after New Cooperative Medical Scheme (NCMS) was implemented; the other indicating the treatment group. Although CHNS has no survey questions directly related to the NCMS, the community surveys ask whether there is a Cooperative Medical Scheme (CMS) in this community (village or neighborhood) and when the CMS was first implemented. Since NCMS was implemented in all rural communities beginning in 2003, combining this information, we can determine 1) whether or not the community had NCMS; 2) when the NCMS was introduced; and 3) whether or not the community had CMS in place before the implementation of NCMS.

Using three waves of data from CHNS (2000, 2004, 2006), we construct the binary variable, *Post*, in the following way to indicate the time periods before and after the implementation of NCMS. For communities exposed to NCMS in 2004, *before NCMS* is defined as wave 2000 (*Post*=0) and *after NCMS* is defined as wave 2004 (*Post*=1). For communities that implemented NCMS during 2004-2006, *before NCMS* is defined as wave 2004 (*Post*=0) and *after NCMS* is defined as wave 2006 (*Post*=1).[2,3]

[2] Appendix Table A2 reports the number of communities and counties exposed to NCMS across provinces over 2000-2006. In wave 2004, 3 out of 36 surveyed counties and 6 out of 144 rural communities implemented the NCMS. In wave 2006, the NCMS expanded to 22 surveyed counties and 69 communities.

[3] We also perform separate estimates using panels from 2000-2004 and 2004-2006, respectively. The trends are similar in sign to those reported in the text, but the impacts of NCMS do not achieve statistical significance, likely reflecting the smaller sample sizes in these estimates.

As discussed in Section 4, we define three pairs of treatment and control groups in this study. Control group I includes communities without any CMS before and after the NCMS (N=11,352 for adults, 2,048 for children). Control group II refers to communities with CMS in either period (N=1,115 for adults, 138 for children). We similarly define treatment group I (N=4,623 for adults, 817 for children) and treatment group II (N=626 for adults, 76 for children), respectively. We combine groups I and II to obtain all the treated (N=5,249 for adults, 893 for children), and the corresponding control groups (N=12,467 for adults, 2,186 for children) for our third pair wise comparison. We exclude communities that had the old CMS in the baseline wave but lost CMS in the later wave,[4] and communities that had NCMS in the consecutive waves 2004 and 2006,[5] accounting for 6.56% of the full sample.

5.3 Other Independent Variables

Our empirical model also controls for other covariates affecting the demand for private health insurance among rural residents. One important explanatory variable is a binary measure indicating the availability of private health insurance in the community. This variable is based on the response of community health workers to a survey question about whether private (commercial) medical insurance was available from an insurance carrier within the community. It is used as a proxy for access to private health insurance in rural areas. However, private health insurance is not segmented by communities and rural residents may purchase private insurance in neighboring or other communities if it is unavailable in their own community. But greater distance to a private insurance carrier may present a barrier that makes it more difficult to obtain private coverage if one must go outside of their community.

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[4] We excluded these communities because the reasons for such changes were unclear. For example, it may be a transition to NCMS, or just a failure of the old CMS.

[5] In the 2004-2006 panel, there are very few communities that had NCMS in both waves. They are excluded because there is no "*before NCMS*" data for them. Thus, they would not belong to any treatment or control group as defined in this study.

For the adult sample, individual-level control variables include health status (overall health status, presence of chronic disease and activities of daily living (ADLs)), health and health care behaviors (smoking, exercise behavior, use of preventive care, doctor visits and hospitalized days in the past 4 weeks), education (illiterate, primary school, middle school, high school and college), working status, household income (inflated to RMB in 2006), and other demographic variables including age, gender, marital status, household size, and residential province.

In the analysis for children, we control for a similar set of individual characteristics. Child health status is measured by height-for-age Z-score[6] using U.S. Children as the reference group.[7] This has been found to be a reliable health indicator (Strauss & Thomas, 1998; Chen & Li, 2009). The average Z-score is -0.82 in our sample, indicating that children in rural China were on average shorter than U.S. children for the same age and gender. Health care utilization includes use of preventive care, medical care and inpatient care. In addition to other individual demographic variables (age, gender, whether child attends school, household income and size), we control for parents' socioeconomic characteristics, including education, employment, age, and exercise behavior.

6. Results

6.1 Health Insurance Trends & Descriptive Statistics

As shown in Table 1, public health insurance coverage among adults and children rose dramatically during the period from 2000 to 2006 in rural China. In our sample, CMS covered about 10 percent of communities, 7 percent of adults and 4 percent of children in 2000, while the coverage increased to 50 percent of

[6] It is calculated as the difference between actual height and median height divided by the standard deviation in the reference population children of same age and gender.

[7] As recommended by WHO, the U.S. 2000 CDC growth charts can be used for international analysis, and the measured growth distribution is reliable and reasonable [CDC Growth Charts: United States; http://www.cdc.gov/nchs/about/major/nhanes/growthcharts/background.htm].

communities, and about one-third of the rural population in 2006. In contrast, the share of adults with private health insurance declined from 7 percent in 2000 to 1.2 percent in 2006. The percent of privately-insured children remained relatively stable at approximately 12-13 percent during this period.

[Insert Table 1]

Table 2 presents summary statistics for the adult sample overall and also by treatment/control status. Compared with the control groups, people in treatment groups had less private health insurance coverage, were slightly wealthier, used more health care, but exercised less often. Comparisons within control groups (I and II), or within treatment groups (I and II) show that, prior to the NCMS, residents in communities that had the old CMS were wealthier and more likely to be employed. Although subjects in communities that had the old CMS also used more medical services, they were slightly less healthy. Private health insurance is more commonly available in communities that had the old CMS system. This suggests that it is necessary to stratify different groups based on the presence or absence of the old CMS in the first period.

[Insert Table 2]

Descriptive statistics for the sample of children are presented in Table 3. Compared with the control groups, children in treatment groups had similar private coverage, but were younger, healthier, wealthier, and used more preventive care and physician services. Compared with those living in communities without a prior CMS history, children from communities with a prior CMS history were younger, healthier, and their parents were wealthier and more likely to be employed.

[Insert Table 3]

6.2 The Impact of the NCMS on Adult Private Health Insurance Demand

Table 4 reports the results for the impact of the NCMS expansion on the demand for private health insurance for adults. The first panel in Table 4, labeled "baseline

model," presents simple difference-in-difference (DID) estimates of the NCMS impact using Equation (1) with no controls for availability of private health insurance, individual characteristics, time and region effects. Marginal effects are calculated and reported with standard errors in parenthesis. The simple DID estimates suggest that, overall, the implementation of NCMS significantly increased individual demand for private health insurance by 2.9 percent in treatment groups (I and II), as shown in Column (1). But these effects differ substantially by individual treatment group. While the positive effect of NCMS is 1.7 percent for treatment group I (Column (2)), it is much stronger for treatment group II, with a marginal effect of 15.6 percent (Column (3)).

[Insert Table 4]

The second panel in Table 4 presents the results for the full model specified in Equation (2). Compared to the baseline model, we find a similar effect of NCMS, but of somewhat smaller magnitude. For treatment group I, NCMS increased private health insurance coverage by 1.6 percent, which is significant at the 10 percent level. For treatment group II, the marginal effect is 6.9 percent but statistically insignificant, possibly reflecting the smaller sample size of subjects in this group. The NCMS significantly increased the probability of purchasing private insurance by 2.1 percent for all treatment groups ($p<0.05$). Overall, the DID estimates, from both baseline and full models, imply that there existed a significant complementary relationship between the NCMS and private health insurance in rural China, and that this relationship was stronger in communities with a prior CMS history.

In addition, the significant negative estimates on the variable *Post* in all specifications indicate that all rural adults became less likely to purchase private health insurance during the period 2000-2006, a pattern consistent with the strong downward intertemporal trend seen in Table 1. The positive interaction effect on the variable *Post*Treatment* indicates that this downward intertemporal trend was mitigated in communities where NCMS was implemented. The estimated effect of

treatment status is -0.003 and significant at the 10 percent level for all groups, but insignificant for groups I and groups II, respectively, which suggests that there was little time-invariant difference between treatment and control groups once we control for other covariates.

The availability of private health insurance increased individual take-up significantly by 1.2 percent in communities without a CMS history (group I), but had no significant effect in communities with a CMS history (group II). This pattern may be explained by the difference in the development of private health insurance markets between these two types of communities. Specifically, as shown in Tables 2 and 3, private health insurance covered fewer communities without a CMS history (about 10-13 percent), where the lack of availability of private insurance restricted individual demand.

As expected, affordability remains an important determinant in the demand for private health insurance among rural adults. Both individual education and household income have a significant, positive effect on private coverage. We find no evidence for adverse selection in the decision to purchase private health insurance. Indeed, adults with worse self-reported health status are less likely to be covered by private insurance. Possibly, insurers practice risk selection based on the applicants' health conditions. Moreover, this empirical finding is consistent with related studies (Davidson, Sofaer, & Gertler, 1992; Shea & Stewart, 1995). Alternatively, this pattern may suggest that self-rated overall health is more a proxy for individual risk preference than a measure of actual physical health; that is, people who report better self-rated health status may be more risk averse and more likely to purchase health insurance on that account (Doiron, Jones, & Savage, 2008). We also note that exercising, which is itself an indicator of risk aversion (e.g., subjects who exercise are more risk averse over poor health outcomes), has a positive and significant relationship with insurance take-up.

6.3 The Impact of the NCMS on Child Private Health Insurance Demand

Table 5 shows the estimated effect of NCMS on child private health insurance coverage. In contrast to the results in Table 4 for the adults, the simple DID estimates in the baseline model indicate that with the advent of NCMS, there was a significant offset in child private health insurance coverage. The marginal effect is -5.6 percent for all treatment groups (I+II). The negative impact of NCMS is stronger in treatment group I (-6.2 percent and significant at the 5 percent level), but it is not significantly different from zero in treatment group II.

[Insert Table 5]

With the full specification, we still find a crowd-out effect of NCMS, but it is statistically insignificant in the entire treated cohort and in treatment group I. There is an insignificant positive effect of NCMS in treatment group II. These results imply that in communities without a prior history of CMS, as a result of the NCMS, parents may choose not to pick up private insurance for their children but enroll them into NCMS. However, this finding is not robust to controlling for other covariates including household characteristics and availability of private insurance in the community.

The results for other explanatory variables are consistent to those using the adult sample presented in Table 4. The availability of private health insurance is significantly and positively associated with the probability of private insurance take-up, especially for subjects in groups I. Child health status has no significant effect on insurance coverage. Children attending school have better private health insurance coverage than nonschool-age or nonschool-going children. The likelihood of a child having private coverage increases with parents' socio-economic status, as indicated by the significant positive coefficients on mother's education and employment status in columns (1) and (2), and on father's education in column (3). Moreover, risk-averse parents, measured by children's access to preventive care, are 10 percent more likely to purchase private insurance for their children.

6.4 A Sensitivity Analysis

Researchers have shown the existence of heterogeneity across income groups in the demand for private health insurance (Wang & Rosenman, 2007; Liu et al., 2003), and therefore the relationship between public and private health insurance may also vary by income levels (Liu & Chen, 2002). To investigate this issue, we stratify the sample of adults and children by mean income, respectively, and estimate the full specification for each subsample. Table 6 presents the estimates on the three main independent variables. We find that NCMS significantly increased adults' private insurance coverage in higher income groups (e.g., above mean income), with a marginal effect of 3.4 percent, while the NCMS impact is statistically insignificant for lower income groups (below mean income). Consistent with Table 4, we still find a significant negative coefficient on the variable, *Post*, in all regression results for adult sample, indicating the decreasing trend of adult private coverage over the period 2002-2006 that cannot be attributed to any of the explanatory variables in the model. Moreover, the results for children show that NCMS had a crowd-out effect (8.6-9.5 percent) on child private coverage in the lower income group, which is marginally significant at the 15 percent level. For children from higher income groups, the estimated impact of NCMS is positive but insignificant.

[Insert Table 6]

7. Conclusion and Discussion

With the launch and expansion of the New Cooperative Medical Scheme (NCMS), individual demand for private health insurance has been changing in rural China. In this study we employ the difference-in-difference method to empirically examine the impact of NCMS on individual demand for private health insurance coverage. This paper is among the first to empirically identify the relationship between the developing NCMS and private health insurance in rural China. The

overall effects of NCMS on private health insurance purchases have been modest, but differ for adults and children. Adults were 2.1 percent more likely to purchase private health insurance when public health insurance became available. The NCMS had a larger positive effect on adult private coverage in higher income groups and in communities with a prior history of CMS. We also find that NCMS crowded out child private health insurance, especially in lower income groups, but these estimates are insignificant or only marginally significant in the full specification.

For both adults and children, risk preferences and socio-economic status, including income and education, are important predictors of private insurance take-up. We find no evidence for adverse selection in the demand for private health insurance.

One reason for the positive effect of NCMS on adult private health insurance coverage may be the involvement of private insurers in local NCMS management. Although the central government stipulates that a local agency should be set up to manage NCMS at counties, some local governments have contracted with private insurance companies to manage local NCMS plans, in order to lower the government costs by using the insurers' existing resources, technology and network platforms (Mao, 2005; Blomqvist, 2009; Wang, 2009). Through the involvement in the operation of local NCMS plans, such as fund operation, reimbursement, and claim settlement, the private insurers may design, provide and advertise some supplemental private insurance plans for certain subpopulations (Blomqvist, 2009; Wang, 2009). Therefore, those with high health care needs as well as ability to pay would be more likely to purchase private health insurance along with the availability of NCMS.

Another reason for the differential effect of NCMS on adult and child private health insurance demand may reflect the preexisting availability of private health insurance for students in many communities. Since the 1990s, local private insurers began introducing some student health insurance programs with low premiums and limited coverage, through school administration in rural areas of China (Mao, 2005; Zhu et al., 2008). This explains why children attending school have more private coverage

than other children, as shown in Table 5. But with the availability of NCMS in rural China, parents may have substituted this in favor of preexisting private insurance for their children, as NCMS offers similar coverage and benefits but lower premiums (Zhu et al., 2008). This explanation is consistent with our findings that NCMS has a crowding-out effect on child private coverage, especially among low-income households.

It must be acknowledged that this study is subject to two potential limitations. First, our empirical identification hinges on the exogeneity of NCMS at the county level. If the government takes private coverage into account when expanding NCMS, this could lead to biased estimates of the relationship between these two systems. However, this endogenous legislation scenario may not be problematic in our context, since we examine individual demand for private insurance and also control for the availability of private insurance at the community level. Moreover, Lei & Lin (2009) find that counties implementing NCMS differ little from non-NCMS counties in their observable characteristics in the CHNS sample. Using the DID method, we also control for the time-invariant unobservable differences between the treated and untreated communities. Second, due to data limitations, the measure of NCMS is constructed based on survey questions related to the presence and history of cooperative insurance at the communities, with no direct distinction between old and new schemes. Reporting bias may exist if the respondents, the community head or community health workers, mistakenly consider the NCMS the same as old CMS, which would lead to an underestimate of the NCMS impact.

Overall, our findings provide empirical evidence for a certain degree of complementarity between social health insurance system and private health insurance system for adults, and draws attention to the potential private crowd-out from subsidized public programs for children, which may have important policy implications for the deepening health care system reform in China. It motivates further studies to better understand the underlying causes for both complementary and substitution effects of the NCMS among different groups. This research also raises

the fundamental question of how the public sector should design programs to ensure access to basic health care for everyone, especially the poor and the vulnerable.

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Table 1: Public & Private Health Insurance Coverage in Rural China

	Year	Obs.	Individual level coverage		Community level coverage	
			Public[a]	Private	Public[a]	Private
Adults (18 and above)	2000	6,584	0.070	0.069	0.128	0.034
	2004	6,289	0.096	0.012	0.185	0.138
	2006	6,427	0.378	0.012	0.532	0.213
Children (under 18)	2000	1,738	0.041	0.109	0.099	0.043
	2004	1,426	0.088	0.118	0.174	0.103
	2006	1,232	0.312	0.127	0.514	0.228

Notes: a. Public insurance refers to the old CMS prior to 2003 and consists of the old CMS and NCMS from 2003 and after.

Table 2: Descriptive Statistics for Adult Sample

	All		Control		Treatment	
			Control group I[a]	Control group II[b]	Treat Group I[c]	Treat Group II[d]
	Mean	SD	Mean	Mean	Mean	Mean
Dependent Variable						
Private insurance purchase	0.024	0.142	0.017	0.092	0.009	0.050
Independent Variables						
Access to private insurance (PHI)						
Availability of PHI in community	0.129	0.335	0.131	0.161	0.104	0.315
Health status						
Overall health: excellent (default)						
good	0.471	0.499	0.478	0.392	0.481	0.408
fair	0.322	0.467	0.327	0.355	0.301	0.326
poor	0.071	0.256	0.065	0.090	0.077	0.100
Any chronic disease	0.083	0.276	0.082	0.093	0.079	0.105
ADL	0.070	0.255	0.063	0.080	0.080	0.101
Personal characteristics						
Age: 18-24 (default)						
25-34	0.145	0.352	0.152	0.140	0.128	0.146
35--54	0.494	0.500	0.484	0.474	0.527	0.470
55--64	0.177	0.381	0.170	0.188	0.181	0.239
65 and above	0.137	0.344	0.140	0.162	0.125	0.123
Female	0.519	0.500	0.511	0.537	0.528	0.546
Married	0.853	0.354	0.841	0.864	0.875	0.892
Education: illiterate (default)						
primary school	0.266	0.442	0.259	0.247	0.291	0.241
middle school	0.312	0.463	0.308	0.322	0.321	0.305
high school	0.147	0.354	0.160	0.130	0.125	0.103
college	0.017	0.130	0.022	0.013	0.007	0.006
Employed	0.703	0.457	0.684	0.808	0.710	0.811
Household income: 10k- (default)						
10,000--20,000	0.304	0.460	0.308	0.281	0.308	0.223
20,000--30,000	0.179	0.384	0.175	0.233	0.174	0.193
30,000 and above	0.211	0.408	0.182	0.349	0.223	0.406
Household size	3.889	1.558	3.971	3.832	3.713	3.811
Health and health care behaviors						
Smoking	0.297	0.457	0.298	0.254	0.310	0.274
Doing exercises	0.048	0.215	0.056	0.041	0.035	0.027
Use of preventive care	0.017	0.131	0.012	0.021	0.022	0.066
Use of medical care	0.113	0.316	0.097	0.153	0.134	0.168
Sample Size	17,716		11,352	1,115	4,623	626

Notes: a. control group I: communities where the old CMS and NCMS were never implemented.

b. control group II: communities that had the old CMS in both periods but never had NCMS.

c. treatment group I: communities where the old CMS was never implemented but NCMS was.

d. treatment group II: communities that had the old CMS in the first period and NCMS in the second period.

Table 3: Descriptive Statistics for Child Sample

	All		Control		Treatment	
			Control group I[a]	Control group II[b]	Treat Group I[c]	Treat Group II[d]
	Mean	SD	Mean	Mean	Mean	Mean
Dependent Variable						
Private insurance purchase	0.123	0.329	0.108	0.333	0.108	0.316
Independent Variables						
Access to private insurance (PHI)						
Availability of PHI in community	0.122	0.327	0.122	0.138	0.091	0.434
Health status						
Height Z score	-0.819	1.281	-0.894	-0.838	-0.688	-0.183
Personal characteristics						
Age: below 6 (Default)						
6-12	0.476	0.499	0.472	0.601	0.466	0.474
12 and above	0.297	0.459	0.308	0.196	0.296	0.171
Girl	0.455	0.498	0.451	0.457	0.469	0.421
School child	0.696	0.458	0.697	0.754	0.690	0.605
Household income: 10k- (default)						
10,000--20,000	0.321	0.468	0.333	0.299	0.308	0.184
20,000--30,000	0.196	0.396	0.189	0.246	0.202	0.211
30,000 and above	0.197	0.402	0.156	0.343	0.241	0.539
Household size	4.477	1.373	4.496	4.448	4.400	4.842
Health care utilization						
Use of preventive care	0.049	0.214	0.049	0.073	0.040	0.080
Use of medical care	0.066	0.255	0.053	0.145	0.073	0.171
Inpatient days	0.020	0.510	0.023	0.000	0.018	0.000
Mother's characteristics						
Mother's age	36.03	5.916	36.27	35.61	35.76	33.22
Mother's edu: illiterate(default)						
primary school	0.299	0.456	0.302	0.235	0.310	0.210
middle school	0.425	0.494	0.396	0.600	0.451	0.613
high school	0.117	0.329	0.140	0.078	0.074	0.065
college	0.013	0.109	0.017	0.009	0.003	0.000
Mother: employed	0.795	0.407	0.795	0.941	0.765	0.855
Mother: doing exercise	0.030	0.177	0.031	0.008	0.034	0.000
Father's characteristics						
Father's age	37.08	6.269	37.26	37.21	36.90	33.25
Father's edu: illiterate (default)						
primary school	0.215	0.410	0.214	0.136	0.236	0.125
middle school	0.527	0.500	0.515	0.524	0.548	0.688
high school	0.193	0.401	0.198	0.233	0.179	0.125
college	0.024	0.151	0.030	0.029	0.010	0.021
Father: employed	0.921	0.268	0.914	0.961	0.933	0.938
Father: doing exercise	0.064	0.246	0.065	0.107	0.055	0.021
Sample Size	3,079		2,048	138	817	76

Notes: a. control group I: communities where the old CMS and NCMS were never implemented.

b. control group II: communities that had the old CMS in both periods but never had NCMS.

c. treatment group I: communities where the old CMS was never implemented but NCMS was.

d. treatment group II: communities that had the old CMS in the first period and NCMS in the second period.

Table 4: Estimates of NCMS Impact on Adult Private Health Insurance Demand

	(1) Control I+II vs. Treatment I+II	(2) Control I vs. Treatment I	(3) Control II vs. Treatment II
Baseline Model			
*Post**Treatment status	0.029(0.004)***	0.017(0.004)***	0.156(0.024)***
Post	-0.029(0.003)***	-0.015(0.002)***	-0.191(0.022)***
Treatment status	-0.015(0.002)***	-0.012(0.002)***	-0.049(0.011)***
Sample size	17,716	15,975	1,741
Pseudo R^2	0.0460	0.0275	0.1550
Full Model			
*Post**Treatment status	0.021(0.008)**	0.016(0.008)*	0.069(0.044)
Post	-0.018(0.002)***	-0.010(0.002)***	-0.099(0.026)***
Treatment status	-0.003(0.001)*	-0.002(0.001)	0.005(0.004)
Availability of PHI in community	0.009(0.003)***	0.012(0.003)***	-0.005(0.004)
Health: poor	-0.003(0.002)*	0.001(0.003)	-0.005(0.003)*
Health: fair	-0.004(0.001)***	-0.002(0.001)*	0.001(0.004)
Health: good	-0.003(0.001)**	0.000(0.001)	-0.005(0.003)
Any chronic disease	-0.001(0.002)	-0.001(0.001)	0.003(0.006)
ADL	-0.002(0.002)	-0.001(0.002)	-0.001(0.005)
Age:25-34	0.000(0.003)	0.000(0.002)	0.001(0.008)
Age:35-54	0.000(0.003)	-0.001(0.002)	0.002(0.007)
Age:55-64	0.001(0.003)	0.000(0.003)	-0.002(0.006)
Age: 65+	0.001(0.004)	-0.001(0.002)	0.005(0.013)
Female	0.000(0.001)	-0.001(0.001)	0.002(0.003)
Married	0.002(0.001)	0.001(0.001)	0.004(0.003)
Education: primary sch.	0.003(0.002)	0.005(0.003)**	0.005(0.005)
Education: middle sch.	0.005(0.002)**	0.008(0.003)***	0.003(0.005)
Education: high sch.	0.014(0.004)***	0.020(0.006)***	0.005(0.008)
Education: college	0.021(0.010)**	0.028(0.013)**	0.005(0.021)
Employed	-0.004(0.002)**	-0.003(0.001)**	0.001(0.003)
Income: 10,000-20,000	0.007(0.002)***	0.004(0.002)**	0.007(0.008)
Income: 20,000-30,000	0.011(0.003)***	0.005(0.002)**	0.013(0.011)
Income: 30,000+	0.023(0.005)***	0.017(0.004)***	0.008(0.007)
Household size	-0.002(0.000)***	-0.002(0.000)***	-0.001(0.001)
Smoking	0.000(0.001)	0.000(0.001)	0.004(0.004)
Exercising	0.009(0.003)***	0.007(0.003)**	0.0138(0.016)
Use of preventive care	0.000(0.003)	0.003(0.005)	-0.004(0.003)
Use of medical care	0.002(0.002)	0.000(0.002)	0.003(0.005)
Wave 2004-2006	-0.017(0.002)***	-0.010(0.002)***	-0.063(0.014)***
Sample size	17,716	15,975	1,741
Pseudo R^2	0.1981	0.1956	0.4581

Notes: a. Marginal effects are reported and standard errors are in parenthesis;

b. Other regressors include indicators of provinces, which are not reported here;

c. ***statistically significant at the 1%; **statistically significant at the 5%; *statistically significant at the 10%; #statistically significant at the 15%.

Table 5: Estimates of NCMS Impact on Child Private Health Insurance Demand

	(1) Control I+II vs. Treatment I+II	(2) Control I vs. Treatment I	(3) Control II vs. Treatment II
Baseline Model			
*Post**Treatment status	-0.056(0.026)**	-0.062(0.026)**	0.000(0.000)
Post	0.034(0.014)**	0.034(0.014)**	0.019(0.080)
Treatment status	0.033(0.020)*	0.033(0.020)*	-0.018(0.098)
Sample size	3,079	2,865	214
Pseudo R^2	0.0030	0.0040	0.0006
Full Model			
*Post**Treatment status	-0.018(0.030)	-0.031(0.032)	0.133(0.169)
Post	-0.005(0.015)	0.003(0.014)	-0.160(0.100)
Treatment status	0.001(0.020)	0.026(0.022)	-0.168(0.090)*
Availability of PHI in community	0.044(0.022)**	0.042(0.023)*	0.106(0.120)
Height Z score	0.003(0.005)	0.005(0.005)	-0.011(0.037)
Age: 6-12	0.050(0.031)	-0.027(0.027)	-0.156(0.095)
Age: 12+	0.054(0.038)	-0.013(0.014)	0.136(0.096)
Girl	0.007(0.012)	0.002(0.012)	0.186(0.090)**
School child	0.064(0.018)***	0.073(0.018)***	-0.142(0.159)
Income: 10,000-20,000	0.020(0.018)	0.021(0.017)	-0.211(0.103)**
Income: 20,000-30,000	0.031(0.022)	0.020(0.020)	0.044(0.180)
Income: 30,000+	0.035(0.023)	0.017(0.021)	0.125(0.189)
Household size	-0.011(0.006)*	-0.008(0.005)	-0.089(0.040)**
Use of preventive care	0.100(0.042)**	0.111(0.044)**	0.071(0.205)
Use of medical care	0.042(0.031)	0.004(0.027)	0.223(0.157)
Mother: age	0.001(0.002)	0.000(0.002)	0.016(0.018)
Mother_edu: primary school	0.025(0.026)	0.018(0.025)	0.085(0.221)
Mother_edu: middle school	0.049(0.025)*	0.035(0.024)	0.147(0.141)
Mother_edu: high school	0.142(0.048)***	0.122(0.046)***	0.491(0.380)
Mother_edu: college	0.179(0.111)	0.164(0.107)	-
Mother: employed	0.057(0.013)***	0.054(0.012)***	-0.045(0.261)
Mother: exercise	0.037(0.042)	0.048(0.043)	-
Father: age	-0.001(0.002)	0.000(0.002)	-0.007(0.015)
Father_edu: primary school	-0.035(0.029)	-0.049(0.024)**	0.972(0.012)***
Father_edu: middle school	-0.021(0.033)	-0.040(0.032)	0.954(0.023)***
Father_edu: high school	-0.013(0.033)	-0.022(0.029)	0.988(0.007)***
Father_edu: college	-0.030(0.036)	-0.023(0.035)	-
Father: employed	0.012(0.025)	0.005(0.025)	0.082(0.140)
Father: exercise	0.000(0.025)	-0.003(0.024)	0.004(0.165)
Wave 2004-2006	-0.0005(0.014)	-0.007(0.014)	-0.017(0.064)
Sample size	3,079	2,865	214
Pseudo R^2	0.1676	0.1620	0.3715

Notes: a. Marginal effects are reported and standard errors are in parenthesis;

b. Other regressors include indicators of provinces, which are not reported here;

c. ***statistically significant at the 1%; **statistically significant at the 5%; *statistically significant at the 10%; #statistically significant at the 15%.

Table 6: Estimates of NCMS Impact by Income Level

	Above mean income			Below mean income		
	(1) Control I+II vs. Treatment I+II	(2) Control I vs. Treatment I	(3) Control II vs. Treatment II	(1) Control I+II vs. Treatment I+II	(2) Control I vs. Treatment I	(3) Control II vs. Treatment II
Sample of Adults						
*Post**Treatment status	0.034*	0.011	0.119	0.015	0.018	0.018
	(0.017)	(0.013)	(0.078)	(0.009)	(0.010)	(0.044)
Post	-0.027***	-0.012***	-0.086**	-0.013***	-0.007***	-0.070**
	(0.005)	(0.004)	(0.036)	(0.002)	(0.002)	(0.035)
Treatment status	-0.006	-0.001	0.001	-0.001	-0.002	0.006
	(0.004)	(0.004)	(0.005)	(0.001)	(0.001)	(0.005)
Sample size	5,357	4,482	875	12,046	11,197	849
Pseudo R^2	0.1783	0.1694	0.4715	0.2141	0.2279	0.5099
Sample of Children						
*Post**Treatment status	0.047	0.039	0.158	-0.086#	-0.095#	0.405
	(0.051)	(0.053)	(0.224)	(0.047)	(0.050)	(0.307)
Post	-0.006	0.006	-0.263	0.001	0.005	-0.690**
	(0.028)	(0.026)	(0.209)	(0.015)	(0.015)	(0.338)
Treatment status	-0.022	0.020	-0.298	0.020	0.034	0.123
	(0.035)	(0.037)	(0.205)	(0.025)	(0.027)	(0.387)
Sample size	1,070	943	127	1,922	1,839	83
Pseudo R^2	0.2075	0.1964	0.3253	0.213	0.219	0.6452

Notes: a. Estimates for full specification. Other control variables are not reported here;

b. Marginal effects are reported and standard errors are in parenthesis;

c. ***statistically significant at the 1%; **statistically significant at the 5%; *statistically significant at the 10%; #statistically significant at the 15%.

Appendix:

Table A1: Definition of Control and Treatment Groups

		Existence of Old CMS prior to the NCMS	Exposure to NCMS	Interpretation of the estimates
Group I	Control group I	No	No	The effect of NCMS in communities with no prior history of CMS
	Treatment group I	No	Yes	
Group II	Control group II	Yes	No	The effect of NCMS in communities with prior history of CMS
	Treatment group II	Yes	Yes	
Group III	Control group I+II	--	No	The effect of NCMS
	Treatment group I+II	--	Yes	

Table A2: The Number of Counties and Rural Communities Exposed to NCMS

Province	2000		2004		2006	
	Counties	Communities	Counties	Communities	Counties	Communities
	N=36	N=142	N=36	N=144	N=36	N=145
Liaoning	0	0	0	0	4	11
Heilongjiang	0	0	0	0	3	9
Jiangsu	0	0	1	1	3	9
Shandong	0	0	1	1	3	11
Henan	0	0	0	0	1	4
Hubei	0	0	0	0	3	11
Hunan	0	0	1	4	1	4
Guangxi	0	0	0	0	2	5
Guizhou	0	0	0	0	2	5
Total	0	0	3	6	22	69