How does the New Cooperative Medical Scheme Vary Cross Counties and Over Time ?

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Abstract

China initiated the New Cooperative Medical Scheme (NCMS) for rural residents in 2003. There is a literature that evaluates various aspects of NCMS' s impacts, including health-care service utilization, out-of-pocket expenditure and health status. However, the current literature has paid limited attention to the heterogeneity of the NCMS's crucial characteristics, for instance deductible and copayment rates. Ignoring these variations prevent researchers from providing a complete study of NCMS's impacts. To fill in this gap, I collect policy documents released by county governments and create a novel NCMS policy dataset. The dataset covers eight provinces in China that vary substantially in geography and economic development. It spans from 2003 to 2014 and includes about 1800 unique county year observations. Using this dataset, I present evidence of the heterogeneity in NCMS. I find that the plans differ greatly in several dimensions: deductible, coinsurance rates and maximum reimbursement. To deal with the non-linear feature of most NCMS plans, I simulate 100 draws from a distribution fitted to the actual medical expenditure in rural China. I calculate the average reimbursement rate by applying the NCMS plans to the simulation draws. I find the average reimbursement rates vary greatly over different types of hospitals and cross counties. These findings imply that future research evaluating the NCMS should caution against treating NCMS as a homogeneous insurance and incorporate its heterogeneity.

Keywords: New Cooperative Medical Scheme; Rural China;

1. Introduction

From 1978 to 2002, the share of the 0.8 billion rural residents in China covered by health insurance plummeted from 90 percent to 20 percent. At the same time, health care prices rose. Annual per capita spending on health services in China increased more than 40 times, from 11 to 442 yuan[1] (Yip and Hsiao [8]). The sharp drop in health insurance coverage coupled with the rising health care costs rendered rural residents especially vulnerable to bankruptcy. In 2003, the Chinese central government initiated the New Cooperative Medical

[1]The amount in U.S dollars are roughly from $ 1.35 to $ 55

Scheme (NCMS) to protect rural residents from medical impoverishment. Three hundred pilot counties were chosen to implement the NCMS in 2003. The program expanded quickly. In 2014, almost all counties in China have adopted this insurance scheme and more than 90 percent of all rural residents are covered.

While the NCMS's achievement in coverage rate is remarkable, its benefits in promoting the use of health care, reducing out-of-pocket expenditure and improving health have not been well documented. Existing research has come to mixed conclusions. Wagstaff et al. [6] use the difference-in-difference method to evaluate NCMS. They use panel data from the 2003 and 2005 National Health Service Survey, and an administrative database that contains annually updated data on all health care providers in China. They find that the NCMS has had an appreciable positive impact on the utilization of both outpatient and inpatient services. Lei and Lin [4] use the recent NCMS expansions at the county level to estimate the impact of NCMS on utilization, health and expenditure. They report little impact of NCMS on self-reported health status and whether individuals felt sick or were injured in the four weeks prior to the survey. They show that adopting the NCMS has significantly increased the probability of using preventive care services, but NCMS does not affect utilization of formal medical services and out-of-pocket expenditures.

A major problem with papers evaluating the NCMS is that they ignore its heterogeneity. Since each county designs its own NCMS subject to a few constraints, they come up with very different design of this insurance. The design of NCMS has also evolved over time adapting to the amount of resources available. The cross county and over time variations of the NCMS suggest that the insurance's impacts are unlikely to be the same in different counties and times. Therefore, it's not surprising that existing research have not been able to come to a definitive conclusion of the program's impacts. And ignoring the heterogeneity prevents researchers from improving the designs of the NCMS.

A limited number of studies have examined the variations in the NCMS designs. Babiarz et al. [1] consider the heterogeneity of the NCMS at the county level. But they only look at

types of services that qualify for reimbursement: inpatient only, inpatient and outpatient. They find that plans reimbursing outpatient reimbursement is associated with an increase in the probability of using medical care, and clinic reimbursement is associated with a decrease in the probability of using a township health center or hospital. Zhong [9] focuses on whether immediate reimbursement design in NCMS would affect health care utilization. To avoid the complexity of program designs of the health insurance plans, the authors define the plans in terms of several dummy variables. The limitation of his study is that he does not have detailed information on the different policies for outpatient and inpatient expenses of the insurance. He finds that the method of reimbursement has a strong influence on individuals likelihood of seeking outpatient treatment. Hou et al. [3] is the only study that examines the cross county variations in the NCMS in detail. They use data from a repeated cross section household survey conducted across six counties in two provinces in 2006 and 2008. At the county level, the survey has information about the copayment rate and the cap. They construct a single generosity measure of the NCMS based on the copayment rate and cap. They find that an increase of 40 percentage points in NCMS coverage would raise the inpatient admission probability by 0.16.

My work is most closely related to Hou et al. [2013] and improve on their work in several dimensions. Hou et al [2013] only have 6 county year observations in two provinces. And the time frame is between 2006 and 2008. I collected policy documents released by county offices responsible for the design and implementation of NCMS in eight provinces from 2003 to 2014. I transcribed the documents into a data set of the characteristics of NCMS. These characteristics include the deductible, coinsurance rates and cap at different levels of hospitals. There are 754 counties and 1857 county year observations in the data set. This large and detailed data set allows me to make a meaningful statement about the cross section and over time variation in NCMS. Using this dataset, I find that the plans differ greatly in several dimensions, deductible, coinsurance rates and cap. I calculate the average coinsurance rate by applying the NCMS plans to simulation draws of medical expenditure.

I find the average coinsurance rate vary greatly over different types of hospitals and cross counties. The average coinsurance rate tends to be higher for township and county hospitals and lower for provincial hospitals, serving as a method to induce enrollees to use medical resources at lower administration levels.

The rest of the paper is organized as this. Section 2 provides the background of the NCMS. Section 3 describes the data sets and presents the variation of NCMS. Section 4 concludes.

2. Background of the NCMS

2.1. History of the NCMS

Prior to the inception of NCMS in 2003, there existed the original Cooperative Medical Scheme (CMS) for rural residents in China. The CMS was first implemented in rural China in the 1950s (Yip et al., 2008). It was financed by the budget of the communes (collective farming). The CMS organized health stations, paid village doctors to deliver primary care, and provided drugs. It also partially reimbursed patients for services received at higher level hospitals. The CMS experienced dramatic development in its early years. At its peak, it covered as many as 90 percent of rural residents in 1979 (Xingzhu and Huaijie [7]). It is believed by many that the program helped reduce China's mortality rate during the 1960s and 1970s (Sidel [5]). When the commune system collapsed in the early 1980s, most villages lost their collective budget. This resulted in the loss of financing source for the CMS. Counties began to opt out the program and coverage rates fell sharply from 90% in 1980 to 5% in 1985 (Xingzhu and Huaijie [7]). Despite various attempts to rebuild an insurance system, the majority of rural residents remained uninsured between 1985 and 2003. The coverage rate remained low throughout the 1990s, never exceeding 10% (Yip and Hsiao [8]). By 2003, the rate of coverage had increased to approximately 20% (Yip and Hsiao [8]).

For residents in rural China, the direct result of losing health insurance was the increasing risk of getting impoverished by medical expenditure or not being able to seek health care

when sick. The situation was worsened by another unintended effect of the market reform in China. By the early 1990s, government subsidies for public health facilities fell to 10% of the facilities' total revenues. To keep health care affordable, the government setted prices for basic health care below cost. At the same time, the government wanted facilities to survive financially. It set prices for new and high-tech diagnostic services above cost and allowed a 15% profit margin on drugs.Blumenthal and Hsiao [2] These policies created perverse incentives for providers who had to generate 90% of their budget from revenue-generating activities. Subsequently, providers over-prescribed drugs and tests and hospitals raced to introduce high-tech services and expensive imported drugs that gave them higher profit margins. The combined effect of lacking health insurance and rising health care cost led to a higher risk of bankruptcy for rural residents.

To solve this problem, the Chinese government launched the NCMS in 2003. The NCMS aimed to provide health coverage for the nation's entire rural population by 2010 (State Council, 2002). To understand the regulation structure of the NCMS, I will briefly illustrate the administrative structure of China's political system. China has four levels of formal administration under the central government. The first level consists of 34 provincial-level governments. The second level of administration includes more than 300 prefectural-level administrative units, including prefectures and prefectural-level cities. The third level of administration includes nearly 3,000 counties. The lowest tier of official administration is made up of approximately 40,000 townships. Central government is usually in charge of designing laws and policies. Provinces also have the right to pass their own laws and regulations, which may extend national laws and regulations, but not conflict with them. The central government gives provinces considerable leeway in adopting policies.

The NCMS is administered in a similar fashion. The central government issues broad guidelines. Provincial governments usually add their own stipulations. County governments are responsible for designing and implementing the NCMS , following guidelines from central and provincial governments. The 2002 State Council Policy Document provides the first

batch of guidelines of the NCMS : (1) voluntary participation (2) risk pooling at the county level; and (3) focus on catastrophic health care expenditure. Following these guidelines, provinces issued recommendations regarding details of the NCMS (e.g the lowest level of deductibles). Besides these general guidelines, each county is allowed to design and implement its own programs.

2.2. NCMS Financing

One of the most important part in the guidelines set by the central government is how to finance the NCMS. The NCMS is financed by a combination of enrollee contributions and various levels of government subsidies. Since the insurance preimum is low, the government subsidy is a major source of revenue for the NCMS. As a result, the amount of government subsidy for the NCMS directly influence the insurance's generosity. In this section, I discuss the over time and cross section variation in the NCMS budget.

2.2.1. Over Time Variation in the NCMS Budget

Table 1 shows the guidelines set by the central government about the financing of NCMS. The first guideline was released in 2003. And several changes were made between 2003 and 2014. The guideline sets a level for individual premium, matching subsidy from the central government and a minimum level of subsidy from provincial and county governments. From column 1 in Table 1, we can see that the level of premium is low. The premium never exceeds one third of the total amount of budget. The low level of premium is intended to incentivize participations. The second column in Table 1 suggests that subsidy from the central level government has increased from 10 yuan per person in 2003 to about 120 yuan per person in 2012. One thing worth pointing out is that the subsidy from the central government is not equally distributed to all participating counties. Until 2008, the central government only subsidized the NCMS in the west and central areas of China. Starting in 2008, provinces in the east area began to receive a portion of the subsidy given to provinces in the west and central areas. The rationale behind this setup is to equalize the NCMS budget among

different areas. Provinces in the east are usually richer and are capable of providing more financial resources for the NCMS than those in the west and central areas. We will see in section 2.22 that despite the effort to equalize the budget in different areas, provinces in the east still have a larger budget to operate the NCMS. [2]

In column 3, we can see that the total amount of budget has increased from 30 yuan to 240 yuan between 2003 and 2012. The increased budget of NCMS will undoubtedly increase its generosity. I use data from China Health Statistic Yearbook and China Statistic Yearbook to check whether local governments have followed the rule. The China Health Statistic Year Books report the average budget for the NCMS at the provincial level. Column 2 in Panel 1 Table 2 shows that the average budget has increased from 120 yuan to 280 yuan from 2008 to 2011. Panel 2 breaks down the average budget by area and year. We can see that the average budget for NCMS has been growing in all three areas. This confirms that the NCMS budget increases over time and the trend is present regardless of which area a province belongs to. Section 4 of this paper uses the policy data set to describe the change in reimbursement plans and shows the NCMS has indeed become more generous over time.

2.2.2. Cross Section Variation in the NCMS Budget

The central government has regulated the lowest premium each county can charge for NCMS. But since NCMS enrollment rate has been listed as one of the many evaluating criteria of local officials, most local governments choose to not increase beyond the lowest level. As a result, the budget of NCMS depends heavily on the subsidies from various levels of governments. Richer counties are able to provide subsidy higher than the required level. This leads to cross section variation in the NCMS budget.

Figure 1 plots the NCMS budget level over GDP per capita for each province in the east

[2]In China, each province belongs to either east, west or central area depending on its geographic location. The detailed breakdown of the area for each province can be accessed at the Statistics China website. http://www.stats.gov.cn/ztjc/zthd/sjtjr/dejtjkfr/tjkp/201106/t20110613_71947.htm

Table 1: Financing Regulation of NCMS from 2003 to 2012

Year	Individual Premium	Central Government Subsidy	Local Subsidy	Total Budget
2003	10	10 for west and central areas	10	30
2007	10	20 for west and central areas	20	50
2008	20	40 for west and central areas. A portion of 40 for east area.	40	100
2009	20	40 for west and central areas. A portion of 40 for east area.	40	100
2010	NA	60 for west and central areas. A portion of 60 for east area.	60	120
2011	50	100 for west area.90 for central area. A portion of 80 for east area.	NA	200
2012	60	130 for west area. 120 for central area. Subsidy for east not specified	NA	240

Note: Data taken from official documents released by Ministry of Health in various years. The exchange rate of U.S dollar to Chinese Yuan is between 6 to 8 in this period. Between 2008 and 2012, the policy documents did not specify what proportion of the subsidy for west is given to the east area.

Table 2: Summary Statistics of NCMS Budget

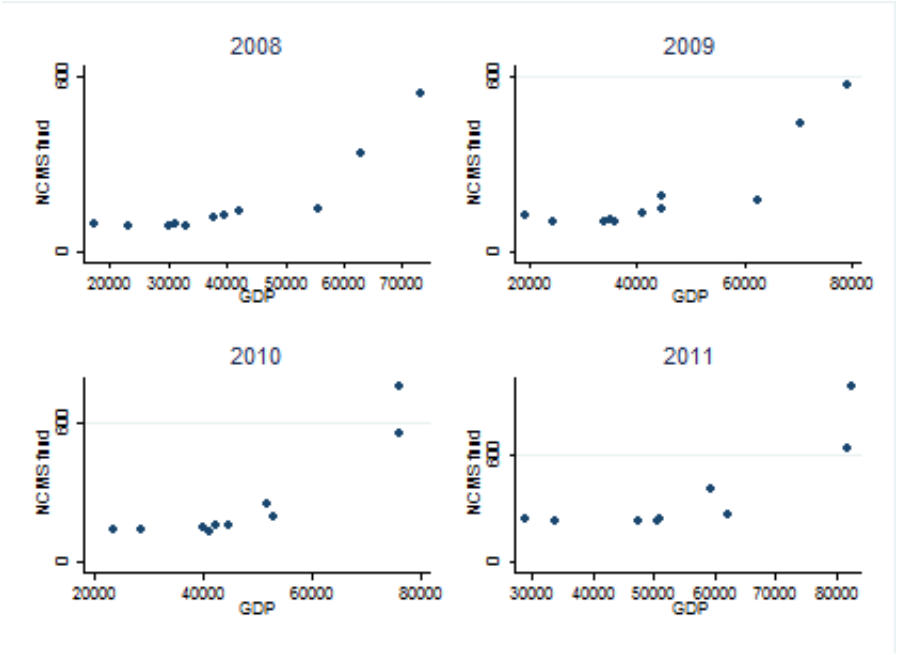
Year	Observations	Mean	Policy Requirements	Std	Min	Max
Panel 1 : Average NCMS Budget by Year						
2008	30	118.83		91.74	77.63	537.00
2009	30	138.74		101.55	101.42	563.82
2010	29	189.67		133.81	135.20	757.70
2011	29	283.46		157.29	225.40	987.00
Panel 2 : Average NCMS Budget by Area and Year						
East						
2008	11	169.10	100	141.17	87.67	537.00
2009	11	198.25	100	154.07	103.16	563.82
2010	10	264.74	120+premium	214.65	135.20	757.70
2011	10	372.15	200	251.82	231.10	987.00
Central						
2008	8	88.21	100	6.19	79.57	95.08
2009	8	102.74	100	1.58	101.42	106.19
2010	8	149.61	120+premium	3.43	141.20	151.80
2011	8	234.66	200	8.85	229.80	256.20
West						
2008	11	90.82	100	7.67	77.63	104.73
2009	11	105.41	100	3.60	102.18	115.46
2010	11	150.55	120+premium	7.64	140.90	165.50
2011	11	238.33	200	11.65	225.40	269.10

Note : The data is taken from China Health Statistic Yearbook published in various years. The unit of observation is province.

from 2008 to 2011. It's clear that the NCMS budget level positively correlates with the GDP per capita and the pattern persists in all years. Figure 2 and 3 plot the same graph for central and west China. The correlation of NCMS budget and GDP in the two areas is almost zero. To confirm this visual pattern, I run a regression of the budget for ncms on provincial gdp levels for year 2009 for the three areas separately. In the regression with east provinces, the coefficient for gdp is 0.0017 and significant at 5 percent level. This suggests when gdp increase by 10000 yuan, the budget for the NCMS would increase by 17 yuan. [3] In the regressions for the west and central area, the coefficient for gdp is not significant. These results suggest that counties in the west and central areas follow the financing rules released by the central government closely and richer counties in the east provide more than the required levels.

[3]This regression excludes the two outliers in Figure 1. They are Beijing and Shanghai.

Figure 1: Scatter Plot of the NCMS Budget and GDP in East China



Even though the levels of the NCMS budget are similar across counties, different design of the NCMS still generate variations in how much the NCMS would reimburse in case of medical expenditure. I plot the budget constraint for an insuree with average income for three counties in the same province in 2010. All three counties have the same level of budget: 120 yuan ($20). It's clear from the figure that the insured individuals face very different constraints. In the most generous county, an insured individual would not exhaust his disposable income until total medical expenditure exceeds 57100 yuan. In the least generous county, this number shrinks to 31000 yuan. The local government's management capacity could explain the variation in generosity conditional on budget level. Yan et al. [2011] pointed out the lack of management capacity for the NCMS in county governments. They showed that the local NCMS offices have problems with the shortage of staff (particularly qualified professional staff) and the instability/movement of staff. These problems could affect some counties more seriously and this could explain why counties design the reimbursement plan differently.

Figure 2: Scatter Plot of the NCMS Budget and GDP in Central China

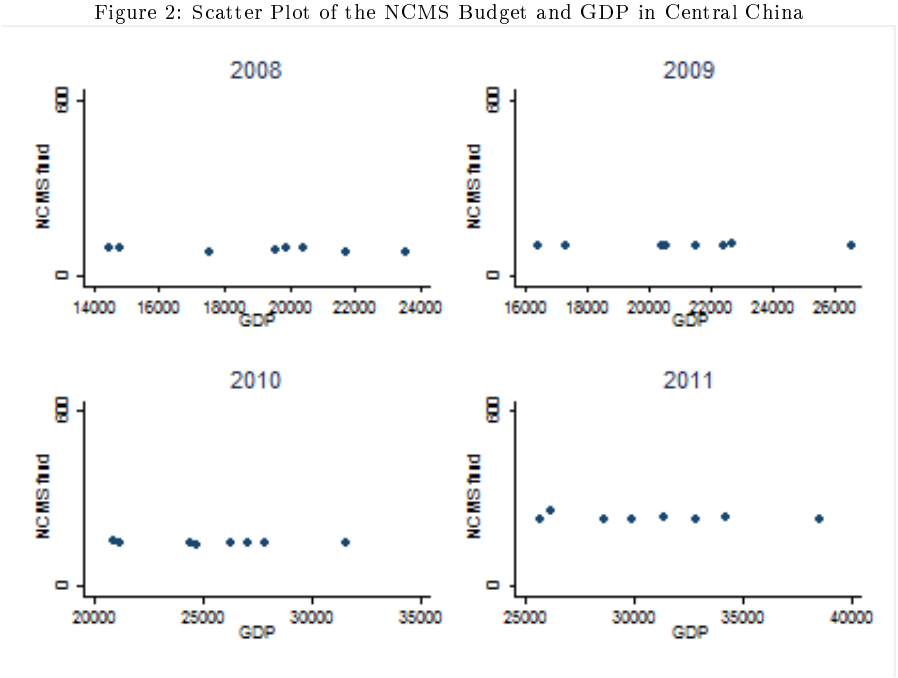


Figure 3: Scatter Plot of the NCMS Budget and GDP in West China

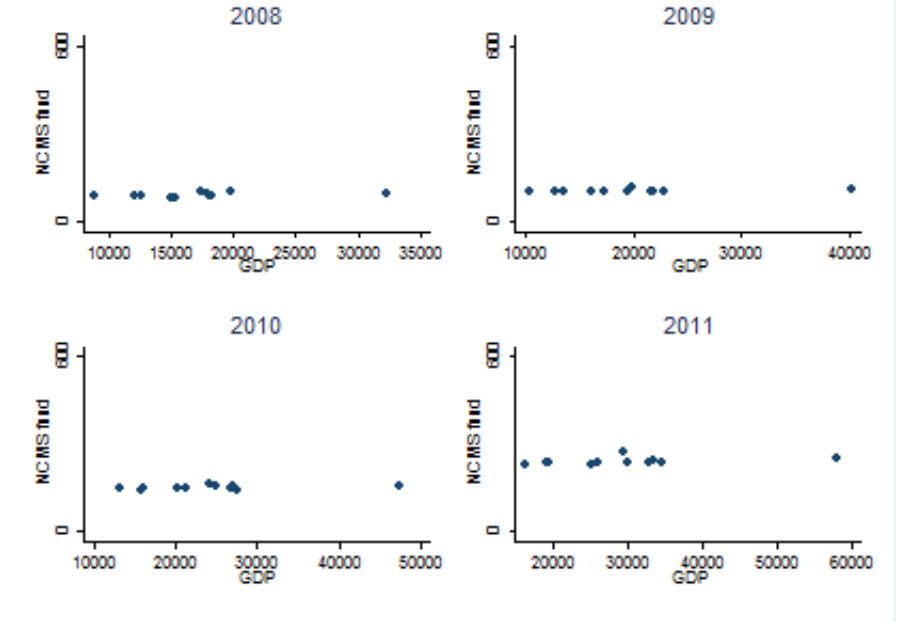
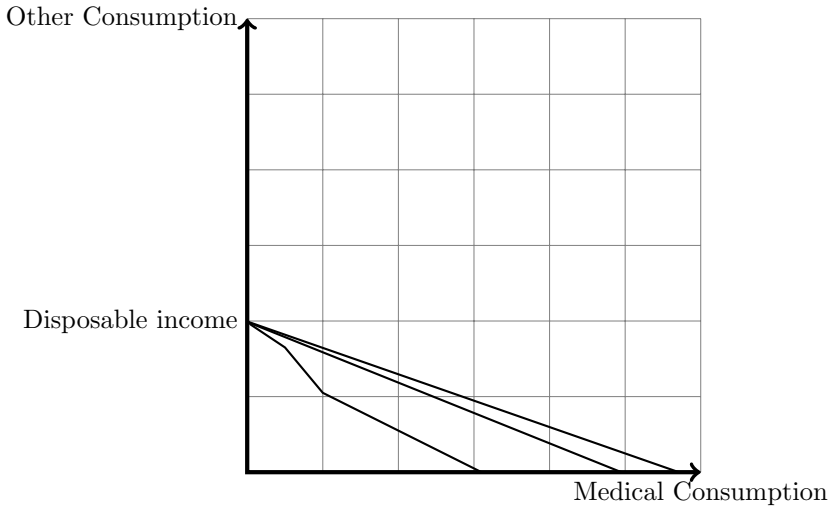


Figure 4: Budget Constraint for an Insuree in Counties with the Same Level of budget



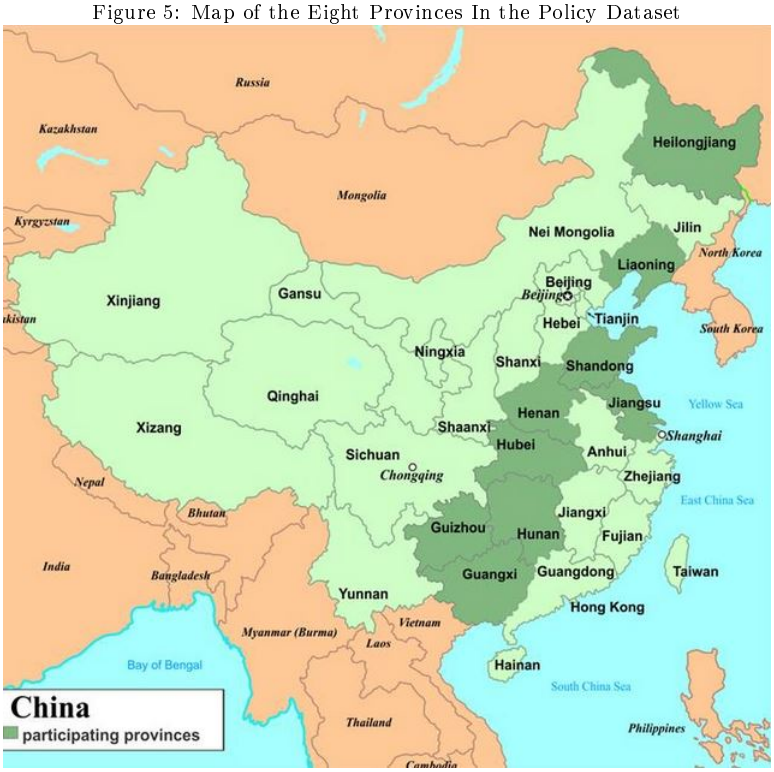
3. Variation of the NCMS Characteristics

I construct a primary data set that includes each plan's deductible, copayment rates and cap per year. The data set covers all counties in the eight provinces that are included in the China Health and Nutrition Survey (CHNS). Figure 5 plots the map of the eight provinces in China. We can see that these provinces vary a lot in terms of geographic locations. [4]

In order to construct the data set, I searched county government policy documents for every county in the eight provinces. These eight provinces are Liaoning, Heilongjiang, Jiangsu, Shandong, Henan, Hubei, Hunan and Guangxi. For each county, I tried to search for all the NCMS policy documents released from 2003 to 2014. After finishing collecting the policy documents, I manually coded the relevant reimbursement plan information into the data set. Table 3 summarizes the number of observations in the data set. The majority of the dataset appears after 2007. There are two explanations. First, the NCMS is implemented gradually throughout China. Many counties did not participate in the NCMS in the first few years after the initiation of the NCMS. Second, the county governments become more

[4]Guizhou province in the CHNS sample is excluded from the policy datasets. This is caused by the lack of the policy documents of this province on the internet.

Figure 5: Map of the Eight Provinces In the Policy Dataset



willingly and capable to publish the NCMS regulations online as the use of internet become more prevalent in workplaces.

3.1. Heterogeneity in the Non-Linear Feature of the NCMS

The first notable feature of the insurance design is that the NCMS imposes a non-linear budget set for enrollees. The copayment rate depends on how much the total medical expenditure is. Table 4 shows the average number of different coinsurance rates by level of hospitals and province.[5] The number of coinsurance rates does not vary much depending on hospital levels. But there are large differences cross provinces. Both Heilongjiang and Guangxi did not adopt the spline feature at all. In contrast, for Liaoning, the neighboring province of HeiLongjiang , the average number is more than 2. The standard deviation in parenthesis tell us about the variation within province and hospital levels. There is no vari-

[5]The data for township hospitals in HuBei and HuNan provinces are missing.

Table 3: Number of Observations of the NCMS Policy Data Set

Year	Number of Counties In the Data
2003	3
2004	10
2005	16
2006	53
2007	126
2008	206
2009	138
2010	264
2011	343
2012	384
2013	253

ation in the two provinces with the no spline policy. This suggests that this policy is strictly followed by counties in these two provinces. There are quite large differences in provinces that have this non-linear feature. Each county differ in the way of designing the non-linear feature of NCMS.

3.2. Heterogeneity in the Deductible Feature of the NCMS

Deductible is the amount of money an insuree has to spend before any reimbursement. Thus, the value of the deductible is an important factor in determining the generosity of the insurance. Table 5 provides the summary statistics for the deductible by province and hospital levels. The first striking pattern from the table is that all provinces adopt the same strategy in designing the deductible. The level of deductible increases as patients use higher level of hospitals. The difference between the deductible for a provincial and township hospital could often be as large as ten times. And the magnitude of the deductible differ both cross provinces and within province. The lowest deductible of township hospital is 38 yuan in Liaoning while the highest is 193 in Jiangsu. This design is intended to guide patients towards local hospitals. In China, primary care is close to non-existent. Most people's interactions with the healthcare system are limited to the hospital. Hospitals therefore take on a much bigger role in the healthcare system of China than in the US. Hospitals in China

Table 4: Summary Statistics of the Number of Coinsurance Rates by Hospital and Province

	Level of Hospital			
Province Name	Township	County	City	Province
LiaoNing	2.92	2.46	1.97	2.00
	(2.32)	(0.80)	(0.82)	(0.84)
HeiLongJiang	1.00	1.00	1.00	1.00
	(0)	(0)	(0)	(0)
JiangSu	2.60	2.61	2.91	2.89
	(1.82)	(1.65)	(1.49)	(1.51)
ShanDong	1.32	1.47	1.48	1.38
	(0.74)	(0.81)	(0.84)	(0.81)
HeNan	1.38	1.41	1.64	1.68
	(0.65)	(0.66)	(0.76)	(0.76)
HuBei	NaN	1.64	2.42	2.60
	()	(0.63)	(0.72)	(0.72)
HuNan	NaN	1.02	1.03	1.02
	()	(0.22)	(0.23)	(0.19)
GuangXi	1.00	1.00	1.00	1.00
	(0)	(0)	(0)	(0)

Note: The data for township hospitals in Hubei and Hunan are missing. This table shows the mean. Standard deviations are in parentheses.

are organized according to a 3-tier system that recognizes a hospital's ability to provide medical care, medical education and conduct medical research. Patients do not visit all hospitals equally. The perceived quality of services at lower-tier hospitals is low, while the provincial hospitals are trusted to provide state of the art procedures. As a result, China has a dichotomy of nearly empty Tier 1 hospitals and overflowing, over-capacity lines at Tier 3 hospitals. For instance, the No. 3 hospital affiliated to the Peking University serviced more than three million outpatient visits in 2013. This dichotomy explains why it is necessary for NCMS to have higher deductible and copayment rate for higher level hospitals.

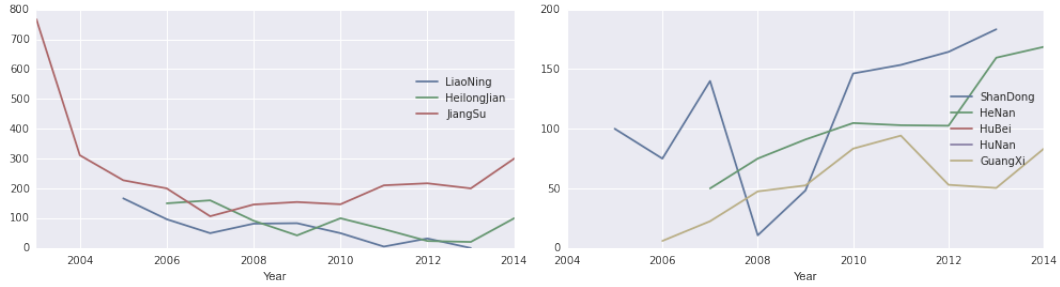
The standard deviation at province and hospital level reveal the significant within province variation in deductible. For instance, in the provincial hospital in Jiangsu, the standard deviation is 365 when the mean is 455 yuan. Figure 6 7 and 8 plot the deductible for the three level of hospitals by province and over time. For the township and municipal hospitals, the eight provinces can be divided into two groups based on their trend in the deductible. We can see that some provinces lowered the deductible for the two level of hospitals while others

Table 5: Summary Statistics for Deductible by Province and Hospital Levels

	Level of Hospital			
Province Name	Township	County	City	Province
LiaoNing	38		289	430
	(60)		(289)	(441)
HeiLongJiang	77		539	707
	(67)		(210)	(219)
JiangSu	193		423	455
	(194)		(342)	(365)
ShanDong	136		611	739
	(75)		(226)	(287)
HeNan	116		811	1650
	(46)		(282)	(1261)
HuBei	NA		746	964
	()		(233)	(318)
HuNan	NA		594	808
	()		(225)	(248)
GuangXi	56		298	358
	(27)		(110)	(112)

Note : This table shows the mean. Standard deviations are in parentheses.

Figure 6: Deductible of the NCMS for Township Hospitals by Province Over Time



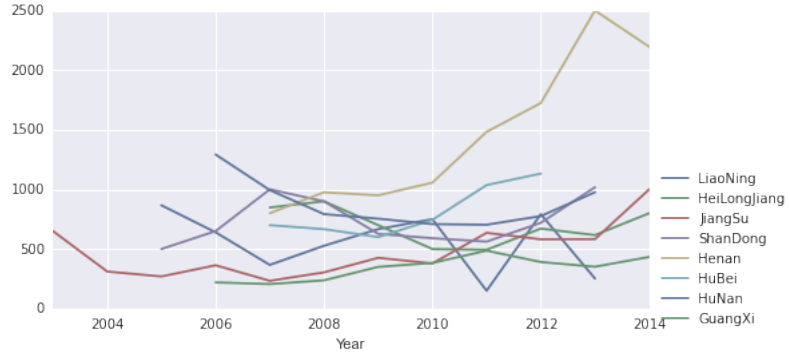
raised. This suggests that there is no consensus among provinces in how these deductible should be designed. However, in Figure 8, the deductible for provincial hospitals has a clear upward trend over time for all provinces. This shows that the policy makers have tried hard to direct patients to lower level hospitals.

3.3. Heterogeneity in the Cap Feature of the NCMS

One important feature sets NCMS apart from health insurance like Medicare or Medicaid. Almost every county sets a cap per person per year. Insuree has to bear full costs of medical expenditure when it exceeds the cap. In comparison, Medicare will assume the full costs when the healthcare costs is larger than a pre-specified amount. As a result, the cap is an

Figure 7: Deductible of the NCMS for City Hospitals by Province Over Time

Figure 8: Deductible of the NCMS for Provincial Hospitals by Province Over Time



important determinant of how much the NCMS can protect insurees from bankruptcy. Table 6 presents the summary statistics of the cap by province. There are significant variation cross provinces. The average value of cap in Henan is about twice as large as that in Liaoning. In all provinces, there are large variations. In the discussion in section 2, I have shown the NCMS budget increased greatly over time. This is directly reflected in the level of cap. In Figure 9, I plot the cap for all eight provinces over time. It's clear that there is an upward trend in the cap for all provinces.

3.4. Heterogeneity in the Average Reimbursement Feature of the NCMS

Although we have described the heterogeneity in many dimensions of the NCMS, it is still desirable that we can come up with a single measure of the generosity of the insurance and describe the heterogeneity of the insurance using that measure. To deal with the non-linear feature of the NCMS plans and avoid the endogeneous medical expenditure spending

Table 6: Summary Statistics for Cap

Province	Mean	Std
LiaoNing	55081	38203
HeiLongJiang	51723	36529
JiangSu	89325	53474
ShanDong	90853	48586
HeNan	112848	58260
HuBei	61226	25399
HuNan	57684	37764
GuangXi	59011	44799

Figure 9: Cap of the NCMS by Province over Time

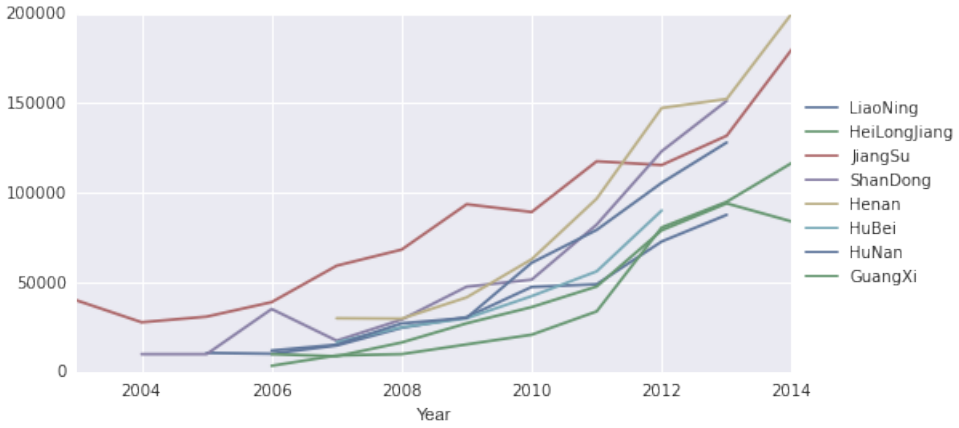
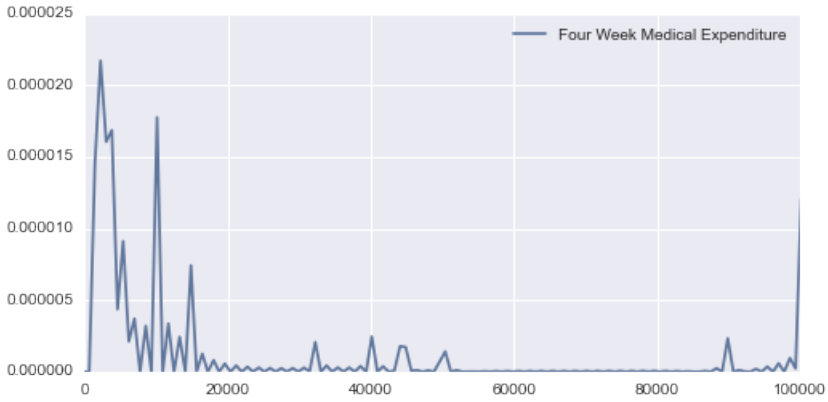


Figure 10: Kernel Density Plot of the 4 week Medical Expenditure in 2009 CHNS



issue, we calculate the average reimbursement rate for each plan by applying the plan to 100 simulated draws from the actual medical spending distribution by rural residents in China. In this way, we can use the average reimbursement to represent the generosity of the NCMS and avoid the endogenous medical expenditure problem.

I use the CHNS data to get the distribution of the medical expenditure in rural China. The CHNS is designed to examine the effects of the health, nutrition, and family planning policies and programs implemented by national and local governments. It has information about whether the survey respondent used health care services in the past four weeks and the total costs. Figure 10 plots the kernel density distribution of the medical expenditure. The graph is consistent with common characteristics of medical expenditure in a population. Most patients spend little for health care but a non-negligible portion of patients have medical expenditure that could cause bankruptcy. This feature of the medical expenditure has important implications for the design of the NCMS.

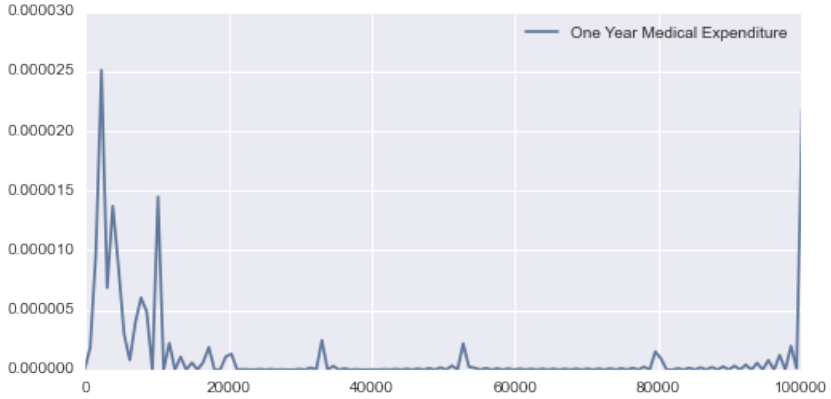
To understand the protection provided by the NCMS, I need to infer the medical expenditure for an entire year for rural residents. I use the following procedure for the interpolation. In each month, each individual has a fixed probability of getting sick. The probability is calculated from the CHNS sample. When an individual is indentified as sick, he takes a draw from the medical expenditure distribution obtained from the CHNS sample. Then I

Table 7: Summary Statistics for Medical Expenditure in 2009 CHNS

Variable	One Year Expenditure
Number of survey respondent	8113
Number of respondent with positive medical expenditure	4605
Medical Expenditure at the 25 percentile	0
Medical Expenditure at the 50 percentile	19
Medical Expenditure at the 75 percentile	240
Maximum Medical Expenditure	199988
Mean of medical expenditure	1753
Standard Deviation	10581

Note: The value of medical expenditure is top-coded at 99999. All values are in currency Yuan.

Figure 11: Kernel Density Plot of the Inferred One Year Medical Expenditure in 2009 CHNS



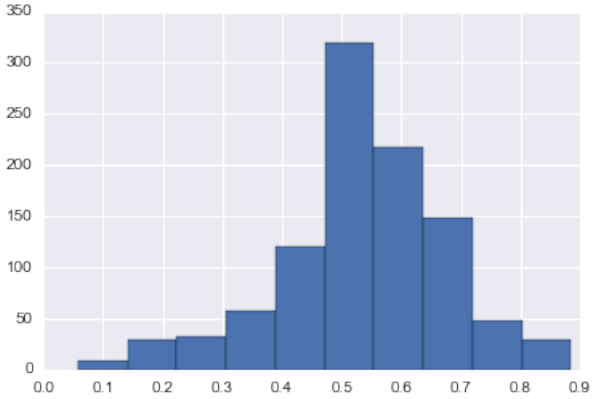
aggregate the monthly expenditure to get the yearly expenditure. The summary statistics are provided in column 2 in Table 7. The imputed average yearly medical expenditure is about 1753 yuan and the maximum is 199988 yuan. To give these numbers some context, the average yearly income for a rural residents in China in 2009 is about 6,597 yuan. Taken at face value, an average China rural resident spent about 26 percent of his income on health care in 2009. However, the high average spending on health care is largely driven by the small proportion of individuals who incured a large amount of medical expenditure. Figure 11 plots the kernel density of the imputed yearly medical expenditure for 2009.

After obtaining the yearly distribution of medical expenditure for rural residents, I apply the imputed yearly expenditure data to every NCMS plan in the dataset. Table 8 presents the summary statistics for the average coinsurance rate for the three types of hospitals. Figure 12

Table 8: Summary Statistics for the Average Reimbursement Rate

	Township Hospital	City Hospital	Provincial Hospital
Mean	0.53	0.21	0.18
Std	0.14	0.078	0.079
Max	0.88	0.59	0.59

Figure 12: Average Reimbursement Rate for Township Hospitals with Simulated Yearly Expenditure data



to 14 plot the distribution of the average coinsurance rate for three types of hospitals. These figures reveal significant heterogeneity in the averagement reimbursment rate across plans even at the same level of hospitals. At the township level hospitals, the mean averagement reimbursement rate is about 50 percent. But there are a large number of plans that have reimbursement more than 70 percent of the total costs. At the same time, around 100 plans reimburse less than 40 percent. The magnitude of the heterogeneity decreases when we look at higher level hospitals. This suggest that the county officials have more idiosyncratic power for designing reimbursement schemes for local hospitals. Another notable feature from the graphs is that the generosity decreases significantly for higher level hospitals. This suggests that the NCMS is designed to induce demand at the local hospitals.

4. Conclusion

This paper is the first to document and discuss the variation in the NCMS design in a systematic way. I create a unique NCMS policy data set that covers eight provinces in China. The data set spans from 2003 to 2014 and includes over 1800 unique county year observations.

Figure 13: Average Reimbursement Rate for City Hospitals with Simulated Yearly Expenditure data

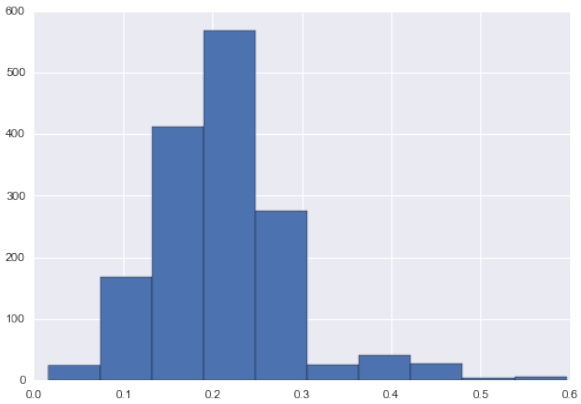
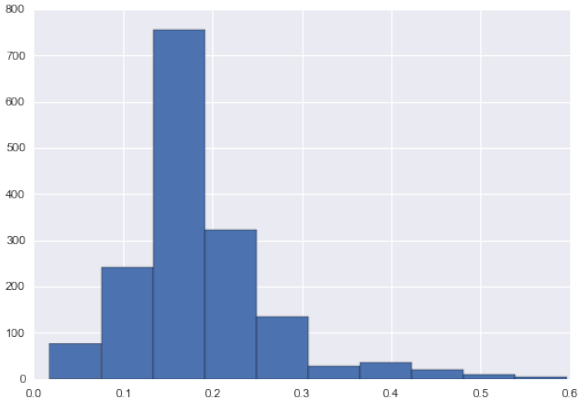


Figure 14: Average Reimbursement Rate for Provincial Hospitals with Simulated Yearly Expenditure data



In each observation, I create variables documenting the deductible , reimbursement rate and maximum amount reimbursed per year for four types of hospitals. Using this data set, I present evidences of both the cross county and over time variation of NCMS.

These variation in insurance characteristics have important implications for research about the NCMS impacts. Previous literature has treated the insurance as homogeneous cross county and over time. This procedure over simplify the problem and can not provide a complete statement about the insurance's effects. It's imperative that future researches take account of the heterogeneity of NCMS.

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