Testing Insurance Against Illness under Health State Dependent Utility Function: The Case of Impoverished Households*

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Abstract

The challenge of testing for insurance against illness is that co-movements between household consumption and illness shocks might reflect changes in the marginal utility of consumption of well insured households. We set up a model in which adult's health influences adult's marginal directly, but not child's marginal utility. A testable implication of the model is that in well insured households, child's consumption should not depend on adult's health shock. We take this hypothesis to the data using a three wave panel of imporvished households collected in Colombia. We proxy child's consumption by child's weight and find that child's weight falls following an adult illness shock. After ruling out alternative explanations and passing a placebo test, we conclude that housholds are insufficiently well insured against illness. However, this would not have been detected should we followed the standard approach in the income shocks literature and use household consumption as the main variable of the analysis.

1 Introduction

Testing whether households are well insured against income shocks has been and still is at the heart of development economics. Due to non-existent or malfunctioning credit and insurance markets, households are not able to fully smooth

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consumption despite the use of informal risk coping strategies such as transfers, gifts, and the sale of assets (Townsend 1994 and 1995, Udry 1994, Besley 1995a, Attanasio and Szekely 2004). In anticipation of this, households might choose inefficient production methods if they are less risky or make suboptimal investment choices (Morduch 1995, Fitzsimons 2007).

In this paper we depart from existing literature by testing whether households are well insured against health shocks rather than income shocks. The advantage of using income shocks is that one can assume that they do not affect preferences, and hence the marginal utility of consumption is invariant to the shock. Consequently, the consumption of a well insured household (that is, of one that equates his marginal utility of consumption across different states of the world) will not be affected by idiosyncratic income shocks. However, the basic assumption that preferences are invariant to shocks is more problematic when we refer to a health shock. Co-movements between health shocks and household consumption could simply reflect changes in the marginal utility of consumption. For instance, if the marginal utility of consumption increased with illness, it is expected that a well insured household would increase consumption when affected by illness in order to equate its marginal utility of consumption across the healthy and sick state. This means that the relation between household consumption and health shocks is not longer informative regarding how well insured the household is against illness, unless without further assumptions on how health affects the marginal utility of consumption.

Testing for insurance against illness is interesting because the interest of governments in expanding health insurance in developing countries is not matched with the existing evidence on how well insured households are. In the last decade, many countries have tried to improve health insurance coverage: China, Vietnam, Colombia, Chile, Indonesia, Mexico are the ones we are aware of. However, the existing evidence is not clear in concluding that households are not well insured against illness. Townsend (1995) finds that the percentage of the year that an adult male is sick has no impact on consumption. Gertler and Gruber (2002) find

that non-medical consumption decreases with major illness shocks but not with milder ones. Mohanan (2011) finds that households affected by exogenous health shocks are able to smooth consumption on food, housing, and festivals, with only small reductions in education spending.

Our contribution is to test for insurance against illness but allowing for a direct effect of health on the marginal utility of consumption. This is important because the evidence on how health affects the marginal utility of consumption is so far conclusive. Lillard and Weiss (1997) finds positive state dependence (the marginal utility of consumption increases with sickness), Viscussi and Evans (1990) and Finkelstein *et al.* (2008) find negative state dependence, and Evans and Viscussi (1991) find that the marginal utility of income does not vary with health. Clearly, the literature on illness state depedence is far from conclusive.

In this paper, we set up a model in which adult's health influences adult's marginal directly, but not child's marginal utility. A testable implication of the model is that in well insured households, child's consumption should not depend on adult's health shock. We take this hypothesis to the data using a three wave panel of imporvished households collected in Colombia. We proxy child's consumption by child's weight and find that child's weight falls following an adult illness shock. After ruling out alternative explanations and passing a placebo test, we conclude that households are insufficiently well insured against illness. However, this would not have been detected should we followed the standard approach in the income shocks literature and use household consumption as the main variable of the analysis.

2 Theoretical model

In this section we derive implications of full insurance that can be tested, and potentially rejected by the data. Implications of full insurance are obtained by solving the social planner's problem which maximizes social welfare (represented by the weighted sum of households' utilities) subject to an aggregate resource constraint. We build on Mace (1991) because her formulation lends easily to

consider health shocks that affect the marginal utility of consumption. Our key departure is to consider a household formed by and adult (A) and a child (C), instead of a single individual.

We start by describing the features of the economy. Regarding the information structure, at each time period t, household's common information is given by finite number S of events $s_{t\tau}$, $\tau = 1, ..., S$. The probability that event $s_{t\tau}$ occurs at time t is given by $\Pr(s_{t\tau})$, with $\sum_{\tau=1}^{S} \Pr(s_{t\tau}) = 1$, for all t.

There are J finite lived households. Each household j receives at time t an exogenous endowment for consuming which depends on $s_{t\tau}$:

$$y_{jt}(s_{t\tau}) = \overline{y}_{jt} + \eta_t(s_{t\tau}) + \phi_{jt}(s_{t\tau}),$$

where $\bar{y}_{jt}$denotes a deterministic component of output, $\eta_t(s_{t\tau})$ represents the aggregate level component happening at time t and $\phi_{jt}(s_{t\tau})$ denotes the idiosyncratic component corresponding to the household j in time t. he household j has preferences for the consumption good of the adult $C_{Ajt\tau}$, and that of the child $C_{Cjt\tau}$,and maximizes expected lifetime utility expressed as $0 < \beta < 1$

$$\sum_{t=0}^{\infty} \beta^t \sum_{\tau=1}^{S} \pi(s_{t\tau}) U[C_{Ajt\tau}, C_{Cjt\tau}, H_{Ajt\tau}],$$

where $H_{Ajt\tau}$ is the adult's health status, and β $(0 < \beta < 1)$ is the discount factor.

We assume that the household j's utility function takes the simple form

$$U[C_{Ajt\tau}, C_{Cjt\tau}, H_{Ajt\tau}] = u_A\left(C_{Ajt\tau}, H_{Ajt\tau}\right) + \lambda u_C\left(C_{Cjt\tau}\right),$$

which assumes that utility is additively separable in adult's and child's consumption, and that adult's health status does not affect the marginal utility of child's consumption (our empirical analysis will shed light on this).Despite the simplicity of the utility function, it allows for adult's health to affect the marginal utility of adult consumption which is a major departure from existing work and it is at the heart of our contribution. Note that we abstract from child's health because in our empirical analysis we focus on how well insured the household is against shocks to adult's health.

Given a set of Pareto-weights, $\{w_j\}$,the social planner maximizes the weighted sum of the objective function

$$\sum_{j=1}^{J} w_j \sum_{t=0}^{\infty} \beta^t \sum_{\tau=1}^{S} \pi(s_{t\tau}) U[C_{Ajt\tau}, C_{Cjt\tau}, H_{Ajt\tau}],$$

subject to a economy-wide intertemporal budget constraint:

$$\sum_{j=1}^{J} C_{Ajt\tau} + \sum_{j=1}^{J} C_{Cjt\tau} = \sum_{j=1}^{J} y_{jt}(s_{t\tau}).$$

We choose an exponential utility specification to obtain a closed-form solution for the test (similar results can be obtained for a power utility function, see Mace 1991). Assuming that the utility functions $u_A(.)$ and $u_C(.)$ take an exponential utility form

$$u_A(C_{Ajt\tau}, H_{Ajt\tau}) = -\frac{1}{\sigma} \exp(-\sigma(C_{Ajt\tau} - H_{Ajt\tau})), \text{ and}$$

$$u_C(C_{Cjt\tau}) = -\frac{1}{\sigma} \exp(-\sigma(C_{Cjt\tau})).$$

The First-Best consumption allocations (derived from the first order conditions of the planner's problem) can be written as

$$C_{Ajt} = \frac{1}{J}\sum_{j=1}^{J} C_{Ajt} + \frac{1}{\sigma}(\log \omega_j - \frac{1}{J}\sum_{j=1}^{J} \log \omega_j) + (H_{Ajt} - \frac{1}{J}\sum_{j=1}^{J} \log H_{Ajt}), \quad (1)$$

$$C_{Cjt} = \frac{1}{J}\sum_{j=1}^{J} C_{Cjt} + \frac{1}{\sigma}(\log \omega_j - -\frac{1}{J}\sum_{j=1}^{J} \log \omega_j). \quad (2)$$

Equations (1) and (2) provide two main insights that are worth highlighting. First, adult's consumption at time t depends on her health status also at time t, H_{Ajt},even in the First-Best. This is because the marginal utility of adult consumption depends on health. In the First-Best, the marginal utility of consumption is equated across different time periods. If the marginal utility of consumption increases (decreases) with health then more (less) consumption

is required to keep the marginal utility of consumption constant when health increases (decreases).

Second, child's consumption does not adult health. This is a because of two reasons. First, because of the additive separability assumption, the marginal utility of child consumption does not depend on adult health. Second, we are solving the First-Best problem that assumes complete markets and hence idiosyncratic shocks will not affect consumption allocations unless these shocks affect the marginal utility of consumption.

Equations (1) and (2) cannot be estimated directly because the Pareto-weights are not observable. After differencing over time and re-ordering, the equations that constitute the basis for the empirical analysis are:

$$C_{Aj,t} - C_{Aj,t-1} = H_{Aj,t} - H_{Aj,t-1} - \frac{1}{J}\left(\sum_{j=1}^{J} \log H_{Aj,t} - \log H_{Aj,t-1}\right) + \frac{1}{J}\sum_{j=1}^{J}\left(C_{Aj,t} - C_{Aj,t-1}\right), \quad (3)$$

$$C_{Cj,t} - C_{Cj,t-1} = \frac{1}{J}\sum_{j=1}^{J}\left(C_{Cj,t} - C_{Cj,t-1}\right). \quad (4)$$

Note that, except for $H_{Aj,t} - H_{Aj,t-1}$, all the rest of the terms in the right hand side of equations (3) and (4) are aggregates. In particular, if the model is correct, no idiosyncratic household components should explain equation (4). If one found that the prediction of the model does not hold, the challenge is to ascertain whether the failure of the model is due to the structure of preferences (child's marginal consumption does not depend on adult health) or to the fact that full risk sharing is not achieved and hence the First-Best solution is not valid.

3 Data and setting

The data used in this paper come from the evaluation of *Familias en Acción (FeA)*, a program implemented by the Colombian government to foster human capital accumulation among poor children living in small rural municipalities. The program, modelled after the Mexican PROGRESA/Oportunidades, provides

monetary transfers to mothers in beneficiary families, conditional on having completed some requirements. We use this dataset because it is an unusual large longitudinal dataset of very poor households living in rural villages and that contains information on health shocks, household consumption, children anthropometric measures (height and weight), assets and transfers. Detailed information about the data can be found in Attanasio (2003).

Although we do not exploit the variability induced by *FeA,* we explain the program allocation criteria in order to understand the economic conditions faced by the households in the sample. The sample consists of 122 municipalities: 57 treatment municipalities were targeted by *FeA* as of December 2002 and 65 were chosen as comparison municipalities.[1] Qualified municipalities for the *FeA* program had less than 100.000 inhabitants, a bank that will be used to transfer the money safely, and enough education and health infrastructures. The treatment municipalities included in the sample were chosen randomly within each of 25 strata. The comparison municipalities were chosen as the most similar to the treatment municipalities among those that did not qualify for the program. Proximity was assessed in terms of population size, percentage of population living in the urban part of the municipality, index of quality of life, and an index measured built using information on health and education infrastructures. In practice, most of the comparison towns satisfy most of the conditions imposed by the program but they did not receive either because they did not have a bank or because the town major did not carry out the necessary paperwork.

The sample only includes households who were in the poorest SISBEN category as of December 1999. In Colombia, households are assigned a SISBEN category (which ranges from 1 to 6, with 1 being the poorest) on the basis of the value of their SISBEN score, which is constructed using different indicators of economic well being (see Castaneda 2005 for more details on SISBEN).

Three waves of data have been collected on the same households, the first

[1] 13 municipalities that were originally part of the comparison group became treated between November 2003 and December 2005

wave started in the summer of 2002, the second between July and November 2003, and the third between December 2005 and March 2006. Attrition rates were reasonably low (6% between the first and second wave and an additional 10% in the third wave). In the first wave, 11502 households were interviewed. All interviewed households had children below 17. Our sample is smaller because we only include households with children in the age ranges for which child's height and weight was collected (children below 7 years old in the first wave, below 8 years old in the second wave, and below 10 years old in the third wave).

Child's height and weight are key variables for our analysis. We follow the literature in not using height and weight directly as dependent variables, but we construct the so-called z-scores for these variables standardizing them by age and sex according to the World Health Organization/Nursery for Disease and Control (WHO/CDC) reference population. In particular, the z-score for height-per-age is obtained from the height of a child, subtracting the median height of and dividing by the standard deviation of height of the WHO/CDC reference population of the same age and gender. Height-per age is thought to be a good measure of long term nutritional status and it is little sensitive to short-term fluctuations. Weight-per-age is built analogously to height-per-age but using weight instead of height. Similarly, weight-per-height is obtained from the weight of a child, subtracting the median weight of and dividing by the standard deviation of weight of the WHO/CDC reference population of the same height and gender. Weight-per-height is thought to be the most sensitive to short-term nutritional fluctuations of the three anthropometric indicators (EXPAND).

The information about household consumption in the survey includes consumption of 98 different food items, independently of whether they were purchased, obtained as a gift, obtained as a payment in-kind, or they come from their own farm. It also includes information on 51 non-food items such as fuel, transportation, hygienic and cleaning products, clothes and shoes, durables, and medical expenses. In our analysis, we use five different measures of household consumption: Total consumption, food consumption, medical expenditure, others

expenditures that exclude those on food or health, and household consumption not related with health. This last category incorporate items such as money given to children to be spent at school, newspapers, personal services (hairdressers, beauticians, etc.), leisure (cinema, night clubs, trips, etc.), clothes and shoes, books, music, and toys.

We define health shocks using whether or not individuals report to have had any health problem during the last fifteen days that did not let him perform activities of daily living. We define our health shocks separately for male and female, and three different age groups –12 to 17, 18 to 65, and older than 65 years old-. The objective of making this age and gender division is to be able to exploit that the effect of the health shock on household income might vary according to the individual's age and gender. Moreover, if there is any effect of adult's health on the marginal utility of child consumption, this is also probably different according to the individual's age and gender. Moreover, we only consider health shocks that hit individuals who are likely to be active in the labour market (defined as individuals that have ever worked for paid). This allow us to consider shocks that might reduce household income while alleviating selection concerns that some individuals who are not working at the time of the interview because of a health shock.

It will very important to understand our results that the households in our sample are extremely imporvished (probably because they were all the poorest SISBEN category in 1999, see above). Average family size is 6.3 and most mothers (58%) have not finished primary education. Average consumption is about 180 US dollars per month, which includes our estimates for consumption of food produced or acquired as remuneration of work.[2] The average share of food consumption in total consumption is 64%.The children in our sample have a deficit in height: 20% of children are chronically malnourished. However, they do not have a deficit in 'weight per height' nor problem of obesity.

[2] According to the 2003 Quality Life Survey, the average household consumption in Colombia is US$ 432, excluding consumption in kind.

4 Empirical test

Equations (3) and (4) describe the evolution of consumption under the assumption that full risk sharing is possible so that idiosyncratic shocks can be completely smooth. According to equation (4), the change in child's consumption does not depend on idiosyncratic changes in adult's health. Hence, full insurance would be rejected if one found that idiosyncratic changes in adult health, $H_{Aj,t} - H_{Aj,t-1}$, explained changes in child's consumption, $C_{Cj,t} - C_{Cj,t-1}$.Note that the same cannot be said of equation (3) because idiosyncratic changes in adult's health legitimately explain changes in adult's consumption even in the First-Best, just because the marginal utility of consumption depends on health. This is why one ideally focuses on child's consumption to test for full insurance against adult's health shocks instead of adult or household consumption.

Due to the above, we test for full insurance by considering the empirical counterpart of equation (4), instead of (3). Because we do not measure child's consumption, we use child's weight as a proxy for consumption (this might have some problems that we address in section 4.2) Our main estimating equation is:

$$\Delta W_{ijm,t} = \sum_{q=1}^{6} \alpha_q \Delta H_{Ajm,q,t} + \beta \Delta X_{ijm,t} + \theta_{m,t} + \varepsilon_{ijm,t}, \tag{5}$$

where $W_{ijm,t}$ is the weight (either weight-for-age or weight-for-height z-scores) of a child i, of household j, living in municipality m at time t; $H_{Aj,q,t}$ takes value 1 if a member of household j living in municipality m who belong to age-gender group q is unable to carry out his daily activities due to sickness but takes value 0 otherwise, $X_{ijm,t}$ are covariates related to participation in the FeA program as well as change in household demographics because they might have their own independent effect on child's weight, and $\theta_{m,t}$ is a municitpality-time fixed effect to recognize that each municipality is a different economy and hence the term $\frac{1}{J}\sum_{j=1}^{J} \Delta C_{Cj,t}$ in equation (4) might be different for households living in different municipalities. Note that q takes integer values from 1 to 6 because we have 6 age-gender groups (12 -17, 18-65, +65 for both male and female).

We will estimate equation (5) using two different estimation methods: Ordinary Least Squares and Instrumental Variables (IV) using $H_{Ajm,q,t-1}$ to instrument for $\Delta H_{Ajm,q,t}$.The IV method does not require the health variable, $H_{Ajm,q,t}$, to be strictly exogenous (as OLS does) but it is sufficient if the health variable is predetermined. The standard errors are clustered at the municipality level to consider the different levels of correlation of the error term: correlations between several children of the same household at a given time period, correlations among households living in the same municipality (spatial correlation), as well as correlation of error terms in different time periods.

5 Results

5.1 Main Results

Table 1 shows the estimates of equation (5) for four different regressions: one per estimation method (OLS and IV) and dependent variable (weight-for-age and weight-for-height). Both OLS and IV results show that health shocks suffered by 18-64 years old men decrease child's weight. Because the health status question asks about the last 15 days, the point estimates are necessarily small (ranging from 2.85% to 4.62% of one standard deviation of weight) but they are statistically significant at 5%. The point estimates of weight-for-height are larger (in absolute value) than the weight-for-age ones, which is consistent with weight-for-height being more sensitive to short-term fluctuations of nutritional status. These results are consistent with the rejection of the full insurance hypothesis because we find that an idiosyncratic shock explains child's weight, contrary to what equation (4) predicts.

It is interesting to note that the effect of the illness shock is only significant when the shock is suffered by males 18-64, which is what we would expect if the effect of the shock hits the child through a decrease in food consumption (note that we find some positive coefficients for females aged 12-17 in the OLS results, but they completely vanish in the IV).

5.2 Alternative explanations

In our theoretical model, we assumed that adult's health does not enter directly into the child's utility function. If this is not the case, we would expect adult's health to enter in equation (4). In that case, a negative coefficient of adult's health on young's child weight would not reflect lack of insurance but an optimal adjustment given that the child's marginal utility of consumption varies directly with adult's health. However, we would have expected this mechanism to be a factor in illness shocks suffered by both males and females 18-65, but we only find it for males. So, our results are more consistent with a drop in income than with a direct change in the child's marginal utility of consumption.

As we mentioned above, ideally we would have estimated equation (5) using child's consumption rather than child's weight. Because we are using child's weight, our results in Table 1 could be driven by other explanations that would imply that child's weight decreases but not child's consumption. First, it is plausible that child's consumption does not changed due to the adult's illness shock but child's physical activity increases, leading to a decrease in weight. This could happen, for instance, if the child (aged 0 to 9) takes up the father's job or if the mother's take up the father's job and the child takes up the mother's job or activities. Unlike other developing countries, child labor only starts in 12 years of age. Enrolment in primary school is over 95% for the same sample that we are using. When the first wave survey questionnaire was being designed, local experts believed pointless to ask about child labor for children aged 9 or younger. This was changed in the third wave in which time use was asked for children older than 6 years old. The percentage of children reporting different activities are given in Table 2. The percentage of children involved in activities such paid work, unpaid work, and working on the family business is negligible. In order to examine this further, we estimate a fixed effect conditional Logit on whether healthy household members change their labour supply in response to illness shocks of other household members. According to Table 3, there is no evidence of labour substitution across household members aged 12 or above.

Clearly, we would have expected that it is easier to substitute labour with a 12-18 years old child than with a below 9 years old. If so, these results provide further evidence that increase in physical activity is not driving the results. Coming back to Table 2, the only activity that is done by a substantial percentage of children (37%) is cooking and taking care of other children. If this was driving the Table 1 results, we would expect to see that an illness shock of females aged 18-65 would decrease young children's weight, but we do not.

Other explanations that could explain a decrease in weight but not a decrease in child's consumption is that an illness contagion process, through which when a male aged 18-65 gets sick, a 0-9 year old child also gets sick and his weight decreases. If this mechanism was important at explaining our results in Table 1, we would have expected to see a decrease in the young child's weight when his mother gets sick. However, this does not seem to be the case according to Table 1.

5.3 Placebo regressions

Table 4 show the results of estimating equation (5) but using child's height (height-for-age indicator) instead of weight. One expect to find null effects of illness shocks on child's weight because height does not change in short periods of time. Significant effect of adult's illness shocks on child's weight would indicate that there was some omitted time varying determinant of child's nutritional status that was also correlated with changes in health status of older siblings and adults. This would also be of concern for our results in Table 1. The estimates of Table 2 support our empirical strategy as we do not find any effect of older siblings' and adult's health in the last 15 days on young child's height (the point estimates are very close to zero and they are not statistically significant).

5.4 Results using household consumption

It is natural to wonder what the results would have been if we had used household consumption to test for full insurance. This is a natural benchmark because the

literature that tests for insurance against income shocks uses household consumption as the dependent variable, as it would seem intuitive that the marginal utility of consumption does not vary directly with the income shock. Table 5 shows the results of estimating equation (5) but using household consumption instead of child's consumption. Overall, the results seem to suggest that there is no immediate drop in consumption following the illness shock. In some specifications, there is even a positive increase in some categories of household consumption. The results are then consistent with a re-allocation of resources within the household, so that the adult 18-64 consumes more but the young children consume less, and overall household consumption does not change or it even increases. This is consistent with either the adult's marginal utility increasing with illness (so he needs more consumption to equate the marginal utility with the last period) or with the belief that the extra consumption will speed up the adult's health recovery process.

5.5 Coping mechanisms

A natural question is how the household will afford to enjoy the same level of household consumption, or even increase it, if the household is liquidity constrained and it suffers a drop in income due to the illness shock. Table 6 shows, using a fixed -effect conditional Logit estimator, that an illness shock suffered by a 18-65 years old male increases the probability that the households will have positive net transfers, debts, and that they own less animals. Hence, though a household is able to attract resources upon an illness episode, our Table 1 results indicate that the extra resources are not enough to restore full insurance.

6 Conclusions

This paper tests for insurance against illness by assumming that child's marginal utility of consumption does not depend directly on child's health but still allowing adult's health to enter into his utility function direcly, affecting the marginal utility of consumption. We reject the hypothesis of full insurance because we find

that an illness shock of a 18-64 years old male living in the household decreases child's weight by up to 4% of one standard deviations.

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Table 1. Child weight over Health shocks in differences

	OLS		IV	
VARIABLES	**Weight for Age**	**Weight for Height**	**Weight for Age**	**Weight for Height**
Male 12-17	-0.0184	-0.0117	0.0118	-0.0532
	[0.0283]	[0.0272]	[0.0464]	[0.0449]
Male 18-64	-0.0285***	-0.0380***	-0.0334**	-0.0462***
	[0.00901]	[0.0106]	[0.0143]	[0.0172]
Male >65	-0.0038	-0.0268	-0.06	-0.102
	[0.0371]	[0.0481]	[0.0586]	[0.0629]
Female 12-17	0.112**	0.129*	0.00387	-0.0786
	[0.0543]	[0.0735]	[0.0650]	[0.0665]
Female 18-64	0.000854	-0.0101	-0.00328	-0.0164
	[0.0110]	[0.0138]	[0.0160]	[0.0202]
Female >65	-0.0824	-0.0689	-0.041	-0.0128
	[0.0614]	[0.0720]	[0.0713]	[0.0778]
Observations	12,124	12,124	12,124	12,124

*** p<0.01, ** p<0.05, * p<0.1

Table 2. Activities of children aged 7-9 in the third wave of data

Activity	*No. Children*	Percentage
Worked for paid in the previous day weekday	12	0
Did unpaid work	38	0
Worked in family business inside home	24	0
Took care of animals or worked in the field	271	6%
Cooked or take care of children	1740	37%
None of the above	2662	56%
Total	4747	100%

Table 3: Labour supply of healthy household members.

	Household member age 12 to 17	Household member age 18 to 65	Household member older than 66
Male			
Age 12 to 17	-14.180	3.598	24.387
	[11.358]	[15.170]	[67.076]
Age 18 to 65	6.480	-1.991	25.233
	[5.236]	[5.109]	[30.145]
Older than 65	11.673	3.818	14.881
	[16.301]	[14.507]	[23.539]
Female			
Age 12 to 17	-7.357	3.075	-54.038
	[20.542]	[21.528]	[89.046]
Age 18 to 65	-0.212	4.735	-2.460
	[5.299]	[6.500]	[21.800]
Older than 65	-20.023	22.776	34.761
	[15.767]	[18.207]	[53.970]
Observations	13528	31358	1328
R-squared	0.11	0.31	0.14

Note: Here we add to the specification used in Table 8 a dummy variable to consider whether the household lives in a rural area, and another binary variable considering whether the household is a one-parental one. Robust standard errors in brackets.

Table 4, Child Height over Health shocks in differences

	OLS	IV
VARIABLES	**Height for Age**	**Height for Age**
Male 12-17	-0.0167	0.0664
	[0.0331]	[0.0535]
Male 18-64	0.00294	0.0074
	[0.0107]	[0.0186]
Male >65	-0.0269	-0.00385
	[0.0294]	[0.0457]
Female 12-17	0.0361	0.0657
	[0.0543]	[0.0956]
Female 18-64	0.00543	0.00868
	[0.0116]	[0.0171]
Female >65	-0.0329	-0.0226
	[0.0527]	[0.0649]
Observations	12,124	12,124

Robust standard errors in brackets

*** p<0.01, ** p<0.05, * p<0.1

Table 5, Consumption over Health Shocks in differences

	Ordinary Least Squares				*Instrumental Variables*			
VARIABLES	**Health Expenditures**	**Non-Health consumption**	**Food consumption**	**Food outside the home**	**Health Expenditures**	**Non-Health consumption**	**Food consumption**	**Food outside the home**
Male 12-17	-1.28	1.827	-2.771	0.956	-1.086	-0.699	-2.705	0.738
	[0.991]	[6.484]	[4.281]	[0.713]	[1.247]	[8.343]	[5.793]	[0.934]
Male 18-64	1.449***	4.261	3.256*	0.281	1.050*	3.655	2.845	-0.0588
	[0.397]	[2.661]	[1.854]	[0.323]	[0.590]	[3.664]	[2.542]	[0.402]
Male >65	1.318*	-2.407	6.477	-0.266	-0.0895	-1.283	14.60*	0.817
	[0.749]	[6.899]	[5.328]	[0.884]	[1.042]	[11.15]	[8.328]	[1.711]
Female 12-17	-1.548	-5.541	-0.335	2.043	0.498	-0.593	4.735	3.852
	[1.335]	[9.701]	[6.943]	[1.826]	[1.748]	[10.92]	[8.340]	[3.949]
Female 18-64	1.514***	3.895*	-0.638	0.525	1.789***	1.931	-3.066	-0.198
	[0.423]	[2.347]	[1.756]	[0.331]	[0.586]	[3.238]	[2.280]	[0.506]
Female >65	-1.223	17.47	16.04	-1.712	-2.167	41.31***	25.23**	-3.401
	[1.842]	[12.52]	[9.954]	[1.677]	[3.241]	[15.51]	[11.67]	[2.646]
Observations	8,773	8,773	8,773	8,756	8,773	8,773	8,773	8,756
R-squared	0.007	0.031	0.024	0.004	0.042	0.107	0.102	0.064

Robust standard errors in brackets

*** p<0.01, ** p<0.05, * p<0.1

Table 6: Informal mechanisms of insurance

	Net transfer payments	Debts	Savings	Assets (Animals owned)
Males				
Age 12 to 17	0.369	0.156	0.589	2.289
	[0.212]*	[0.275]	[0.412]	[1.707]
Age 18 to 65	0.151	0.155	-0.176	-1.173
	[0.070]**	[0.073]**	[0.218]	[0.490]**
Older than 65	0.095	-0.036	0.407	-1.874
	[0.179]	[0.271]	[0.493]	[1.335]
Females				
Age 12 to 17	0.176	-0.421	0.014	2.737
	[0.297]	[0.326]	[0.729]	[1.505]*
Age 18 to 65	-0.012	0.125	0.025	-0.174
	[0.070]	[0.080]	[0.177]	[0.481]
Older than 65	0.089	0.482	0.120	1.537
	[0.263]	[0.333]	[0.840]	[1.311]
Observations	8196	5219	1194	9397
R-squared				0.35

Note: The specification controls for household's composition by age and gender, age, time dummies, age and education level of the household head, two dummy variable to consider whether the household lives in a rural area, or whether the individual lives in a one-parental household. Robust standard errors in brackets. Robust standard errors in brackets, clustered at municipality level. * significant at 10%; ** significant at 5%; *** significant at 1%.