NHH

INSTITUTT FOR SAMFUNNSØKONOMI

DEPARTMENT OF ECONOMICS

SAM 16 2013

ISSN: 0804-6824

October 2013

Discussion paper

Health Insurance Coverage for Low-income Households: Consumption Smoothing and Investment

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Abstract

I estimate the effects of public health insurance on consumption smoothing and investigate the extent to which the public insurance interacts with private arrangements of self-insurance. Exploiting a dramatic expansion in health insurance coverage in rural China, I find that the introduction of public health insurance helps households completely insure against severe health shocks. The health insurance also reduces the magnitude of decline during a health shock in investments in children's education, agricultural activities and durable goods. The evidence suggests that the benefit of social insurance for low-income households could also come from reducing the use of costly smoothing mechanisms.

JEL: D1, O1, I1

1 Introduction

Low-income households in developing countries face high idiosyncratic income risk and at the same time have limited access to credits and formal insurance markets. Since Townsend (1994), a standard method to test for full insurance is to estimate the effects of idiosyncratic shocks on consumption fluctuations.[1] Despite the lack of formal insurance, many papers have found that households in developing countries are able to smooth their consumption in response to most idiosyncratic shocks.

*I thank Arne Bigsten, Ilyane Kuziemko, Magne Mogstad, Marcos Vera and the participants at several seminars and conferences for helpful comments and discussions. All remaining errors are mine. Email: kai.liu@nhh.no.

[1] See Morduch (1995) and Townsend (1995) for a review of this literature.

One of the main policy implications from this literature is that welfare gains to households from additional social insurance should be small. If households are able to smooth consumption through informal insurance fairly well, there would be little welfare gain from additional social insurance, as such insurance would only crowd-out private channels of consumption smoothing (Morduch, 1995; Gertler and Gruber, 2002). The last argument, however, hinges on the implicit assumption that the costs of informal insurance and public insurance are equal. If households are able to substitute cheaper public insurance for the costly smoothing mechanism they used before, the welfare gains could be substantial. Indeed, theoretical frameworks developed in Chetty and Looney (2006) and Chetty (2006) show that social insurance programs can have substantial welfare gains even when consumption does not fluctuate with idiosyncratic shocks. When households are very risk averse, they may use highly costly measures to smooth their consumption paths.

To infer the welfare value of additional social insurance programs, it is important to examine the efficiency costs of the behaviors used by households to smooth consumption. Social insurance programs could have substantial welfare benefits by reducing the use of costly smoothing techniques even though consumption may not fluctuate much with shocks to begin with. Testing this hypothesis empirically is challenging for several reasons.[2] First, identifying the causal effect of a social insurance program requires exogenous variation in the coverage of the program. There are still few formal insurance programs in developing countries. Existing programs often target specific groups of the population and the take-up rate is usually low and endogenous. For example, individuals with certain unobserved traits (such as risk aversion) may self-select into insurance programs, and those unobserved characteristics also affect their consumption choices and other behaviors. Second, tests of complete insurance require exogenous and preferably large shocks to household resources, which are hard to identify empirically. Finally, one also needs a panel data to observe consumption and other variables describing private smoothing mechanisms over time.

This paper overcomes these difficulties by exploiting the introduction of a large-scaled health insurance program in rural China. I have two goals. One is to provide causal estimates of the effects of public health insurance on consumption smoothing. The second goal, which is more important and relevant as to inferring the welfare implications of additional social insurance, is to show whether and

[2]Chetty and Looney (2007) take a first step in this direction by comparing the effects of unemployment shocks on consumption and investments in Indonesia and the US. A literature review is presented in the next section.

how additional public insurance interacts with other channels of consumption smoothing in response to health shocks. The new program, called the New Cooperative Medical Scheme (NCMS), raises the percentage of rural households covered by any health insurance plan from less than 10% in 2000 to over 90% in 2009. The introduction of the health insurance program was implemented over a six-year period from 2003 to 2008 in different counties in rural China at different times. My main estimation strategy exploits variation in the timing of the introduction of the health insurance reform across counties and controls for county and year fixed effects. I compare households' responses to health shocks before and after the health insurance reform, and between counties that have already implemented the reform to those that have not yet implemented the reform.

Using panel data from the China Health and Nutrition Survey (CHNS), I find that health insurance coverage helps households smooth food consumption against severe health shocks. Households were not fully insured prior to the reform but they are perfectly insured against severe health shocks after the reform. Moreover, I find that the public health insurance program enables households to shift away from using costly smoothing mechanisms to cope with severe illness. Prior to the reform, a negative health shock decreases school enrollment of girls, investment in livestock and durable purchases. Access to health insurance eliminates these negative effects: households experiencing health shocks after the reform invest more in the schooling of girls, livestock and durables, relative to the households experiencing a health shock in the absence of the reform. These results are robust to several checks which could pose potential threats to identification. The evidence suggests that the benefit of social insurance, for low-income households that are liquidity-constrained, could come from reducing the use of costly smoothing mechanisms. Finally, I also test for potential mechanisms by which households achieve complete insurance with health insurance. I find that the availability of health insurance reduces out-of-pocket expenditure on treating severe illness by as much as 10% of annual household income. There is also evidence that access to health insurance diminishes individual productivity losses in the event of illness, possibly due to an improvement in the quality of treatment.

This paper builds on an important literature trying to understand the channels of consumption insurance in developing countries. The literature has suggested important roles provided by savings and asset accumulation (Jalan and Ravallion, 1999), access to microfinancial institutions (Gertler, Levine, and Moretti, 2009), sales of durables (Rosenzweig and Wolpin, 1993), and family networks (Angelucci,

De Giorgi, and Rasul, 2012). An important question for policy is whether and how public insurance programs interact with different private channels of insurance. A handful of empirical papers have studied this question. Cutler and Gruber (1996) find that an increase in Medicaid coverage was associated with a reduction in private insurance coverage. Using data from developing countries, Cox, Eser, and Jimenez (1998), Attanasio and Rıos-Rull (2000) and Jensen (2004) find that an increase in the benefits from public transfer programs crowds out incidence and magnitude of private transfers which were used to support extended family members. The current paper extends this literature in a couple of ways. First, none of the existing crowding-out estimates is based on an actual insurance program that insures against certain risks. Second, relatively few papers have identified the causal relation between social insurance and the private channels of consumption insurance. The health insurance reform that has taken place in rural China across counties and over time provides exogenous variations to identify the causal effect. Third, most of these papers study the effects of public programs on private transfers. This paper shows that public insurance may crowd-in some other private arrangements to cope with negative shocks (such as investment) and that could lead to very different welfare implications of public insurance. Chetty and Looney (2007) is the only paper I know which tests the same hypothesis by comparing the effects of unemployment shocks on consumption and investment behaviors in Indonesia and the US.

This paper also connects to a large literature estimating the effects of health insurance on health and health care use. The key empirical challenge facing researchers is to obtain credible variations in health insurance coverage which are not correlated to unobservable characteristics. Researchers have shown that the expansion of public health insurance in the US (such as the Medicaid) has positive impact on health outcomes, particularly for mothers and children (e.g. Currie and Gruber (1996a,b)). More recently, an influential paper by Finkelstein, Taubman, Wright, Bernstein, Gruber, Newhouse, Allen, Baicker, et al. (2012) uses the Oregon Medicaid lottery as a convincing random variation in health insurance coverage for a group of uninsured low-income adults. The authors find that health insurance coverage leads to higher health care utilization, reduction in out-of-pocket medical expenditures and better self-reported health outcomes.

While the Chinese expansion in health insurance is not a random experiment in nature, it is attractive in several ways. First, it is a large-scaled program at a national level. Second, household mobility is

restricted because of the household registration system, reducing the extent of endogenous selection of health insurance from mobility. Third, the coverage of health insurance in rural areas before the reform, including private and public insurance, had consistently been very low and participation rate in the new public health insurance program is very high. Since the share of compliers is high, the estimated effects are close to the average treatment effects of health insurance coverage for the entire population. Fourth, the level of implementation of the new health insurance program is at county level. Together with limited household mobility, this rules out spillover effects which may confound the direct effects of health insurance (Angelucci and De Giorgi, 2009). A couple of studies have used the Chinese health insurance expansion to study its effects on health outcomes. Lei and Lin (2009) and Wagstaff, Lindelow, Jun, Ling, and Juncheng (2009) do not find any evidence that health insurance improves *average* health status (measured by either self-reported health status or doctor-diagnosed diseases), despite the fact that the program significantly increases the utilization of formal outpatient and inpatient care and preventive care. They also do not find any evidence that the program reduces *average* out-of-pocket expenditures (unconditional on the severity of illness). In section 6 of this paper, I reconcile their findings with mine. The primary focus of this paper is to study the effects of health insurance on non-health related outcomes such consumption and investment, which the literature has not produced much evidence on.[3] The effects on non-health outcomes reveal interesting parameters that are useful for evaluating the welfare implication of health insurance.

The empirical test on consumption insurance follows seminal papers by Cochrane (1991), Mace (1991) and Townsend (1994). Several papers have studied the insurance of consumption against health shocks in developing countries. Kochar (1995) and Townsend (1995) conclude that low-income households appear to be able to insure against health shocks fairly well, despite the fact that health shocks tend to lower household resources. A more recent paper by Gertler and Gruber (2002) finds imperfect consumption insurance against major illness. The key component is the definition of major health shocks, as Gertler and Gruber (2002) find that families are able to insure the costs of minor illness but not those of major illness. Following their work, I consider health shocks from severe illness.

The paper proceeds as follows. Section 2 discusses institutional background of the health insurance reform and introduces the data and main variables used in estimation. Section 3 presents the empirical

[3]Gruber and Yelowitz (1999) finds that expansion in Medicaid leads to a reduction in savings and an increase in consumption. Similar findings have been found using data from developing countries (Chou, Liu, and Hammitt (2003)).

model, followed by estimation results in Section 4. Section 5 presents a few robustness checks. Section 6 investigates potential mechanisms underlying the key results. Section 7 concludes. A theoretical framework is outlined in the appendix.

2 The Data and Institutional Background

2.1 The Health Reform and the NCMS

Before the transition from a planned economy to a market economy, households in rural China had access to universal health insurance through the Cooperative Medical Scheme (CMS). When China reformed its rural economy in 1979 and introduced the Household Responsibility System, the CMS collapsed and left around 90 percent of all farmers uninsured (Yip and Hsiao, 2008). In the next two decades, households in rural China had little formal insurance against health shocks. During the 1990s, despite several attempts to rebuild the CMS, my data shows that less than 15% of the rural households were covered by any kind of health insurance, public and private combined.

Economic costs associated with illness could be in at least two forms. One is the cost of diagnosis and medical treatment, and the other is the loss of income if illness limits the ability to work. Each of these costs can be substantial relative to the income of the households. Aiming to provide a basic social safety net against the cost of medical treatment for *all* rural households, in 2003, the central government launched the NCMS with the goal of offering health insurance to all rural areas by 2010. In replacement of the old CMS program, the new program was rolled out gradually at county level. The timing of the establishment was determined by the provincial government and guidelines from the central government. In 2003, every provincial government was required to select at least 2-3 counties as pilot counties for the NCMS (State Council, 2003). In 2006, the central government required provincial governments to expand the program to cover at least 40% of all the counties by the end of 2006 and 60% of all the counties by 2007 (Department of Health, 2006). By 2008, the program had been implemented in all rural areas, covering the entire rural population. Therefore, for half a decade, rural households in China had different access to public health insurance. Whether one was covered by the program depended on the county in which the household was registered. Because of the strict household registration system (*hukou*), mobility of households between counties is restricted.

Participation in the program is voluntary, but if the household decides to join the program, all members of the household must be enrolled in the program. Annual premium has been kept low thanks to heavy subsidies from the government. For example, in 2008, typical annual premium was 20 RMB (3 USD) per person, supplemented by a subsidy of 80 RMB (12 USD) from central and local government (Department of Health, 2008).[4] The amount of subsidies has been increasing over time, and the central government provides larger subsidies for underdeveloped regions in central and western parts of China. In the first few years of the reform, the program emphasized coverage of inpatient expenses and outpatient expenses related to severe illness.[5] In recent years, there have been efforts to increase the coverage of outpatient expenses and lower the deductables for inpatient services (Department of Health, 2008). The benefits of the program vary by county. Two thirds of the counties cover both inpatient service and outpatient service, with the cost of inpatient service reimbursed through a formula and the cost of outpatient service reimbursed through a household medical savings account.

Table 1 summarizes the coverage of the program, calculated from the sample used for estimation (which I discuss momentarily). Among the 36 counties observed in the data[6], three had started the program by 2004. The program expanded quickly, with over 50% of counties having implemented the program by 2006. By 2009, all the counties in the data were covered by the NCMS. Turning to coverage at household level, we see from Table 2 the same pattern of increase for households with access to the NCMS. The proportion of households who are insured by either the old CMS or the NCMS grew quickly since the implementation of the reform, rising from 6.9% in 2000 to over 94% in 2009. Before the 2009 survey, it is not possible to distinguish coverage by the old CMS from the NCMS at household level. Since the NCMS had completely replaced the old CMS in 2009, we could infer that the take-up rate of the NCMS in 2009 is 95%. The final two columns of Table 2 summarize the percentages of households covered by any kind of health insurance, private and public combined. Health insurance coverage never exceeded 16% before the reform, and was rising steadily up to 95% in 2009 due to the introduction of the NCMS.

The estimation strategy (to discuss in Section 3) controls for any time-invariant characteristics at county level. Nevertheless, it would be helpful if the timing of the implementation of the reform across

[4] In 2006, about 20% of the costs of the program were covered by the central government, 50% of the costs were financed by the local government and the remaining 30% came from households' premium payments (Lei and Lin, 2009).

[5] See Wagstaff, Lindelow, Jun, Ling, and Juncheng (2009) for detailed evidence on the coverage from a sample of pilot counties in 2005.

[6] Four counties from Liaoning province were not surveyed in the 1997 wave.

counties were uncorrelated with observable county-level characteristics before the reform. The selection of pilot counties was decided by the provincial government. It could be that counties with low average income had stronger incentives to push the provincial government for the reform. Table 3 shows the means and standard deviations of several county-level characteristics in 1997 and 2000, the years before the introduction of the NCMS, by counties grouped by their years of reform. The table suggests that there is little relationship between these factors and the timing of the implementation of the reform. Counties that implemented the reform early do not appear to have significantly different characteristics than counties that started the reform late.

2.2 The CHNS Data

I use data from the China Health and Nutrition Survey. The survey is based on a multistage, random cluster process that yields a sample of about 4,400 households with a total of 19,000 individuals that are tracked over time. The sample covers nine provinces that vary substantially in terms of geography, economic development, and other socioeconomic indicators. This survey was conducted in 1989, 1991, 1993, 1997, 2000, 2004, 2006 and 2009. I use data from 1997-2009, consisting of five waves which cover the entire period of the health insurance reform. I use data at both individual and household levels from the CHNS and focus on the rural sub-sample. The rural households are defined by the head living in a rural county and holding a rural registration card (hukou). Individual level data contains information on health, education, health insurance, food consumption and demographics such as age and relationship to the household head. Household data includes information on agricultural expenditures and various sources of income. I drop households with intermittent waves to make sure the observed changes in variables always refer to changes between adjacent waves. Confidential community data from the CHNS is used to determine the year of implementation of the NCMS at county level.

Since the enrollment into the health insurance program must be at household level, all the variables analyzed in this paper are defined at household level. To focus on stable households, I keep households whose head is aged between 25 and 65 and drop households recording a change in the household head. The measure of consumption available from the CHNS is food consumption, which accounts for roughly half of the budget share in total household expenditure in rural China during the period of the sample.[7] Food consumption is collected by a dietary questionnaire recording items and amounts of

[7]Using provincial-level data from the Rural Household Survey Statistics, Yu and Abler (2009) find that the share of

food consumption over the past three days (including food consumed both at and away from home). Individual food consumption is provided from the CHNS Individual Daily Nutrients Intake Data. It contains macronutrients including average daily intake of calories (in kilocalorie), protein (in grams), fat (in grams) and carbohydrate (in grams). Monetary value of the food consumption is, however, not readily available from the data. One advantage of working with nutrition intake, as opposed to the monetary value, is that one does not need to compute the value of home-produced food, prices of which are usually difficult to predict. In addition, while the budget share of food consumption decreases with income, nutrition intakes such as protein are luxury goods which could be a better proxy of nondurable consumption over time (Angelucci and Attanasio, 2013). One drawback is that nutrition intake would be affected by unobserved food prices which could differ by location and time. In the empirical analysis, I account for location- and time-specific differences in prices by including a separate intercept for each county and for each year. I trim the top 0.5% of daily caloric intake (and the other nutrients associated with outliers in calories), corresponding to daily caloric intakes that are above 5262 kilocalorie. Household level consumption is calculated by summing up individual food consumption and dividing it by an adult-equivalence scale.[8]

To capture severe health shocks that have a direct impact on labor supply and consumption, I define a dummy variable indicating whether the individual, during the past four weeks, had been sick, injured, or suffering from a chronic or acute disease *and* had been unable to carry out daily activities for at least five days.[9] Given that the NCMS focuses coverage toward severe illness, the five-days-work-limiting criterion is meant to identify severe sickness that can affect the household's endowment. These questions are available in all waves of the survey for every adult respondent aged above 18.[10]

food in total expenditure is 59% in 1994 and falls to about 46% in 2003.

[8]The adult equivalence scale, taken from Angelucci, De Giorgi, and Rasul (2012), is one for household members aged 18 or older, and 0.73 otherwise.

[9]The survey questions are: "During the past 4 weeks, have you been sick or injured? Have you suffered from a chronic or acute disease?" and "For how many days during the past 4 weeks were you unable to carry out normal activities due to this illness?". In addition to the self-reported sickness, I also use the physical examination data of the CHNS (which is based on actual examination at the time of the survey) to classify an individual as suffering from severe sickness if he/she belongs to any one of the following categories: blind on either or both eyes, has lost the use of one or both arms, or has lost the use of one or both legs.

[10]An alternative is to define health shocks from questions measuring health status based on the individual's self-reported ability to perform daily activities, similar to that used in Strauss, Gertler, Rahman, and Fox (1993); Gertler and Gruber (2002). The CHNS, however, only collects data on physical limitations for persons aged over 55 and terminates the collection of these data after the 2006 wave. This means that the health shocks defined by physical limitations are only available for the elder population and health shocks are not defined for half of the counties that implemented the reform after 2006. For these reasons, in the main analysis, I focus on the severe sickness measure. Nevertheless, the results on consumption smoothing using changes in physical limitations as proxies for health shocks show similar patterns as the ones to report below. These results are available from the author upon request.

Health status at household level is imputed from health of the head and/or the spouse of the household. Sickness takes place in a household as long as either the head or the spouse becomes sick. A healthy household is one where both the head and the spouse are healthy. I define a health change variable to be zero if there is no change between waves, -1 if the household moves from sick to healthy and 1 if the household moves from sick from healthy.

Table 4 presents means and standard deviations of the main variables in the selected sample. All monetary values are deflated by the CPI provided in the CHNS.[11]

3 Empirical Strategy

The basic empirical analysis is derived from a simple model of consumption choice under two states of the world. The model is based on Chetty and Looney (2006) and is outlined in the Appendix. The essential intuition is simple: when a less costly smoothing mechanism becomes available (the NCMS in our context), in the event of negative shocks to the household resources, the household would substitute public health insurance for more costly mechanisms used to smooth consumption. There are two predictions from the model that are directly testable in our context. One is that consumption should fluctuate less in response to health shocks when the NCMS is available. The extent of the fluctuation would still depend on risk aversion: if households are very risk averse, consumption changes with the NCMS may not be significantly different from the consumption changes without the NCMS. The other testable implication is that, if households resort to costly consumption-smoothing mechanisms before the reform, one would observe strong crowding out of expensive insurance channels when public health insurance becomes available. The empirical analysis below attempts to test for any substitutability between existing smoothing mechanisms and the NCMS.

The empirical test for consumption smoothing follows the standard practice in the literature (e.g. Cochrane (1991),Townsend (1994)). To test whether households are fully insured against health shocks, following Gertler and Gruber (2002), I regress changes in consumption on proxies for health shocks. Under the null hypothesis of complete insurance, the coefficient on health shock should be zero. The

[11] The price index in the first wave of the survey is calculated based on the cost of a standard consumer basket supplied by the State Statistics Bureau of China (by province and urban-rural areas). Changes in the price index in future waves track changes in the national CPI. The price index will not affect the parameters of interest, because it is completely absorbed by year and county fixed effects.

idea is that, if households are fully insured against idiosyncratic shocks (either through mutual insurance or self-insurance), consumption growth should not be correlated with changes in household endowment once growth in community-level resources are controlled for. To estimate how the insurability of health shocks changes with and without access to the health insurance program, I add an interaction term between health shocks and a reform variable R_{jt}, indicating whether the health insurance reform has been implemented in county j and wave t.[12] The main empirical model is as follows:

$$\triangle \ln c_{ijt} = \alpha_0 \triangle h_{ijt} + \alpha_1 (\triangle h_{ijt} R_{jt}) + \alpha_2 R_{jt} + \triangle h_{ijt} \gamma_t + \triangle h_{ijt} \gamma_j + \beta X_{ijt} + \gamma_j + \gamma_t + \varepsilon_{ijt} \qquad (1)$$

where $\triangle \ln c_{ijt}$ is the growth in log consumption per adult equivalent for household i in county j, $\triangle h_{ijt}$ is change in health, and γ_j and γ_t are county and wave fixed effects respectively. X_{ijt} is a set of demographic variables controlling for potential taste shifters. It consists of changes in household size, changes in share of children in the household, and a set of characteristics of the household head including age, age-squared, education and marital status. $R_{jt} = 1$ if county j implemented health insurance reform in or after wave t. Since reform is an interaction between wave and county, when interacting reform with changes in health, I am creating a triple-interaction, between time, county and changes in health. That means there are two interaction terms that need to be controlled for: $\triangle h_{ijt} \gamma_t$ are wave fixed effects interacted with health shocks which allow for the flexible time trend in the effects of health changes, and $\triangle h_{ijt} \gamma_j$ are county dummies interacted with health shocks which control for permanent unobserved heterogeneity across counties in consumption changes in response to health shocks. Because the number of people reporting changes in health within a county is small, in estimation, instead of interacting health shocks with county dummies, I interact changes in health with more aggregated provincial dummies. Therefore, I allow for unobserved heterogeneity in consumption smoothing across provinces, but restrict the effects to be the same across counties within the same province.

The wave fixed effects allow for secular changes in outcome over time that may be completely unrelated to the reform. The county fixed effects allow for the fact that variation in the timing of the reform across counties may not have been exogenous. Consistent estimation is still achieved so long as (a) these characteristics are fixed over time during the sampling periods or (b) implementation of the

[12] Recall that the data is not collected in every year. The sample I am using contains five waves collected in 1997, 2000, 2004, 2006 and 2009.

reform is not correlated with changes in these characteristics. The county fixed effects would capture local hospital capacity, level of economic development and other unobserved characteristics that could be correlated with the timing of the reform.

Equation (1) regresses changes in log consumption on changes in sickness. The first-difference setup already eliminates unobserved household heterogeneity (such as preferences and health endowment) which may determine the level of consumption and correlate with sickness at the same time. α_1 shows the effect of a health shock with health insurance coverage. In the context of consumption insurance, it identifies the causal effect of health insurance on consumption smoothing against health shocks. α_2 shows the direct effect of being covered by health insurance (on households that did not experience health shocks between waves). α_0 shows the direct effect of a health shock in the absence of health insurance, in the baseline county and baseline year. Instead of presenting the full set of estimated parameters α_0, γ_t and γ_j, in subsequent tables showing regression results, I compute the average marginal effect of a health shock in the absence of the health insurance ($M0$). These are the average effect of the health shock in the absence of health insurance. I also compute the average effect of a health shock with health insurance ($M1$). $M1$ measures the net effect which is a sum of $M0$, the average direct effect of the health shock without insurance, and the parameter α_1, the effect from health insurance in mitigating the health shock.

I use the same empirical model to evaluate the consequences of severe illness on various economic outcomes, before and after the expansion of health insurance. To capture any common shock to consumption across households within the county and over time, standard errors are clustered at the county level, which is the level where the reform is implemented.

Threats to identification. There are several potential threats to identifying the causal effects of the health insurance program. First, while the correlation between reform and permanent county characteristics is controlled for through county fixed effects, there could be other changes that influence the timing of the reform and affect the dependent variable of interest at the same time. One way to test whether such a confounding factor exists is to check whether, conditional on year and county effects, there is any remaining correlation between the timing of the future reforms and the outcome variables before the reform. If future reforms predict outcome variables prior to the reform, then it is likely that there exist unobservable county-specific trends that are correlated with the timing of the

reform. In the robustness section below, I find no evidence supporting this hypothesis, for almost all major outcomes of interest. Second, changes in health status are assumed to be exogenous shocks, conditioning on the observable characteristics, unobserved county and year effects.[13] One possibility is that the marginal utility of consumption may depend on health status directly, or indirectly through induced changes in leisure when consumption and leisure are not additively separable. In this case, the growth of consumption will vary with the state of health even with full insurance. Health shock will then be correlated with omitted preferences in the error term. To test for such state dependence, in the robustness section, I estimate the model using changes in total consumption by household members who did not experience a health shock. The main conclusions remain to hold.

4 Estimation Results

4.1 Consumption Smoothing

Table 5 reports estimates based on the main empirical model as specified in equation (1). The dependent variables are growth in household food consumption in terms of four nutritional intakes: calories, protein, fat and carbohydrate. The first row presents the average effects of a health shock before the reform on the growth of nutrition intakes. Since the model is specified in first differences, they can also be interpreted as the average effects of illness on the level of nutrition intakes. I find that negative health shocks prior to the reform lead to sizable and significant reductions in the growth of protein and caloric intakes. Growth in these intakes are lowered by 5.3% and 6.8%, respectively.[14] Estimates on fat and carbohydrate intakes are of the same sign but are imprecisely estimated. This evidence suggests that we can reject the hypothesis of full insurance against severe health shocks before the reform.

After the reform, however, I could no longer reject the hypothesis that households are fully insured against health shocks. The net effects of the health shock after the reform are shown in the second row of Table 5. None of the growth in nutrition intakes are significantly affected by the health shock. The effects of the health shock after the reform subtracts the effects of health shock before the reform is the consumption smoothing effect of health insurance (parameter α_1 shown on the third row). For caloric

[13] Note that he first-differencing already eliminates any unobserved household characteristics (such as health endowments) that may confound identifying the effect of illness.

[14] The estimated effects of illness on consumption without health insurance in rural China are of similar magnitude compared with estimates from US households. For example, Cochrane (1991) finds that long periods of illness of PSID households (more than 100 days in a year) lead to a reduction of food consumption growth by 11-14%.

and protein intake, there are positive and significant effects of health insurance coverage on consumption smoothing against health shocks – offering access to health insurance completely eliminates the negative effects on caloric and protein intakes from severe illnesses that were present prior to the introduction of health insurance. The estimates for fat and carbohydrate are also positive but are not statistically significant.

The direct effects of health insurance on consumption growth are positive but not significantly different from zero (the fourth row in the table), indicating that the consumption behavior of households without experiencing health changes is not affected. Remaining rows in Table 5 show the estimated coefficients for the main control variables. Growth in per capita log consumption fall with increase in log household size and rise with increase in the share of children in the household. Consumption grows at a faster rate for older heads and heads who have at least graduated from primary school.

4.2 Investment

I employ the same empirical model as described in equation (1) to estimate the effects of illness on investment with and without health insurance. I consider three types of investment that are most common to all rural households: investment in children's human capital, agricultural investment and investment in durable goods.

As human capital investment, I consider the rate of school enrollment, defined as the number of children who are enrolled in school among those aged between 10 and 18 within the household.[15] The normal age finishing 9 years of schooling is 16. Tuition is free for 9 years of schooling (primary and lower-middle school education). Schooling would incur costs to purchase books, tools, transportation, tuition for any schooling of more than 9 years, and opportunity costs in terms of forgone earnings. Brown and Park (2002) document that in poor counties in rural China, a family with one child in primary school and another in lower middle school spends as much as fifty percent of expenditures per capita on fees related to education.

[15]This variable is defined using a combination of two variables. The first and the main variable is whether the child is currently enrolled in school. Prior to 2004, this variable was collected from the household survey. Starting from the 2004 wave, this variable is collected from a separate child questionnaire where the respondents must be children under age 18 living in the household at the time of the survey. To track children who are members of the household but were temporarily away from the household (temporary migrant workers and students at boarding schools, in particular), I use another question from the household survey which, for each member away from the household, records the reasons for not currently residing in the household, such as schooling or seeking employment in cities.

Table 6 shows that, in the absence of health insurance, severe illness leads to a reduction in children's schooling. On school enrollment rate for all children in the household and for boys, the effects of sickness are negative but insignificant. This suggests that there is no significant reduction in boys' schooling in response to health shocks before the reform. On the contrary, sickness leads to large and significant drop in school enrollment for girls: moving from healthy to severe illness implies a 28.7% decline in the likelihood of girls being in school. These results are consistent with previous evidence that girls' schooling in rural China is more sensitive to economic conditions of the household than boys' (Connelly and Zheng, 2003; Hannum, 2005; Song, Appleton, and Knight, 2006). After the reform, severe illness no longer has any significant impacts on human capital investments (row 2 in Table 6). The difference in the effects of negative health shock before and after the reform implies the interaction effects of health insurance on other smoothing mechanisms (row 3). In particular, following a negative health shock, households with health insurance are 40% more likely to keep their girls in school, relative to households experiencing a health shock without health insurance (column 3). Access to health insurance thereby reduces the gender difference in schooling within the household that is due to a negative health shock.

As agricultural investment, I consider investment in farming and gardening and livestock. Investment in farming and gardening refers to the total amount spent, in the past year, on leasing land, purchasing seedlings, fertilizer, tools, insecticides and hiring labor. Investment in livestock includes the total amount spent on purchasing, feeding and caring for up to four types of livestock and poultry. Equipment includes tractor, garden tractor, irrigation equipment, power thresher, household water pump, motorcycle and automobile. Finally, as investment in durable goods, I create a binary variable indicating whether the household had purchased durable good in the past 12 months. The categories of durable goods include television, refrigerator and washing machine, which are the most common and useful appliances in Chinese households. One problem with the measurement of investment in agricultural activities and durables is that it is based upon actual investment taken place in the past year. The health shocks are based on health conditions in the last four weeks. Ideally one would also like to observe health shocks from the past year, but this is not possible without additional data. Severe health shock in the past four weeks can be thought of as a proxy for health shock in the past year. In the data, severe health shock appears to be fairly persistent: conditional on unhealthy in the previous survey, over 20% of the households remain unhealthy in the current survey. Nevertheless, the results relating to agricultural

and durable investment should be interpreted with caution.

Columns (4)-(6) presents the estimates on agricultural and durable investment. Before the reform, the estimates imply that moving from healthy to illness would lower the investment in livestock by 550RMB and the probability of durable goods purchase by 6.7%. Investment in farming is inelastic to severe health shocks, suggesting that the household without health insurance adjusts its investment behavior primarily by delaying investments in livestock and durable goods. After the reform, neither livestock investment nor durable purchase is affected by severe health shocks (row 2). The estimated parameters α_1, which can be interpreted as capturing the "crowding-in" effect between health insurance and other channels of consumption smoothing, are positive and significant for investment in livestock.

The theoretical model predicts that, when public health insurance becomes available, the household should smooth consumption by switching from costly smoothing mechanisms to public health insurance. The findings suggest that, in the absence of public health insurance, low-income households in rural China reduce girls' schooling, investment in livestock and delay purchase in durables to cope with severe health shocks. The availability of the public health insurance program reduces the extent to which the household rely on these types of investment after a severe health shock.

Finally, note that the direct effects of the reform are not significantly different from zero on all types of investment. One hypothesis is that the availability of health insurance could reduce incentives for investment. If investment decisions were made as an ex-ante response against future health shocks to the household (such as investing more in children's schooling so they may have higher earnings to compensate the earnings losses when the head is sick), the availability of public health insurance may reduce the overall incentives to invest. This does not appear to be the case empirically. The fourth row of Table 6 demonstrates that the coefficients on reform are close to zero and insignificant in all types of investment, suggesting that health insurance does not change the investment behaviors of households that did not experience a health shock. Therefore, the reform shifts investment behavior through changes in ex-post response to health risk, but not through changes in the ex-ante response.

5 Robustness Checks

5.1 Dynamic Impacts of the Reform and Pre-treatment Trend

One limitation of the specification of equation (1) is that it assumes that treatment is associated with a one-time shift in outcomes. Since there was little health insurance coverage for most rural households before the reform, it may take time for people to understand the details of a new health insurance program. As a robustness test I also estimate a more flexible equation, allowing the effects of the reform to vary over time:

$$\begin{aligned}\triangle \ln c_{ijt} =&\alpha_0 \triangle h_{ijt} + \sum_{y=-b}^{a} \alpha_1^y \triangle h_{ijt} 1(t - T_j = y) + \sum_{y=-b}^{a} \alpha_2^y 1(t - T_j = y) \\ &+ \triangle h_{ijt}\gamma_t + \triangle h_{ijt}\gamma_j + \beta X_{ijt} + \gamma_j + \gamma_t + \varepsilon_{ijt} \end{aligned} \tag{2}$$

The indicator function is equal to one when the observation is $y = -b, ..., a-1, a$ waves from the date T_j, the year that health insurance is provided in county j. The indicator for $y < -b$ is omitted. The set of τ describes the evolution of outcomes before and after the reform, relative to the outcome b periods before the reform. In practice I choose to include dummies indicating the first wave immediately prior to the reform ($y = -1$), the first wave immediately following the reform ($y = 1$) and two or more waves after the reform ($y >= 2$).[16] The flexible specification in equation (2) identifies the effects of the program immediately after implementation and whether or not they persist over time. One potential concern is that the timing of the reform could be correlated with changes in unobserved characteristics (e.g. induced by other reforms). The coefficient on the wave prior to reform is an important test for differential evolution of outcomes before the reform that may confound the true estimated effects of the program.

Table 7 shows the dynamic effects of the program on consumption smoothing and investment, where the previous results suggest significant impacts. The estimates are generally in line with the conclusion obtained in the last section. On consumption smoothing, the estimates using caloric and protein intakes show no significant effects in the first wave prior to the reform. The effects are sharply increasing in the first survey since the reform and also persist into the future. On investment, I find no evidence that

[16] The reason for combining the effects of two waves or more is that outcomes are observed at most three waves after the reform (2004, 2006 and 2009) and that few counties started the reform in 2004.

there is any preexisting trend. The effects on girls' schooling and durable purchases increase visibly as the reform begins and persist over time, although the estimates on livestock investment do not suggest any clear patterns over time.

5.2 State-dependent Preferences

The growth of consumption can be shifted by changes in the state of health even with full insurance, when the marginal utility of consumption depends on health status directly, or indirectly through induced changes in leisure when consumption and leisure are not additively separable. One advantage of the CHNS data, compared with other household panel data of consumption, is that it collects food consumption data at individual level. I construct an alternative measure of adult-equivalent consumption by excluding the consumption of the household head and/or the spouse who ever experienced a health shock in the panel. This measure circumvents the problem that changes in health may impact the marginal utility of consumption for the sick member directly. Note that average caloric intakes from the head and the spouse account for about 65% of the average level of household caloric intake. For a sick household, by excluding head and spouse who ever become sick, I may only use the variation coming from the remaining 35% of household consumption. If there are within-household allocation of food consumption in response to the health shock (such as maintaining consumption level of children if parents are altruistic), then changes in consumption may be more muted for the rest of the household. Table 8 presents the set of consumption-smoothing regressions, using changes in the log of this alternative consumption measure as the dependent variable. The standard errors are larger, making the estimated effect of health insurance on consumption smoothing insignificant. Nevertheless, the main conclusion is similar to the baseline measure of consumption: the null hypothesis of complete insurance is rejected for caloric and protein intakes before the reform, but we cannot reject the hypothesis of full insurance after the reform.

6 Potential Mechanisms

While there are interesting patterns of substitution between public health insurance and private arrangements of insurance, competing mechanisms could lead to similar findings. A negative health shock could incur two types of costs on households. One is the medical expenditure needed to treat the illness,

which can be substantial relative to their income. Another is the negative shock to productivity, which, depending on the quality of the treatment, could be persistent. The direct effect of health insurance is to reduce out-of-pocket medical cost to treat severe sickness. In the context of the theoretical model, this is represented by a direct reduction in the cost of consumption smoothing. Health insurance could also reduce the productivity loss from a health shock, perhaps indirectly by improving the quality of treatment after a health shock. This means that the effects of the NCMS may come from reduction in the severity of health shocks on household resources (represented by changes the extent of the bad state in the model).

To evaluate the importance of each mechanism, I apply the main empirical model to conduct two empirical tests. First, I test whether out-of-pocket medical expenditure for treating the severe health shock is reduced after the reform. The out-of-pocket cost is the portion of the cost paid by the household for being treated for the same illness that was used to define health shocks. It includes expenditures on treatment at up to two clinics or hospitals, plus the cost of informal treatment if the individual seeks informal care. In column (1) of Table 9, I report estimates from the model in equation (1) with the dependent variable replaced by changes in out-of-pocket medical expenditure. The results indicate that, without health insurance, moving from healthy to severe sickness leads to nearly 1600 RMB (approximately 250 USD) out-of-pocket spending on treating the illness. This is close to 10% of mean annual household income. After the health insurance expansion, severe sickness increases out-of-pocket spending by 480 RMB, which is not significantly different from zero and 70% less compared to before. These estimates provide strong evidence that the health insurance reduces out-of-pocket expenditures significantly. If the alternative hypothesis is that households were only switching from informal care to formal care when they gained access to health insurance with out-of-pocket expenditure intact, one would not expect the out-of-pocket expenditure to be different after the reform. This result appears to differ from the findings of Wagstaff, Lindelow, Jun, Ling, and Juncheng (2009) and Lei and Lin (2009), who find that the NCMS does not have significant impacts on the out-of-pocket expenditures. However, their results are based on average out-of-pocket expenditures, unconditional on the types of health shock. The policy guidance from the central government made it clear that the program is designed to reduce the financial burden for rural households suffering from severe sickness. Indeed, for households without a severe health shock, the reform does not have significant impact on expected expenditures

(last row of column 1 in Table 9).

As a second test, I look for evidence of whether health insurance help families to reduce productivity losses from the health shock. To do so, I estimate the baseline model in equation (1) using changes in income as dependent variables. Columns (2) of Table 9 shows that the effect of illness has significant negative impact on the income of the head without health insurance. Moving from healthy to sickness reduces income of the head by more than 30%. With health insurance coverage, the negative impact on head's income is completely muted. In columns (3)-(4), I repeat this exercise by focusing on changes in the total income of head and spouse and changes in total household income, respectively. Compared with the impact to head's income without health insurance, the negative effects on head and spouse's joint income are smaller and become insignificant when total household income is used. This suggests that, at least in the absence of health insurance, labor supply from other household members also serves as a channel to reduce the negative impact of the health shock. After the reform, none of the income measures is significantly affected by illness. Therefore, it appears that health insurance also dampens the productivity losses from severe health shock for the head and the spouse. One explanation is that health insurance may improve the quality of treatment or the health outcome after the severe shock. In columns (5) and (6), I estimate the model on changes in the number of days affecting normal daily activity (due to the illness) in the previous month and changes in self-reported health status. The self-reported health status variable is taken from a question asking the respondent to provide a rank from 1 to 4 describing his/her health compared to that of other people of the same age (1 is excellent and 4 is poor). As expected, severe shocks in the absence of health insurance increase the number of sick days by 12 days in the previous month and the self-reported health status by 0.24 points. After the reform, severe illness remains to have quantitatively similar effects on the duration of sickness and health status. The coefficients on the reform dummy interacted with changes in health are insignificant (row 3 of columns 5 and 6). Therefore, the severity of health risks, measured by either the length of sickness and self-reported health outcomes, does not appear to be affected by accessing to health insurance .

Even though there is no direct evidence indicating that health insurance changes the severity of a health shock, one cannot rule out that health insurance may improve the quality of health care. Lei and Lin (2009) and Wagstaff, Lindelow, Jun, Ling, and Juncheng (2009) show that the same health

insurance program significantly increases the utilization of formal outpatient and inpatient care, both of which could lead to better treatment against severe sickness. If the quality of treatment goes up, the effect of health shock on individual income may become smaller and less persistent. Testing this hypothesis is left for future work, as the CHNS data does not contain variables measuring the quality of health care.

7 Conclusion

I investigate the impacts of public health insurance coverage on consumption smoothing and investment for households in rural China. By doing so I aim to address two research questions. One is whether additional social insurance in developing countries could help households better smooth consumption. The other question, perhaps more importantly, is how additional social insurance interacts with existing private insurance arrangements. The empirical challenge is that individuals with certain unobserved traits (such as risk aversion) may self-select into insurance programs, and the unobserved heterogeneity also affects consumption and investment choices. In contrast to previous studies, I am able to address the problems of selection and omitted variables bias by exploiting a dramatic expansion in health insurance coverage in rural China. I find that the introduction of public health insurance leads to complete consumption insurance against severe health shocks. Public health insurance also *crowds in* investment in girls' education and agricultural activities, suggesting that households were using costly mechanisms to self-insure against health shocks when health insurance was unavailable.

Understanding both questions is highly important and relevant to policy in developing countries. The existing literature has suggested that public insurance programs may have little net effects on the welfare of the intended beneficiaries, because the provision of these programs may crowd out private arrangement of self-insurance. To understand the net welfare gain of public insurance programs, the more important policy question is at what cost public insurance replaces private arrangements of smoothing against shocks. The evidence from rural China suggests that, at least for low-income households that are liquidity constrained and for idiosyncratic shocks that are large relative to household resources, additional public insurance programs could lead to net gains by reducing the use of costly self-insurance mechanisms. Analyzing consumption fluctuations alone may provide an incomplete picture of the true welfare gains of additional social insurance.

A Appendix: An Analytical Framework

I follow Chetty and Looney (2006) to sketch a simple model highlighting the welfare gains from publicly provided insurance. Suppose there are two states in the world, one with good health and one with bad health. Suppose that, in the good state, the utility cost of obtaining consumption level c is $\theta_g c$. In the bad state, the utility cost of reaching consumption level c requires a larger cost $\theta_b c$. I normalize $\theta_g = 1$, so θ_b measures the additional utility cost of reaching consumption level c in the bad state, relative to the cost in the good state. If θ_b is high, households that are hit by shocks will need to sacrifice more in order to reach the same consumption level as before. To facilitate the discussion later, suppose the household can choose from a menu of insurance channels denoted by $\{\theta_b^1, \theta_b^2, \ldots\}$. θ_b^k summarizes the cost of consumption smoothing from different channels. A utility-maximizing household would choose the $\theta_b = \min\{\theta_b^1, \theta_b^2, \ldots\}$. Assuming a CRRA utility function, the optimal changes in consumption in response to a bad health shock can be written as

$$\frac{\triangle c_i}{c_i} = 1 - (\frac{1}{\theta_b})^{1/\gamma} \tag{3}$$

where γ is the coefficient of risk aversion. From equation (3), it is obvious that changes in consumption depend on two parameters: the cost of consumption smoothing and the coefficient of risk aversion. Consumption may not fluctuate much in response to health shocks because of either a low cost of smoothing (such as easy access to the credit markets) or a high cost of smoothing but with households that are very risk averse (γ is large). To evaluate the welfare consequences of insurance policies, one must determine why and how households smooth consumption – because of high risk aversion (large γ) or through good insurance arrangements (low θ_b). Looking at consumption changes alone would not be sufficient to distinguish between these two explanations.

The health insurance reform considered in this paper can help to distinguish between the two explanations of consumption smoothness. The availability of health insurance to cover lumpy expenditures of health care can be thought of as an additional channel to insure against health shocks. Suppose the cost of smoothing consumption using health insurance is θ_b^h. If θ_b^h is higher than θ_b, the existing channel of insurance, consumption fluctuations in response to health shocks would not change after the availability of health insurance. If public health insurance is a cheaper way to insure against health shocks (θ_b^h

smaller than θ_b), then we should observe a smoother consumption stream in response to health shocks after the reform than before the reform. The change in smoothness still depends on the risk aversion parameter. If households are very risk averse, a health insurance program may still have a small impact on consumption smoothness. A better measure of the welfare gain of the program is to look directly at the substitution patterns between health insurance and other pre-existing insurance channels. If households resort to costly consumption-smoothing mechanisms before the reform, one would observe strong crowding out of expensive insurance channels when public health insurance becomes available.

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Table 1: Implementation of the Health Reform By County

	Counties		
Year	Total	Treated	% treated
1997	32	0	0.0%
2000	36	0	0.0%
2004	36	3	8.3%
2006	36	21	58.3%
2009	36	36	100.0%

Table 2: Implementation of the Health Reform By Households

				Households			
Year	Total	Access to NCMS	% access	Insured by CMS[a]	% insured by CMS[a]	Insured	% insured
1997	1,407	0	0.0%	181	12.9%	219	15.6%
2000	1,661	0	0.0%	114	6.9%	159	9.6%
2004	1,601	119	7.4%	230	14.4%	264	16.5%
2006	1,575	889	56.4%	791	50.2%	818	51.9%
2009	1,442	1442	100.0%	1369	94.9%	1382	95.8%

Notes: a. CMS includes both the CMS prior to the reform and the NCMS program after the reform. In the CHNS data, it is not possible to distinguish whether a household is covered by the old CMS from the NCMS.

Table 3: Characteristics of Counties by Reform Years, Prior to the Reform

	Years of Reform					
	2004		2006		2009	
	Mean	SD	Mean	SD	Mean	SD
Households with severe sickness (%)	0.03	0.03	0.03	0.03	0.04	0.04
Total household income	15205.67	2844.97	14900.89	4674.06	15349.80	5889.60
Household with health insurance	0.20	0.26	0.09	0.18	0.14	0.26
Head with at least 9 years of schooling	0.53	0.13	0.47	0.10	0.43	0.13
Age of household head	44.71	1.61	43.83	3.01	45.44	2.41
Number of counties	3		18		15	

Table 4: Summary Statistics

	Mean	SD	Observations
Age of Head	47.05	9.65	7686
Married	0.93	0.26	7654
Head with at least 9 years of education	0.52	0.50	7686
Household Size	3.86	1.41	7611
Household Income	20458.67	25284.17	7546
Income from farming and gardening[a]	8625.93	9451.19	6663
Income from livestock[b]	1266.54	6452.42	4014
Investment in farming and gardening[a]	1827.63	2329.88	4027
Whether purchase durables	0.12	0.32	7686
Share of children (aged 10-18) in school[c]	0.74	0.40	3269
Calories (in kilocalorie)	2374.18	658.22	7622
Protein (in grams)	67.60	22.74	7622
Fat (in grams)	68.45	36.55	7622
Carbohydrate (in grams)	366.48	116.18	7622
Major illness	0.04	0.21	7540

Notes:

a. For households with farming activities on a collective, state or a household farm.

b. For households with activities in raising livestock or poultry either on a collective or at home.

c. For households with children aged between 10 and 18.

Table 5: Effects of Health Insurance on Consumption Smoothing

	Calories	Protein	Fat	Carbohydrate
	(1)	(2)	(3)	(4)
Effects of health shock	-0.068***	-0.053*	-0.096	-0.036
before the reform	(0.025)	(0.031)	(0.067)	(0.024)
Effects of health shock	0.046	0.048	0.065	0.026
after the reform	(0.042)	(0.035)	(0.089)	(0.042)
Reform×Δhealth	0.114*	0.101*	0.161	0.062
	(0.059)	(0.058)	(0.135)	(0.057)
Reform	0.044	0.059	0.101	0.041
	(0.053)	(0.064)	(0.137)	(0.055)
Δ log hh. Size	-0.086***	-0.059**	-0.146***	-0.050**
	(0.019)	(0.023)	(0.044)	(0.021)
Δ share of children	0.065*	0.021	0.062	0.074*
	(0.035)	(0.046)	(0.093)	(0.037)
Head's age	-0.009	-0.012*	-0.005	-0.011*
	(0.006)	(0.007)	(0.012)	(0.006)
Head's $age^2/100$	0.008	0.011	0.002	0.011*
	(0.006)	(0.007)	(0.013)	(0.006)
Head married	-0.011	-0.013	0.011	-0.022
	(0.016)	(0.018)	(0.029)	(0.016)
Head primary school	0.031**	0.029*	-0.020	0.047**
	(0.014)	(0.016)	(0.026)	(0.018)
Head lower-middle school	0.023*	0.020	-0.003	0.030*
	(0.013)	(0.013)	(0.028)	(0.015)
Head upper-middle school or more	0.033**	0.042**	-0.022	0.051**
	(0.016)	(0.016)	(0.029)	(0.019)
N	4967	4967	4967	4967

*** p<0.01, ** p<0.05, * p<0.1. Estimates are from the model as in equation (1) in text. The model is estimated by OLS. Standard errors are clustered at county level and are shown in parentheses.

Table 6: Effects of Health Insurance on Investment

	Human Capital Investment			Agricultural Investment		HH. Durables
	Δ % of children in school	Δ % of boys in school	Δ % of girls in school	Δ inv. in farming	Δ inv. in livestock	P(purchase durables)
	(1)	(2)	(3)	(4)	(5)	(6)
Effects of health shock	-0.074	-0.060	-0.287***	196.832	-550.848***	-0.067**
before the reform	(0.089)	(0.109)	(0.077)	(242.762)	(184.973)	(0.027)
Effects of health shock	0.029	-0.012	0.113	243.280	249.986	0.027
after the reform	(0.122)	(0.155)	(0.142)	(344.531)	(240.188)	(0.047)
Reform×Δhealth	0.103	0.048	0.400*	46.448	800.834*	0.094
	(0.166)	(0.234)	(0.198)	(459.577)	(396.331)	(0.070)
Reform	-0.022	-0.019	-0.043	-330.159	-618.474	-0.029
	(0.056)	(0.074)	(0.079)	(474.010)	(435.803)	(0.023)
Δ log hh. Size	0.021	0.056	-0.014	114.739	-163.376	0.071***
	(0.091)	(0.090)	(0.178)	(119.173)	(156.825)	(0.017)
Δ share of children	-0.636***	-0.157	-0.427**	89.427	-346.426	0.005
	(0.125)	(0.160)	(0.177)	(445.672)	(336.852)	(0.037)
Head's age	-0.040*	-0.074***	-0.053	-22.356	13.520	0.005
	(0.020)	(0.024)	(0.035)	(56.511)	(40.245)	(0.006)
Head's $age^2/100$	0.043**	0.077***	0.055	15.324	-18.682	-0.004
	(0.021)	(0.026)	(0.037)	(57.967)	(41.581)	(0.006)
Head married	-0.004	-0.005	-0.004	33.127	139.306	0.043**
	(0.049)	(0.091)	(0.086)	(103.792)	(172.631)	(0.017)
Head primary school	0.064*	-0.076	0.189***	-8.482	-306.174	-0.002
	(0.034)	(0.058)	(0.053)	(75.084)	(190.169)	(0.016)
Head lower-middle school	0.051	-0.033	0.096	-28.239	-204.940	0.017
	(0.032)	(0.059)	(0.057)	(57.134)	(132.089)	(0.018)
Head upper-middle school	0.094**	0.046	0.134***	-109.449	-208.098	0.031*
or more	(0.035)	(0.065)	(0.048)	(105.615)	(202.656)	(0.018)
N	1641	984	837	2054	2150	5044

*** p<0.01, ** p<0.05, * p<0.1. Estimates are from the model as in equation (1) in text. The model is estimated by OLS. Standard errors are clustered at county level and are shown in parentheses.

Table 7: Dynamic Effects of Health Insurance

	Consumption smoothing		Δ % of girls in school	Δ inv. in livestock	P(purchase durables)
	Calories	Protein			
	(1)	(2)	(3)	(4)	(5)
Waves since reform ×Δhealth					
1	0.112	0.101	0.647**	579.442	0.095
	(0.074)	(0.083)	(0.253)	(630.717)	(0.086)
2+	0.154*	0.152	0.542**	-326.277	0.076
	(0.090)	(0.095)	(0.225)	(558.303)	(0.078)
-1	-0.002	0.001	0.207	-306.575	0.002
	(0.057)	(0.060)	(0.197)	(679.179)	(0.058)
N	4967	4967	837	2150	5044

*** p<0.01, ** p<0.05, * p<0.1. Estimates are from the model as in equation (2) in text. The model is estimated by OLS. Standard errors are clustered at county level and are shown in parentheses.

Table 8: Effects of Health Insurance on Consumption Smoothing: State-dependent Preferences

	Calories	Protein	Fat	Carbohydrate
	(1)	(2)	(3)	(4)
Effects of health shock	-0.058*	-0.072**	-0.026	-0.045
before the reform	(0.032)	(0.035)	(0.072)	(0.035)
Effects of health shock	-0.021	0.008	-0.161*	-0.002
after the reform	(0.057)	(0.051)	(0.094)	(0.066)
Reform×Δhealth	0.036	0.080	-0.135	0.043
	(0.076)	(0.073)	(0.143)	(0.087)
Reform	0.026	0.042	0.067	0.027
	(0.056)	(0.067)	(0.140)	(0.057)
N	4844	4844	4844	4844

*** p<0.01, ** p<0.05, * p<0.1. Estimates are from the model as in equation (1) in text. The model is estimated by OLS. Standard errors are clustered at county level and are shown in parentheses.

Table 9: Effects of Health Insurance on Out-of-pocket Expenditures, Income and Health

	Δ Out-of-pocket expenditure	Δ head's income	Δ H+S income	Δ HH income	Days of Sickness	Changes in health status
	(1)	(2)	(3)	(4)	(5)	(6)
Effects of health shock	1598.615**	-0.322***	-0.240*	-0.137	12.23***	0.237***
before the reform	(324.727)	(0.110)	(0.120)	(0.098)	(0.098)	(0.085)
Effects of health shock	480.880	0.075	-0.045	0.179	14.02***	0.322**
after the reform	(459.381)	(0.255)	(0.238)	(0.146)	(1.127)	(0.146)
Reform×Δhealth	-1117.735*	0.397	0.196	0.316*	1.787	0.085
	(660.958)	(0.280)	(0.298)	(0.183)	(1.445)	0.152
Reform	-65.197	0.022	0.162	0.083	-0.315**	0.003
	(139.935)	(0.184)	(0.182)	(0.139)	(0.147)	(0.088)
N	4965	3588	4300	4875	4810	3174

*** p<0.01, ** p<0.05, * p<0.1. Estimates are from the model as in equation (1) in text. The model is estimated by OLS. Standard errors are clustered at county level and are shown in parentheses. Note that the self-reported health status is not available in the 2009 survey.

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