The Great Famine and Household Saving in China*

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The Great Famine in China (1959-1961) is one of the most dramatic tragedies in history, which may have long term consequences for economic behaviors of Chinese population. In particular, we explore whether it continues to have impacts on household saving choices. Employing a dataset across 122 Chinese counties, we find that the saving rate of rural households in 2002 tend to be higher in counties where the famine was severer; and the impact of the famine is even larger, once its severity is instrumented. Evidence from individual preference data shows that people are more willing to cultivate thrift in children in counties more severely affected. These findings are consistent with the hypothesis that the Great Famine altered the thrifty attitude of survivors and subsequent generations.

Keywords. The Great Famine, saving rate in China, thrift, endogenous preferences

JEL Classification. D14, D91, Q54

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1. Introduction

Historical catastrophic events have shaped our norms, cultures and preferences, which may be passed forward to younger generations and continue to have impacts on their economic behaviors even decades later. In this paper, we show that the China's Great famine (1959-1961), which caused an estimated 30 million death in rural areas, may still influence the consumption and saving choices of Chinese households now. Specifically, our hypothesis is that the Great Famine may alter the thrifty attitude of the generation who experienced it and that of the subsequent generations who did not, which contributes to the high saving rate in the household sector in China.

It is a striking fact that Chinese households save an even larger fraction of their incomes than those in most developed economies.[1] One popular conjecture for such high saving rates is that Chinese households are particularly thrifty, because of Confucian cultural traits.[2] However, Modigliani and Cao (2004) dismiss this type of explanation as "fundamentally baseless" because the household saving rate in China was not always high and indeed was quite low before the end of 1970's.

Distinct from both arguments, our findings show that thrift may indeed constitute one important determinant of the high saving propensity of Chinese households, but the thrifty attitude may not necessarily be shaped by the commonly believed cultural factors. Instead, our hypothesis is that the Great Famine in China that lasted three years from 1959 to 1961, may cause Chinese households to be more thrifty (i.e., patient and prudent).[3] First, the hunger experience may install fear of the lack of foods into survivors, so that they behave in a more thrifty manner, even when resources were abundant years later and when the chances of experiencing hunger in the future seemed to be slim. We label it "experience mechanism." Second, adult famine survivors who cherish the value of thrift may indoctrinate their children to be thrifty. Subsequent younger generations also acquire the thrifty attitude towards expenditure from observing the consumption choices of the older generation who experienced the famine.[4] We label it "transmission mechanism." Both mechanisms raise the saving propensity of Chinese population. The behavioral responses hypothesized here may

[1]For example, in 2004, the survey data suggest that the household saving rate was 26 percent and 24 percent in rural and urban areas respectively; as a share of GDP, household saving is around 16%, significantly higher than that in OECD countries (Kuijs 2006).

[2]Chinese are often described as "notorious savers" and the strong saving propensity is often attributed to the "Confucian values of thrift and frugality" (Moosa 2012). For example, Zhou (2009) argue that Chinese are "influenced by Confucianism, which values thrift, self-discipline, ...," therefore the household saving rate is high.

[3]Patience characterizes the attitude towards the weight given to the future utility flow, while prudence characterizes the attitude towards the inter-temporal risk. Both higher patience and prudence contribute to higher saving rates, other things being equal. In our data, we cannot separate the two types of conceptually distinct preference. In this paper, we refer to them as "thrift."

[4]The transmission of the thrifty attitude can take place within family or through local norms.

not be rational choices made by individuals. Along the same vein, Callen (2015), Malmendier and Nagel (2011) and Alesina and Fuchs-Schündeln (2007) demonstrate how individuals' preferences can be shaped by the experiences of natural disasters, macroeconomic shocks and political environments.

To empirically test our hypothesis, we exploit the county-level variation in the famine severity and study its effect on the variation of thrifty preferences at the individual level, saving rates at the household level and deposits at the county level. Following Meng, Qian, and Yared (2015), we use the population census data to construct a measure for the famine survival likelihood, which is a proxy for the food availability.

Some institutional features allow our approach to be feasible. First, there exists sufficient geographical variation in famine severity (Meng, Qian, and Yared 2015). Second, the disastrous effects of the Great Famine at the aggregate level were unknown to individuals during the famine years and afterwards. Individuals may regard the local severity as a proxy for that of the Great Famine itself and therefore local variation in famine severity can be useful for identifying its effects.[5] Third, migration had been highly controlled during the famine years and afterwords (Dikötter 2010).[6]

Our first step of investigation is to test whether the famine event has altered Chinese people's attitude towards thrift. The World Value Survey provides information about individuals' beliefs and attitudes, including how important the respondents think the characteristic of "thrift" is for their children to learn. Using this survey conducted in 2012, we find that individuals in counties with higher famine severity tend to value thrift more and are more willing to transmit the value of thrift to their children than those in counties less affected. Further, we find that the cross-county variation in the famine severity has a larger impact on the thrifty attitude of cohorts that were born before the famine years than younger cohorts who were born afterwards. It suggests that the direct effect of experiencing hunger on the thrifty attitude is larger than the indirect transmission effect. One may conjecture that the Great Famine could be less severe in places where the population were more thrifty. However, such a mechanism predicts that famine severity should be negatively correlated with the value individuals attach to the thrift characteristic, which is exactly the opposite to what we find.

We then examine whether the impact of the Great Famine on the thrift attitude manifests itself in the saving choices of Chinese households. The dataset from Chi-

[5]The consequences of the Great Famine were classified information and not accessible to the rural households during or after the famine. There is no consensus in the total famine casualties even nowadays. The earliest estimate of the total death toll is 16.5 million, according to Coale (1981), and subsequent studies constantly revise the estimate up. For example, according to Banister (1991) and Dikötter (2010), the total death tolls were 30 million and 45 million, respectively

[6]Both the migration and the common knowledge of rural households about the severity of the Great Famine may bias our estimate towards zero.

nese Household Income Project in 2002 offers detailed information on the expenditures and incomes of rural households in 122 counties, which allows us to measure the saving rate at the household level. In the baseline estimations, we study the impact of county-level famine severity on the household-level saving rates, by controlling for a range of household, village, and county characteristics. In all specifications, households tend to have a higher saving rate in counties where the famine was severer. A one standard deviation decrease in the famine survival index raises the saving rate by 5 percentage points. The economic magnitude of this effect is large, considering the average household saving rate in this sample is 24%. Further, once we restrict the sample to households whose oldest member was born after 1962, or after the famine years, higher household saving rate is still associated with higher famine severity, which suggests that younger cohorts may be still affected, even though they did not have direct exposure of the famine. This evidence is consistent with our conjecture that the value of thrift can be cultivated and transmitted across generations.

Despite the fact that we use a rich set of controls at the household, village, and county levels, we still cannot remove completely the concern that some pre-famine characteristics may drive both the severity of the Great Famine in late 1950's and the current household saving pattern in 2002. To deal with it, we employ a set of instruments for our measurement of famine severity. First, we hand-collect a set of historical data regarding various natural disasters and rainfall shocks before and during the famine years. Second, we take advantage of the variation in resources diversion and political radicalism during the Great leap forward, a political movement that preceded the famine. During this movement, in response to the call of Mao, officials at the county level diverted a substantial amount of agricultural inputs to build irrigation and water reservation projects, which were largely wasteful and contributed to the fall of agricultural output in 1959 (Li and Yang 2005). The attempts to build those projects signaled the radicalism of local officials, which may exacerbate the severity of famine that immediately followed. We have hand-collected detailed information regarding those irrigation projects in each county in late 1950's from county gazetteers, for example, the number of irrigation projects undertaken, and information on whether these projects had been abandoned shortly after being built. The impact of the Great Famine on saving rates becomes larger, when the famine survival index is instrumented.

Further, we investigate the impact of the Great Famine on the relationship between income growth and savings at the county level. Specifically, we investigate whether the heterogeneous famine experiences in late 1950's affect how local bank deposits, i.e., a proxy for savings in rural counties, respond to income growth. With a panel dataset of more than 1600 rural counties, once controlling the year and county fixed effects, we find that the magnitude of the increase in bank deposits in response to income growth

is much larger in counties that were affected the most by the Great Famine.

This paper connects to three strands of literature. First, we propose a new explanation for the determinants of high household saving rate in China. It is complimentary to the existing ones, including rising income, increasing income uncertainty, demographical changes, sex ratio imbalance and one-child policy, etc., which we review in the following section. Second, our paper enriches the endogenous preference literature by offering some evidence on the preference transmission and shows that historical events may have long lasting effects on economic behaviors of subsequent generations. Third, this study illustrates how the Great Famine can affect the economic choices of Chinese population, which is a new addition to the famine literature which focus on the determinants of famines and their long term consequences on health and political beliefs.

The remainder of this paper is organized as follows. In Section 2, we review the related existing literature on the consequences of the Great Famine, on endogenous preferences and on household saving rates in China. In Section 3, we provide a brief background of the Great Famine and explain in details data used in this paper. In Section 4, we motivate our investigation on the impact of the Great Famine by showing that higher county-level famine severity is associated with more thrifty attitudes of individuals. In Section 5, we present our main results on the effect of the Great Famine on saving choices of Chinese households. The last section concludes.

2. Literature Review

Our study provides an explanation for the determinants of the high saving rate in the household sector in China, which complements the existing ones. Yang, Zhang, and Zhou (2012) document a robust relation between the rising saving rate in urban households sector and the rapid income growth. Wei and Zhang (2011) argue that household may save because of the competitive motive in the marriage market: the households with male offspring intend to save more to improve the marriage prospects of their children. Choukhmane et al. (2014) show that the implementation of one-child policy had raised the household saving rate in household sector. Song and Yang (2010) empirically demonstrate that the increase in household savings is due to the structural changes in the labor market. Chamon, Liu, and Prasad (2013) empirical shows that the rise in saving rate is related to the higher income uncertainty. Curtis et al. (2015) use a quantitative model to show that large fraction of the increase in saving rate can be explained by demographic changes.

The hypothesis that we test in this paper is built on the existing endogenous preferences literature. The conjecture that individual life experiences of macroeconomic

shocks or natural disasters may shape the preferences has been the focus of a set of empirical studies in different contexts and environments. Callen (2015) shows empirically how the experience of Indian Ocean Earthquake tsunami has shaped the time preference of survivors of this natural disaster. Malmendier and Nagel (2011) study the effect of the Great Depression experience on the risk preferences of individuals and demonstrate that the Great Depression generation was less inclined to take financial risks. Alesina and Fuchs-Schündeln (2007) show individuals political preferences are heavily influenced by political environments.[7]

The preference transmission mechanism has been characterized in Doepke and Zilibotti (2008 and 2014). Dohmen, Falk, and Sunde (2012) provide direct empirical evidence that risk preference can be transmitted from parents to children by using German datasets. Our paper illustrates that the two mechanisms, i.e., how historical events can alter preferences of individuals and how such effects can be carried forward to the subsequent generations through inter-generational interactions, may have profound impacts on the economic choices of current households.

This paper is mostly related to a line of studies on the consequences of the Great Famine. Chen and Zhou (2007) and Meng and Qian (2009) show that early childhood exposure to the Great Famine had large negative effects on the health conditions of survivors. Peng (1987) focuses on the demographic consequences of the Great Leap Forward by analyzing the massive fertility deficits and excess deaths that occurred during and immediately after the Leap. The findings of Bai and Kung (2014) suggest that the famine event in China may have undermined people's belief about the efficacy of collectivization. Our work has a distinctive focus: we study its impact on the thrift attitude of Chinese households and its long lasting effects on the saving patterns in China half century later.

3. Historical Background, Measurement and Data

According to Ravallion (1997), famines were characterized by both high mortality risks and unusually severe threat to the food consumption. The twentieth century witnessed several severe famines with high casualties in Asia (e.g., Bengal Famine in 1943-44), Africa (e.g., Sudan and Uganda famines in 1980s), the former Soviet Union and Holland (1944-45). The Great Famine (1959-1961) in China was the ultimately worst one with much longer duration and more severely curtailed food availability.

[7]Some other papers on the same theme but in different contexts have also offered concrete evidence suggesting that natural disasters (e.g., tsunamis, earthquakes) and devastating events (e.g., violent conflicts), may help shape individuals preferences, including Bchir and Willinger (2013), Cameron and Shah (2013), Callen et al. (2014), Cassar et al. (2011), Castillo and Carter (2011), Eckel et al. (2009) and Voors et al. (2012).

Prior to the famine years, the agricultural production and food distribution system had been collectivized over a short period of time from 1955 to 1957. When Mao launched the "Great Leap Forward" campaign in 1958, all rural households were organized in the form of people's communes. The traditional organization of agricultural production with family as the basic production unit had been replaced completely. Farmers worked collectively in production teams organized and led by the village officials, without rights to withdraw or work separately (Lin 1990). They had no control over the agricultural output and could only consume in communal kitchens managed by the village (Thaxton 2008). Famine occurred when there was a sudden, sharp drop in grain output of 15% in 1959 and the grain output continued to decline in the following two years, which worsened the lack of foods (Chen and Zhou 2007). The grain redistributed to the village level was below the villagers' subsistence for many reasons, which triggered the massive starvation (Meng, Qian, and Yared 2015). In 1961, the famine ended when the government temporarily increased the amount of grain delivered to the rural areas and reverted some radical policies pursued (Meng, Qian, and Yared 2015 and Walker 2010). The growth rate of population in China recovered and reached 3.57% in 1962, which signaled that the threat to the food consumption was alleviated (Ashton et al. 1984).

The official account for this disaster provided by the government, during or after the demographical crisis, was unfavorable weather conditions.[8] Large-scale propaganda campaigns after the famine were intended to convince the local farmers and survivors in rural areas that the bad weather was the primary reason for the observed high mortality rate. This famine period (1959-61) was typically referred to as "three-year natural calamities" in most of the official historical records.

In contrast, recent studies reveal that natural disasters only accounted for a small fraction of the reduction of grain output during the famine years and the high mortalities were mainly caused by policy-induced decline in agricultural output and defects of the procurement system. Li and Yang (2005) argue that the major cause of the large scale of death is that the government diverted agricultural resources to expedite industrialization and imposed excessive grain procurement burden on peasants. Meng, Qian, and Yared (2015) shows that the inflexibility of the government procurement policy was the major driver for the observed positive correlation between rural mortality rates and per capita food production and it was responsible for the documented severe total famine mortality. Kung and Chen (2011) show empirically that the variation in political radicalism at the province level may explain a large fraction of the

[8]For example, the Central Committee of Chinese Communist Party released an official document which provided an explanation for the cause of the food shortage during the famine years and mainly blamed the bad weather for the abnormal mortality rate, see *Decisions on Several Historical Issues of the Communist Party of China since the Founding of the Republic, 1981*.

variation in excessive grain procurement. Lin and Yang (2000) quantify the extent to which the urban bias and the decline in food availability contributed to the demographic crisis during the Great Famine. Lin (1990) argued that the key driver of this tragedy is collectivization, which led to a sharp decline in labor productivity.

Famine severity. Ideally, the severity of famine can be inferred from the mortality rates and food availability. Chen and Zhou (2007) used excess mortality in 1960 at the province level to generate a measure of severity of the famine. Kung and Chen (2011) study the variations in the excess grain procurement at the provincial level (a proxy for the political radicalism), which had a significant effect on the death rate during the famine years. However, such data do not exist at the lower county or village level. The primary approach in the literature to measuring the variations in severity at the county-level is to extract information from the demographical structures. Both Huang et al. (2010) and Meng, Qian, and Yared (2015) used a 1% sample of China's 1990 population census to derive a measure of famine intensity at the county level based on the size of birth cohorts.[9] This approach is justified because both reduced fertility and increased mortality during the famine may lead to a smaller size of the cohorts born during the famine years, relative to other cohorts. In our paper, we follow the same approach and use 1% sample of China's 1990 census to compute a *survival index* at the county-level. It is the ratio of the birth-cohort size of famine cohort (1959-1961) to that of non-famine cohort (1954-1957), among the agricultural population. That index is correlated with the probability of survival: the smaller is the index in a given county, the severer is the famine.[10]

Savings of rural households To measure the savings of rural households, we employ the 2002 wave of Chinese Household Income Project (CHIP). Its rural sample provides very detailed information about items related to incomes and expenditures of rural households.[11] The sample size of this survey is fairly large: in total, 9200 households from 961 villages and 122 counties were surveyed, which were well distributed across the Chinese territory.

Regarding incomes, the survey reported both the self-declared income value by

[9]The famine cohort in Huang et al. (2010) refers to the cohort of women born during the famine years (1959-1961) and the non-famine cohort refers to the cohort of women born during the 3 years immediately before the famine (1956-1958) and the 3 years immediately after the famine (1962-1964). In Meng, Qian, and Yared (2015), the famine cohort is defined by rural population that were born during the famine years (1959-1961) and the non-famine benchmark is the average county birth-cohort size over the period 1949-1966.

[10]In this paper, we test our main hypothesis with data on the consumption and saving behavior of rural households in China. In principal, the same mechanism should be also applicable to the urban households. However, it is even more difficult to measure impacts of the Great Famine in urban areas, since fewer urban citizens die of starvation during the famine years, even though the lack of food consumption substantially undermined the heath conditions of urban residents.

[11]The survey was conducted by the Chinese Academy of Social Sciences in 2003 and inquired rural households about their situation during the preceding year.

households and disaggregate income items from various sources. In the paper, we use the self-declared income value in our baseline regressions and check the robustness of our results with the sum of incomes from all the reported sources.

Regarding expenditures, the survey provides information on items including staple and non staple food, other food, clothing, transport and communication, daily use goods, medical care paid by self and by government, educational expenditure, durable goods, housing repair, other expenditures. In the baseline regressions, we use the value of expenditures that is aggregated from all the survey items. We also compute various alternative measures of expenditures by excluding some of the reported items, e.g., durable goods and/or medical care paid by government, and by imputing the value of durable consumption differently.

Saving of rural households is defined by the difference between incomes and expenditures. To avoid dealing with negative savings, the main dependent variable that we use is the logarithm of income to expenditure ratio, namely household disposable income divided by household expenditures. To ensure that our results are not driven by the definition of incomes and expenditures, we perform robustness checks by computing this ratio with all the alternative measures of incomes and expenditures.[12]

Characteristics of households, villages and counties The consumption-saving decisions of households may be affected by a range of factors including those related to the characteristics of households and the economic environment, to which they are subject. Primary motivations for savings include maintaining consumption after retirement (loosing ability to work) and maintaining material living standard for the dependents in the family. We therefore control for the age of household head, the proportion of dependent members in the households and the family size. We also include the proportion of woman in the household to control for the gender difference in saving propensity. Another important determinant of saving rate is income or wealth level of the household. Education attainment may be correlated with the income level of the household. We therefore also control for the average education within the household to approximate the stock of human capital possessed. Income can be also correlated with the form of the household's usage of energy and water. The household may be poorer if they access water provided by pump or a well but richer if they have access to tap water. The same can be applied to the usage of coal, firewood or fuel. We include this set of characteristics of the household in our baseline regressions.

It is also legitimate to conjecture that individuals may display different saving patterns in relatively developed and under-developed rural areas. We control for a large

[12]In all regressions regarding saving behaviors, we use the logarithm of income to expenditure ratio instead of saving rates. Given this ratio is a monotone transformation of saving rate, we refer to saving rate in our discussions unless it causes any confusion.

set of variables at both the village and county levels, which capture the conditions for agricultural production and the characteristics that are correlated with the stage of development. Since the properties of terrain are critical for the agricultural production and economic development, we include dummies for the geographical conditions of the village (whether it is plain, hilly or mountainous). Similarly, terrain conditions and soil properties at the county level are also important. The average elevation, ruggedness of the terrain, as well as the share of plain terrain, the share of sandy soil and the share of clayey soil in the county were included in the baseline regressions. Such data were computed by using the GIS Soil and Terrain database (SOTER) of China.[13]

Remote villages are less likely to achieve economic development. We therefore control for the distance between the village and the county seat, which approximates its remoteness. Similarly, it is easier to benefit from the development of urban areas if the location of the county is close to cities. Therefore, we control for whether the county is in a sub-urban area. Further, at the village level, we have information about the salary of village cadres, which is correlated with the development status of the village, and the land available per household, which is correlated with the standards of living of the village. Both are included in our baseline estimations. Villagers tend to emigrate from less developed areas, therefore population growth may be correlated with the level of development. We control for the population growth at the village level between 1998 and 2002. Contemporary economic growth may also affect the inter-temporal consumption choices of households. However, we do not have access to the households income data from previous years. We approximate it with cadres salary growth between 1998 and 2002 as well as the growth rate of county level GDP per capita, which we obtain from the *China data online*.

Considering there might be a difference in saving pattern caused by the difference in ethnicity, we also include the dummy for whether the village is populated by an ethnic minority. To control for village size, we consider the number of villagers in 2002, reported in the CHIP dataset.

Climate conditions In our baseline estimations, we include a set of variables on the climate conditions at the village and county levels to address three potential important concerns. First, in general, climate conditions are important for the agricultural conditions. Areas that are subject to unfavorable climate conditions, for example a

[13]SOTER GIS information have been originally compiled by the Institute of Soil Science, Chinese Academy of Science (ISSAS) and ISRIC-World Soil Information within the framework of the Land Degradation Assessment in Drylands (LADA, GLADA) project. The primary data were compiled using the SOTER methodology (ISSS, 1986). SOTER unit delineation was based on the raster format of the soil map of China, correlated and converted to FAO's Revised Legend (1988), combined with SOTER landform characterization derived from Shuttle Radar Topographic Mission (SRTM) 90 m digital elevation model (DEM). The definition of the different types of soil has followed the standard USDA soil texture triangle.

large variation in the precipitations in the long run, may tend to be underdeveloped. Second, the variations in saving rate of rural households may reflect their response to the weather shocks and the fall of output immediately before the survey year. Third, it may be the case that certain long run characteristics of the climate conditions drive both the mortality rate during the famine years and saving decisions of rural households in 2002.

To address the first concern, we include average rain anomalies (rainfall z-score) at the village level in both the 1980s and 1990s. To deal with the second concern, we control for the rain anomalies at the village level in 1999, 2000, and 2001, i.e., the three years prior to the survey year. Last, to capture the long run rainfall conditions at the county level, we compute the long term average and standard deviation of precipitations for each county in our sample from 1901 to 2002.

The two datasets that allow us to extract the rainfall information and some details of our methodology merit further discussion. The "Tropical Rainfall Measuring Mission"offers very accurate satellite data from 1997.[14] The measures are provided for 0.25 x 0.25 degree grid squares (around 25 km x 25 km), which allows us to construct very precise climatic variables even at the village level. They are recognized to be one of the most accurate precipitation data, as they combine satellite measures with monthly terrestrial rain gauge data. In the economics literature, the TRMM data have first been exploited by Baland, Libois, and Mookherjee (2013), Fetzer (2014) and Libois (2015) for other contexts; we are the first to take advantage of this dataset for studies on China. To construct the standardized precipitation index (rainfall z-scores), we first assign grid points to villages based on latitude and longitude coordinates, aggregate monthly data to obtain yearly rainfall variables, and then compute village-level averages for each year.

In order to compute county-level long term averages and standard deviations, we combine the above described satellite data for the 1998-2014 period with the monthly gridded time series provided by the Department of Geography of the University of Delaware for the 1901-1997 period.[15] The size of the grid (2.5x2.5 degree grid squares) is closer to the area of a whole county. The rainfall z-score, a normalized variable, is the county-level rainfall value subtracting the long-run mean and being divided by

[14]The TRMM is a joint project between the NASA and the Japanese Aerospace Exploration Agency which has been launched in 1997 to study tropical rainfalls. The satellite employ a set of five instruments to construct gridded rainfall rates at very high spatial and temporal resolution. Various technological innovations have been used to increase the accuracy of the climatic measures, including a precipitation radar, flying for the first time on an earth orbiting satellite, and the low flying altitude of the satellite. Technical details about TRMM can be found at `https://climatedataguide.ucar.edu/climate-data/trmm-tropical-rainfall-measuring-mission`.

[15]This dataset can be downloaded from `http://climate.geog.udel.edu/~climate/html_pages/download.html`.

the long-run standard deviation. A positive value for year t in county j means that precipitations in year t in county j are higher than long-term average. Conversely, a negative value means that precipitations have been lower than that. Tables 16 and 17 report summary statistics of variables that we have described.

4. Motivating Evidence: The Great Famine and Thrift

Our hypothesis that the Great Famine still has an impact on the consumption and saving choices even now relies on the idea that the thrifty attitude can be cultivated and transmitted. In other words, we should observe that the famine has an impact on the thrifty attitude of population across counties and such an impact should dwindle over generations. To examine whether this pattern exists, we explore the dataset of World Value Survey which provides detailed information about beliefs, values and preferences of individuals, including their attitude towards thrift. In one set of questions, the survey describes a list of ten characteristics to respondents and ask them to name five qualities that they consider to be especially important for children to learn at home.[16] In the whole sample, roughly 50% of respondents report that they choose "thrift" as one of the important qualities for children to acquire domestically. It is more likely that people who give priority to thrift are more thrifty and take more effort to cultivate thrift in children.

Particularly, the sixth wave of survey conducted in 2012 covers 40 counties in China, which allows us to test the linkage between the Great Famine and the attitude towards thrift. To perform such a test, we control for characteristics at both individual and county levels.[17] Specifically, we estimate a simple Logit model of the following specification:

$$P(Thrift_{ij}) = F(S_j, Z_i, Z_j, \epsilon_{ij}), \tag{1}$$

where $Thrift_{ij}$ is a dummy variable, taking the value of 1 if the respondent i in county j choose "thrift"as one of the five qualities especially important for their children; S_j is the survival index for county j; Z_i and Z_j capture two sets of controls, at the individual and county levels, respectively; and ϵ_{ij} is the error term.

In column (1) of Table 1, we report the result from a simple Logit model only controlling for gender and age. We find that people who live in more severely affected

[16]The list of qualities includes Independence, Hard work, Feeling of responsibility, Imagination, Tolerance and respect of other people, Thrift, saving money and things, Determination and perseverance, Religious faith, Unselfishness (generosity), Obedience, Self-expression.

[17]The individual characteristics that we include in the regressions are: the respondents' gender, age (and age squared), eduction, marital status, whether the respondent has children or not, believes in god or not, as well as whether the respondent is full-time employed and is working in the public sector or not; as well as whether the survey is conduced in front of other people. At the county level, we consider those most important economic characteristics, including GDP per capita (log value) and population (log value), rainfall shock and soil characteristics at the county level in 2012.

counties tend to believe that thrift is more valuable and are more likely to cultivate thrift in children. This result is consistent with our conjecture about how the famine had altered individuals' attitude towards thrift. It also implies that the transmission of the thrifty attitude is indeed stronger in counties more severely affected. In columns (2)-(4), we progressively introduce control variables at both individual and county levels. The estimate is still as significant and its magnitude does not change much.

We further investigate whether the thrifty attitude of younger generations who did not experience the Great Famine is affected at all. To do so, we estimate the Logit model with a sub-sample of individuals who were born after 1962. In column (5) of Table 1, we report the estimated coefficient. We observe that individuals who were born after the famine years still value thrift more in counties more severely hit by the Great Famine. This finding is consistent with our conjecture that the thrifty attitude can be transmitted across generations.

Further, given individuals who were born before the famine were directly exposed to the famine but the younger ones who were born afterwards were not and only affected indirectly through preference transmission, we expect that there exists a "cohort effect." That is, the cross-county variations in the famine severity have a larger impact on the attitude towards thrift of the older individuals. To test this conjecture empirically, we estimate the following Logit model,

$$P(Thrift_{ij}) = F(S_j, Cohort, Cohort * S_j, Z_i, Z_j, \epsilon_{ij}), \tag{2}$$

Cohort is a dummy variable, taking the value of 1 if the respondent was born before a cutoff year X; $Cohort * S_j$ is the interaction between the cohort dummy and famine survival index. We estimate the cohort effect with the cutoff of birth-year X taking values from 1949 to 1979. Then we plot the estimate for the interaction term and the confidence interval (95%) against the cutoff value X, in the Figure 1.

Interestingly, we find that the estimate is negative and statistically significant only when X takes a value between 1958 and 1963. This result indicates that the direct effect of famine experiences is stronger than the indirect effect of preference transmission across generations. Therefore, we expect the impact of the Great Famine to dwindle over generations and eventually disappear in the very long run.

We further exam whether such a relationship between the attitude towards thrift and famine severity exists at the province level. Even though survivors were likely to be affected mostly by the local experiences of the Great Famine and were not able to observe its severity at the province level, they may receive some information about the situations of nearby counties in the same province. Therefore, we expect that peo-

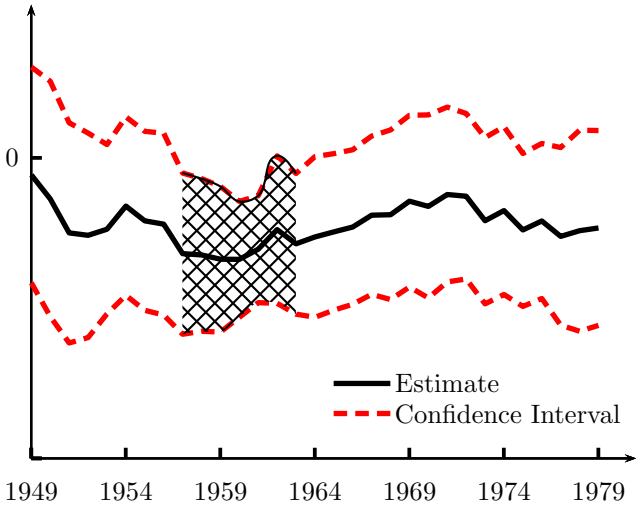

Figure 1. *Cohort effects.*

ple may also value thrift more in provinces that were subject to severer famine but such an association should be weaker. Following Lin and Yang (2000) and Chen and Zhou (2007), we use the excess death rate to approximate the famine severity at the province level. Specifically, the excess death rate is defined by the difference between the provincial death rate in 1959 and 1958, which is positively correlated with the famine severity. The World Value Survey conducted in 1990, 2001 and 2007 reveal the respondents' location at the province level, which makes our investigation feasible.[18]

Table 2 presents the results of *ols* regressions by pooling all the three waves of the World Value Survey. We first only control for the age, gender and age of eduction completion as well as wave dummies.[19] Column (1) of Table 2 reports the result, which suggests that people are more likely to give priority to thrift as one of the five qualities especially important for their children in provinces with higher excess death rates. The estimate of famine impact at the province level is statistically significant with 95% confidence, which is less significant than those of county-level regressions reported in Table 1. That is consistent with our previous conjecture.

In columns (2) and (3) of Table 2, we report the result when we further control for the individual characteristics (whether she or he is a party member and whether she or he has a child or not) and provincial level income per capita. The estimate does not change.

Wei and Zhang (2011) show that the sexual ratio imbalance may affect saving choices of Chinese households through the competition of marriage market. We exam

[18]The World Value Survey conducted in 1995 in China does not release information regarding the location of respondents.

[19]Information regarding respondents' education do not always exits for all the three waves. We therefore use the age of education completion as a proxy for the years of education.

whether sex ratios may matter for the thrift attitude and whether they affect our estimation of the famine impact. We add the provincial level sex ratios (which vary over time) in our regression, which are measured by sex ratios for the cohort of ages 7 to 21. In column (4), the result indicates that our estimate is still robust and sexual imbalance indeed leads to a higher likelihood of picking thrift as a preferred quality.

5. Empirical Strategy and Results

The previous section demonstrates that the Great Famine was likely to have altered the thrifty attitude of individuals who experienced it and they are more willingly to cultivate thrift in children. In this section, we explore the effects of the Great Famine on saving choices directly. We discuss two empirical designs for identifying the effects of the Great Famine on rural household saving rate in 2002. First, we estimate the impact of famine severity during the famine years (1959-1961) on the saving rates of rural households in 2002. Second, to deal with the potential endogeneity issues, we use a set of instruments for the famine severity. Both strategies provide highly significant and consistent estimates.

5.1. Linking the Great Famine to current saving rate

Our baseline estimations are based on the CHIP dataset, covering more than 8000 households across 122 counties. We examine the link between famine severity and saving rates using the following specification:

$$\log(Y/C)_{ikj} = \beta S_j + \eta_i Z_i + \eta_j Z_j + \eta_k Z_k + \epsilon_{ikj} \tag{3}$$

where $\log(Y/C)_{ikj}$ is the log value of income to consumption ratio for household i in village k and county j; S_j is the survival index for county j; Z_i, Z_k and Z_j capture three sets of controls, at the household, village and county levels, respectively, which we explain in details in the previous section; and ϵ_{ikj} is the error term. As we expect to observe some positive correlation within counties, we cluster the standard errors at the county level.

We report the impact of the Great Famine on the saving rate in 2002 in Table 3. The basic result is presented in column (1). It is implied that higher chances of survival during the famine years are associated with a lower household saving rate in 2002. In other words, households that reside in counties with a higher mortality rate during the famine years, tend to have a higher saving rate even nowadays. The magnitude of the impact is sizable: a standard deviation decrease in the survival index raises the household saving rate by roughly 5 percentage points on average.[20]

[20]We report the impact of the famine survival on the saving rate by converting the estimates on the

We further control for income at the household level and growth of income (proxied by the growth rate of salary of village cadres), given both are important determinants for households saving rate. In columns (2) and (3), we find that the estimates of the impact of famine survival are rather similar. That is due to the fact that, in the baseline regression, we have controlled for a range of variables that are proxies for incomes of households and for the development of the village and the county that they reside in.

In column (4), we restrict our sample to households whose oldest member was born after 1962, i.e., after the famine, so that none of the household members had direct exposure to the famine. We find that our estimate is still significant which indicates that the saving decisions of the younger cohorts were also affected by the famine.

In column (5), we present our estimate when we control for an index for the implementation of one child policy at the county level. One the one hand, such a policy, which was implemented in 1978, affected the demographical structure of Chinese population and family size profoundly. Considering that our measure of famine severity or survival likelihood relies on the information we extracted from the demographical structure as well, the correlation between the implementation of one child policy and the famine severity may bias our estimate. On the other hand, the one child policy was another important policy shock which may had an impact on the saving decisions of Chinese households (Choukhmane et al. 2014). We construct a measure of the implementation of the one child policy by dividing the size of the cohorts born during 1978-1981 by the size of the cohorts born during 1975-1977. Such a construction is rather similar to that of the famine survival index. The higher is the one-child policy index, the less rigorously was the policy implemented. We find that in counties the policy was more rigorously implemented, the higher is the saving rate in 2002, which is consistent with the conjecture that such a policy led to a higher household saving rate in China. However, the magnitude of the impact of famine on the saving rate is barely affected.

Even with a large set of controls, it is unlikely that we exhaust the relevant common factors that matter for both the pre-famine characteristics and post-famine development paths of the Chinese villages. To ensure that the estimates obtained do not simply capture unobserved heterogeneity at the village level, we re-investigate the issue by including village fixed effects. In column (6), we present results when we consider a village fixed effect, where we interact the famine survival with income quartile dummies. The result suggests that the poorest rural households in 2002 tend to be the most responsive to the cross county variations in the survival index. A decrease in the survival index, which indicates a lower chance of survival or a higher mortality rate

log value of income to consumption to the standard definition of saving rate, i.e., $(Y - C)/Y$.

during the famine years, raises the saving rate of the poorest households to the largest extent. Such a finding is consistent with the implication of our hypothesis. The poorest rural households typically strive for maintaining consumption at the subsistence level and they save mainly for the reason of building a buffer to cushion the future income shocks. Therefore, thrift (both patience and prudence) becomes the primary driving force underlying the saving behavior for this group of households. In contrast, the richer households may have accumulated a buffer stock to smooth income shocks or save out of alternative motives, such as bequests or conspicuous consumption (e.g., a fancy wedding), for which thrift plays a less important role.[21]

One may argue that the famine could be less severe in places where the population (and their offspring) was characterized by higher patience and prudence, so that they had accumulated a larger buffer to cushion the fall of the agricultural output during the famine years. On the one hand, this mechanism predicts that the saving rate should be higher in counties with less severe famine, which may bias our *ols* estimates towards zero. On the other hand, as we documented in Section 3, the food consumption in the rural areas had been collectivized prior to the famine years and the rural households were not allowed to store food individually. Therefore, it may be reasonable that famine mortality should be explained by various institutional causes and weather conditions, instead of the thrifty attitude of the population.

5.2. Results from two stage least squares estimation (2SLS)

One likely concern with the baseline estimations is that they may suffer from the potential omitting variables problem, for example, some pre-famine characteristics may drive both the severity of the Great Famine in late 1950's and the household saving pattern in 2002. To deal with it, we collect and employ a set of instruments for the survival index at both the county and province levels, which capture some transitory determinants of the famine impacts but do not affect the saving and consumption choices of rural households in 2002.

First, we consider a set of variables capturing the various disasters experiences in the late 1950s at the county level. Conceptually, the unfavorable weather conditions and natural disasters immediately before and during the famine years may have aggravated the mortality of famine.[22] Given the famine occurred after a sudden fall in grain output and availability of food consumption, it is reasonable to conjecture that adverse weather conditions and natural disasters may be negatively affect the chances

[21] Our finding suggests that the cross-county differences in the saving rate of richer households may be less responsive to variations in county-level famine severity, but it does not suggest that richer households are more thrifty.

[22] Li and Yang (2005) has empirically established that the bad weather indeed contributed to the fall of agricultural production.

of survival. Moreover, it is unlikely that the natural disasters that happened in late 1950's still influence the saving pattern in recent years. We collect detailed information regarding natural disasters at the county level from the *Natural Disasters* section of the *county gazetteers*, which documented four types of major natural disasters (hailstone, drought, pests invasion and flood), of which happened often in rural areas for each county.

We also consider rainfall shocks (z-score), a county-level variable, which indicates the abnormal rainfall and is calculated with our climate datasets. The effects of rain anomaly on the famine severity at the county level may also depend on whether a large fraction of the province was subject to disasters. When fewer counties in the same province were affected by natural disasters, each affected county may receive disaster relief provided at the province level. Therefore, we also interact the rain anomaly with a province-level natural disaster index, defined by the proportion of affected areas in each province by disasters. Given the proportion of affected areas in each province in both 1958 and 1959 are strong predictors for the famine survival index, we also include both of them.

The second category of instrument is related to the diversion of agricultural resources during the Great leap forward. In 1950's, it was widely believed that natural disasters were the major cause of the fall of agricultural outputs in rural China and building irrigation projects, as part of the industrialization in the rural area, was considered an effective response to alleviate the situation (People's Daily, 1957, Dec 22nd). In late 1955, Mao made an official comment and encouraged all the counties to build irrigation projects and water conservation programs to "secure the growth of agricultural output." [23] In September of 1957, Mao further called for a movement of building irrigation projects in rural areas of China and instructed that those projects would not be funded by the government and they had to be built by the mass (Chen, 2005). A media campaign was waged immediately and local government officials responded by proposing and building irrigation projects of all kinds.

On the one hand, those projects were built at the expense of a substantial diversion of the man power and other resources from agricultural production. In October of 1957, roughly 30 millions of famers were mobilized to participate. The number of participants reached around 70 millions at the end of 1957 and 100 millions in January of 1958 (Wu, 2006). Li and Yang (2005) found that the resources diversion was one major cause of the fall of agricultural output during the famine years. On the other hand, those irrigation projects undertaken during the political movement were largely showcases and turned out to be white elephants, which were useless for economic

[23] Details of this call for movement can be found in "Mao Zedong Collected Works" reprinted in 1999, volume 6, page 451.

development. Some county gazetteers even explicitly document that those projects were "a pure waste," and were destroyed or abandoned quickly after they were built because of the quality issue. To some degree, the number or frequency of attempting to build those showcase projects should be correlated with the effort local officials had taken to signal political loyalty.

We have collected the details of those large irrigation projects built during the Great leap forward in the section of *Major Events* in *County Gazetteers* or in *Irrigation Gazetteers*. We consider the number of the irrigation projects build in 1956, 1957 and 1958 in each county and whether they had been registered explicitly as a waste may be valid instruments, given they may be correlated with the mortality rate during the famine years but may not have an impact on the saving pattern of households in 2002 through other channels. Even though some of them may actually been used in agricultural production, the initial value of investment may have depreciated fully in 2002. We report the summary of statistics of the instruments that we use in Table 5.

In Table 6, we report the results from the second stage regressions.[24] For comparison of the magnitude, we present results from OLS regressions when we restrict the observations to the sub-smaple used in the IV regressions in Table 7.[25]

In column (1) of Table 6, with the basic set of controls, the magnitude of our estimate becomes substantially larger than that in *ols* regressions, which is consistent with the concern of omitted variables discussed in the beginning of this section.. It implies that in a county with a famine survival rate one standard deviation below the mean, households raise their saving rate by about more than 8 percentage points. Considering the median saving rate in our sample of rural households is 24%, the impact of Great famine seems to be quite sizeable.

In columns (2) and (3) of Table 6, we report our IV estimates when controlling growth, income, land availability and migration. The only difference from *ols* regressions is that the magnitude of the famine impact is larger. In column (4), report our IV estimate for the sample of younger households, all of whose members were born after 1962. The magnitude of this estimate is slightly smaller and less significant than the full sample estimate, which is consistent with our conjecture that the transmission effect is weaker than the experience effect. In column (5), we show the result with controlling one-child policy index. The one-child policy index becomes significant but the impact of the famine survival index is still roughly the same. In column (6), we report

[24] In Table 8, we report results from the first stage regressions. Disaster and rain fall anomaly index are typically negatively correlated with the survival index, which is consistent with our conjecture as well.

[25] In the IV regressions, we have relevant data for counties from 24 provinces. We re-run the *ols* regressions with the smaller sample used in IV regressions. The estimates are still consistent with our findings with the full sample.

the result from the village fixed effect model when instrumenting the famine survival index. The estimate of the famine impact still remains to be significant.

One may be concerned with the exogeneity of the instruments. The climatic shocks that aggravated the famine could be a recurring problem for these counties. There may be certain pattern in saving and consumption for the households that reside in the counties that are subject to volatile rain shocks. However, the set of controls for rainfalls shocks history (i.e., volatility of rain-shocks in both 1980's and 1990's as well as rainfall anomaly three years prior to 2002 and climatic conditions allow us to verify that it is not likely to be the case.

In all estimations, we have checked the relevance and exogeneity of instruments used. Since we instrument the famine survival index with multiple variables, we perform the Hansen's J test using overidentifying restrictions. Given the rain shock anomaly in 1958 is exogenous and do not affect the households saving decision in 2002 through any other channels, we can test the exogeneity of other instruments. We report the p-value of the Hansen J Test in each regression, which is consistent with our exclusion restriction. We also report the first stage F-statistics, which implies that our instruments are not weak.

We further introduce a set of controls at household, county and province levels and exam whether our key estimate for the impact of famine survival likelihood would change. We first investigate the effect of political connections. The concern is that households may have access to additional network for insurance so that they do not have to save that much if they are politically connected. We include a dummy variable for the party affiliation of the household head. Column (1) of Table 9 shows that households with a head who is Communist party member save less, but our estimate for the famine impacts is not affected in terms of magnitude and significance.

Another concern we have is that the Great Famine may have negative impacts on health conditions of famine survivors and their offspring, which in turn affect their saving and consumption choices. We have information about the health conditions of family members of the rural households surveyed. We report our results when controlling for health in columns (3) and (4), which show that households tend to save less if their family members are in bad health and that the effect is significant if the household head or his (or her) spouse is not very health. But the effect of famine survival likelihood does not change in response to those additional controls.

Eldest child is typically considered as a special member of Chinese rural families. The gender and age of the eldest child may matter for the saving choices of rural households, for example, families may save extra resources for the education and wedding of the eldest child who is a son. We report the result when controlling for

those characteristics in column (5), which shows that they do not seem to matter for households' saving choices particularly and our estimate for the famine survival likelihood is not affected either. Similarly, we introduce the sex ratio at the county level as a control and report the result in column (6). Our estimate for the famine impact is still robust.

We have instrumented the famine survival index so that our results are not driven by some pre-famine local characteristics. As an additional test, we include the agricultural population share at the province level in 1953, which is the demographical information that we can obtain from the population consensus prior to the famine years. The result is reported in column (2). As expected, the estimated effect of famine survival likelihood is not affected.

To check the robustness of our findings, we re-run the two stage least squares estimation with alternative measures for incomes, expenditures and famine survival index. In Table 10, we report results by using an income variable, which is aggregated from all income items in the survey. This income measure is inferior, given measurement errors are expected to increase. The additional source for measurement errors is likely to bias our estimates towards zero. The results show that it is indeed the case. In column (4), the estimate for younger households whose oldest member was born after 1962 becomes insignificant. It is also expected, partly because the effect of the Great Famine should be smaller when we focus on the younger households who did not experience famine and was affected by their parents and partly because the noise in income measure bias the estimate towards zero.

We redo our 2SLS estimations by using an alternative expenditure definition which includes the medical care paid by the government. The savings of household members working in the public sector are underestimated, if such expenditure is substantial and important. Our estimate can be biased, if there are less civil servants in the area which were more severely hit by the famine. The results are reported in Table 11, which are nonetheless the same as those in the benchmark estimation.

The famine survival index has been computed for all the counties, despite the size of each cohort. However, very small cohorts (with one or two members) could lead to measurement error in computing the index. We consider an alternative: once any birth cohort size is less than 5 members (or 10 members), we compute and use the survival index at the prefecture level instead and report the results in Table 12 (or Table 13). Our results are still robust to alternative measures of survival index.

5.3. Income growth and saving deposits: the impact of famine

Local bank deposits are typically regarded as an approximation for household saving decisions (Wei and Zhang 2011). Bank deposits are particularly useful for studies of rural households' saving decisions in China, given few of them have access to the financial market and possess other types of financial wealth. Therefore, it is interesting to investigate the relationship between famine severity and the bank deposits. From *China data online*, we collect data on bank deposits at the county level during the period of 1997 to 2010, for 1624 rural counties in China, which allows us to study how local deposit per capita reacts to GDP per capita and famine severity in a fixed effect model.[26] Given we only have access to the deposit data at the county level, we have to rely on the time varying determinants of deposits to investigate whether the counties with heterogeneous famine exposure would evolve differently.

In column (1) of Table 14, we regress log of deposit per capita on log of GDP per capita and its interaction with a dummy of the lowest quartile survival index, by controlling the county and year fixed effects. Not surprisingly, the income elasticity of bank deposits is positive and statistically significant. That is consistent with previous findings that a higher income does raise savings. More interestingly, the estimate of the interaction term is almost as large as that of the income per capita and it is statistically significant. That implies that, in response to the rising income, households in counties most severely affected by famine, i.e., the ones with the lowest 25% survival index, raise their bank deposits roughly twice as much as the rest of households. This result is consistent with our conjecture that the Great Famine in late 1950's still has an impact on the current saving propensity of Chinese households.

In column (2) Table 14, we control for the size of the county (i.e., population) and rainfall anomaly, which potentially affects output in rural counties. Our estimates barely change. One may conjecture that our results can be just driven by poorest counties or the most agricultural counties. To address this concern, in columns (3) and (4), we add the interaction between the log of GDP per capita and a measure of development level (i.e., a dummy of the lowest quartile income group) and interaction between the log of GDP per capita and a measure of urbanization (i.e., a dummy of rural population exceeding 95% in the county), respectively. The magnitude of the effect of survival index (or famine severity) is rather stable. In columns (5) and (6), we replace person level averages with household level counterparts and re-do the exercises reported in columns (1) and (2). The results are still robust.

It is a justified conjecture that the growth rate at the county level may be auto-

[26] We lag GDP for one period in all exercises. However, the results are much similar by using contemporary GDP.

correlated over time, which may bias the estimator when controlling for unobserved heterogeneity.[27] To address the potential bias, we adopt the conditional maximum likelihood estimator to deal with the dynamic linear panel data model, by following closely Verardi and Desbordes (2015). In the column (1) of Table 15, we report our estimates when controlling for rain anomaly and county size. Both the effect of log of GDP per capita and the effect added from its interaction with famine survival index are close to their counterparts in Table 14. As shown in columns (2) and (3), in this dynamic model, adding development and urbanization related controls does not affect our estimates either.

6. Conclusions

Throughout the course of history, the world has witnessed a multitude of catastrophic events, many of which had tremendous impacts on our cultures, norms and even preferences and shaped the way we behave even many years later. This paper discovers the link between the Great Famine that struck China in late 1950's with the observed saving patterns of Chinese households in recent years. Empirically, we show that the Great Famine may have altered Chinese households' thrift preferences and constitute one important determinant of their high saving propensity. Our results offer new understanding of saving patterns of Chinese households and also lend some support to the endogenous preference literature, by suggesting that the attitude of thrift can be shaped endogenously and transmitted across generations.

[27] In standard dynamic linear panel data models, a correlation between the error term and the explanatory variables may arise, when controlling for unobserved heterogeneity.

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Table 1. *The probability of picking "thrift" and the famine survival index with the World Value Survey of 2012 (Logit model).*

	(1)	(2)	(3)	(4)	(5)
Famine survival index	-0.250***	-0.248***	-0.219***	-0.205***	-0.215***
	(0.08)	(0.08)	(0.06)	(0.07)	(0.06)
Gender	Yes	Yes	Yes	Yes	Yes
Age	Yes	Yes	Yes	Yes	Yes
Age squared	Yes	Yes	Yes	Yes	Yes
Rain shock in 2012		Yes	Yes	Yes	Yes
Land properties		Yes	Yes	Yes	Yes
Primary school			Yes	Yes	Yes
Secondary school (tech)			Yes	Yes	Yes
Secondary school (pre-uni)			Yes	Yes	Yes
University degree			Yes	Yes	Yes
Has no child			Yes	Yes	Yes
Believes in God			Yes	Yes	Yes
Works in Public sector			Yes	Yes	Yes
City size 100K-500K			Yes	Yes	Yes
Survey condition (listeners)			Yes	Yes	Yes
Log county GDP				Yes	Yes
Log county population				Yes	Yes
Observations	2222	2222	2222	2222	1418

Significance level: * 10%, ** 5%, *** 1%. Standard errors (in parentheses) are clustered at the county level. In the last column, we restrict the sample to only individuals born after 1962.

Table 2. *The probability of picking "thrift" and the excess death rate at province level with the World Value Survey of 1990, 2001 and 2007 (Logit model).*

	(1)	(2)	(3)	(4)
Excess death rate	0.007**	0.007**	0.007**	0.007**
	(0.00)	(0.00)	(0.00)	(0.00)
Sex ratio				0.275*
				(0.17)
Age	Yes	Yes	Yes	Yes
Gender	Yes	Yes	Yes	Yes
Age of education completion	Yes	Yes	Yes	Yes
Age of education completion squared	Yes	Yes	Yes	Yes
Party member		Yes	Yes	Yes
Per capita income (province level, log)		Yes	Yes	Yes
Having no child			Yes	Yes
Wave dummies	Yes	Yes	Yes	Yes
Observations	3894	3883	3883	3883

Standard errors (in parentheses) are clustered at the cohort level. Significance level : * 10%, ** 5%, *** 1%.

Table 3. *Savings ratio and famine - OLS regressions using all sample - The dependent variable is the log of the savings ratio (income/consumption).*

	(1)	(2)	(3)	(4)	(5)	(6)
Famine survival index	-0.249***	-0.247***	-0.200**	-0.284***	-0.210**	
	(0.08)	(0.08)	(0.08)	(0.10)	(0.09)	
famine X 1 inc. quart.						-0.285***
						(0.07)
famine X 2 inc. quart.						-0.071
						(0.05)
One child policy index					-0.135	
					(0.11)	
Household characteristics	Yes	Yes	Yes	Yes	Yes	Yes
Long run conditions	Yes	Yes	Yes	Yes	Yes	No
Rain shocks history (80s, 90s)	Yes	Yes	Yes	Yes	Yes	No
Recent rain shocks (1999-2001)	Yes	Yes	Yes	Yes	Yes	No
Growth	No	Yes	Yes	Yes	Yes	No
Land, income and migration	No	No	Yes	Yes	Yes	Yes
Observations	8470	8425	8425	2026	8425	8495
Number of villages (FE)						890
Adjusted R-squared	0.0714	0.0714	0.305	0.320	0.310	0.295

Significance level : * 10%, ** 5%, *** 1%. Standard errors (in parentheses) are clustered at the county level in (1)-(4), at the village level in (5). (5) includes village fixed effects. **Household characteristics** includes the age of the household head, the proportion of dependent members in the household, the proportion of women in the household, household size and ethnicity, average education, access to water (via pump, well or tap water), and whether energy is provided by coal, firewood or fuel. **Long run conditions** include terrain condition (whether the village terrain is plain, hilly or mountainous; the slope, elevation, and shape of the nearby environment), agricultural suitability (the share of clayey soil, of sandy soil, of sloping land and of plain land in the county, the amount of land per capita in the village), the distance to the county seat, whether the village was a former CCP base, the mean and the standard deviation of precipitations in the county throughout the XXst century, whether the province is a coastal, a central or a western one. **Rain shocks history** comprises of the averages of yearly rain anomalies (z-score) in the 1980s and in the 1990s in the county. **Recent rain shocks** are yearly rain anomalies (z-score) in 1999, 2000 and 2001 in the village. **Growth** is the growth of the village population and of the average salary of village cadres between 1998 and 2002, and the average of county GDP growth between 1998 and 2002. **Land** is the amount of cultivated land by the household and the amount of total land (including forest, pasture, fishponds) per household in the village as of 1998. **Income** includes dummies indicating the quartile of income distribution to wich the household belongs, whether the village implemented the tax reform, and the amount of cadres salary in 2002. **Migration** is the number of migrants in the household. Column (4) is restricted to households whose oldest member is born after the famine (after 1962)

Table 4. *Savings ratio and famine - OLS regressions - The dependent variable is the log of the savings ratio (income/consumption). Alternative measure of famine severity : excess death at the province level*

	(1)	(2)	(3)	(4)	(5)	(6)
death	0.008***	0.008***	0.006**	0.003		0.004
	(0.00)	(0.00)	(0.00)	(0.00)		(0.00)
famine X 1 inc. quart.					-0.308***	
					(0.07)	
famine X 2 inc. quart.					-0.078	
					(0.05)	
famine X 3 inc. quart.						
famine X 4 inc. quart.						
One child policy index				-0.135		
				(0.11)		
Household characteristics	Yes	Yes	Yes	Yes	Yes	Yes
Long run conditions	Yes	Yes	Yes	Yes	No	Yes
Rain shocks history (80s, 90s)	Yes	Yes	Yes	Yes	No	Yes
Recent rain shocks (1999-2001)	Yes	Yes	Yes	Yes	No	Yes
Growth	No	Yes	Yes	Yes	Yes	Yes
Land, income and migration	No	No	Yes	Yes	Yes	Yes
Observations	9169	9104	9104	8425	8445	2181
Number of villages (FE)					885	
Adjusted R-squared	0.0651	0.0650	0.297	0.306	0.260	0.310

Significance level : * 10%, ** 5%, *** 1%. Standard errors (in parentheses) are clustered at the county level except in (5) (at the village level). (5) includes village fixed effects. **Household characteristics** includes the age of the household head, the proportion of dependent members in the household, the proportion of women in the household, household size and ethnicity, average education, access to water (via pump, well or tap water), and whether energy is provided by coal, firewood or fuel. **Long run conditions** include terrain condition (whether the village terrain is plain, hilly or mountainous; the slope, elevation, and shape of the nearby environment), agricultural suitability (the share of clayey soil, of sandy soil, of sloping land and of plain land in the county, the amount of land per capita in the village), the distance to the county seat, whether the village was a former CCP base, the mean and the standard deviation of precipitations in the county throughout the XXst century, whether the province is a coastal, a central or a western one. main region to which the province belong . **Rain shocks history** comprises of the averages of yearly rain anomalies (z-score) in the 1980s and in the 1990s in the county. **Recent rain shocks** are yearly rain anomalies (z-score) in 1999, 2000 and 2001 in the village. **Growth** is the growth of the village population and of the average salary of village cadres between 1998 and 2002, and the average of county GDP growth between 1998 and 2002. **Land** is the amount of cultivated land by the household and the amount of total land (including forest, pasture, fishponds) per household in the village in 1998. **Income** includes dummies indicating the quartile of income distribution to wich the household belongs, whether the village implemented the tax reform, and the log of cadres salary in 2002. **Migration** is the number of migrants in the household. Column (4) is restricted to households whose oldest member is born after the famine (after 1962) **Interpretation** : if the famine survival index decreases (famine cohorts survived less than non famine ones) by one standard deviation, the savings ratio increases by % to % (col (2) and (3)).

Table 5. *Summary statistics - Set of instrumental variables*

	Mean	**Std. Dev.**	**N**
County rain shock in 1958 (z-score)	-0.265	1.014	6575
1959 county shock X prov. area hit by disasters	0.002	0.041	6575
1958 county shock X prov. area hit by disasters	-0.013	0.038	6575
Province area hit by natural disasters in 1959	0.046	0.027	6575
Number of disasters in 1956 and 1957	1.789	1.491	6575
Number of disasters in 1958 and 1959	1.696	1.608	6575
A 1956 project was a waste	0.049	0.215	6575
A 1957 project was a waste	0.02	0.139	6575
Irrigation project in 1958	1.172	0.993	6575

Table 6. *Savings ratio and famine - 2SLS regressions - The dependent variable is the log of the savings ratio (income/consumption).*

	(1)	(2)	(3)	(4)	(5)	(6)
Famine survival index	-0.341**	-0.357**	-0.346**	-0.300*	-0.343**	
	(0.15)	(0.15)	(0.15)	(0.17)	(0.15)	
famine X 1 inc. quart.						-0.280**
						(0.14)
famine X 2 inc. quart.						-0.061
						(0.11)
One child policy index					-0.270*	
					(0.14)	
Household characteristics	Yes	Yes	Yes	Yes	Yes	Yes
Long run conditions	Yes	Yes	Yes	Yes	Yes	No
Rain shocks history (80s, 90s)	Yes	Yes	Yes	Yes	Yes	No
Recent rain shocks (1999-2001)	Yes	Yes	Yes	Yes	Yes	No
Growth	No	Yes	Yes	Yes	Yes	No
Land, income and migration	No	No	Yes	Yes	Yes	Yes
Observations	6575	6575	6575	1582	6575	6575
Number of villages (FE)						659
Adjusted R-squared	0.0218	0.0196	0.0345	0.0485	0.0408	0.174
KP F-stat	12.40	12.80	12.66	13.78	13.25	40.10
Hansen J p-value	0.277	0.246	0.222	0.460	0.212	0.111

Significance level : * 10%, ** 5%, *** 1%. Standard errors (in parentheses) are clustered at the county level in (1)-(5), at the village level in (6). (6) includes village fixed effects. **Household characteristics** includes the age and the age squared of the hh head, the proportion of dependent members in the household, the proportion of women in the household, household size and ethnicity, average education, access to water (via pump, well or tap water), and whether energy is provided by coal, firewood or fuel. **Long run conditions** include terrain condition (whether the village terrain is plain, hilly or mountainous; the slope, elevation, and shape of the nearby environment), agricultural suitability (the share of clayey soil, of sandy soil, of sloping land and of plain land in the county), the distance to the county seat, whether the village was a former CCP base, the mean and the standard deviation of precipitations in the county throughout the XXst century, whether the province is a coastal, a central or a western one. **Rain shocks history** comprises of the averages of yearly rain anomalies (z-score) in the 1980s and in the 1990s in the county. **Recent rain shocks** are yearly rain anomalies (z-score) in 1999, 2000 and 2001 in the village. **Growth** is the growth of the village population and of the average salary of village cadres between 1998 and 2002, and the average of county GDP growth between 1998 and 2002. **Land** is the amount of cultivated land by the household and the amount of total land (including forest, pasture, fishponds) per household in the village as of 1998. **Income** includes dummies indicating the quartile of income distribution to wich the household belongs, whether the village implemented the tax reform, and the amount of cadres salary in 2002. **Migration** is the number of migrants in the household. Column (4) is restricted to households whose oldest member is born after the famine (after 1962)

Table 7. *Savings ratio and famine - OLS regressions - The dependent variable is the log of the savings ratio (income/consumption).*

	(1)	(2)	(3)	(4)	(5)	(6)
Famine survival index	-0.238**	-0.238**	-0.196**	-0.276**	-0.180*	
	(0.09)	(0.09)	(0.09)	(0.13)	(0.11)	
famine X 1 inc. quart.						-0.290***
						(0.09)
famine X 2 inc. quart.						-0.035
						(0.06)
One child policy index					-0.296**	
					(0.14)	
Household characteristics	Yes	Yes	Yes	Yes	Yes	Yes
Long run conditions	Yes	Yes	Yes	Yes	Yes	No
Rain shocks history (80s, 90s)	Yes	Yes	Yes	Yes	Yes	No
Recent rain shocks (1999-2001)	Yes	Yes	Yes	Yes	Yes	No
Growth	No	Yes	Yes	Yes	Yes	Yes
Land, income and migration	No	No	Yes	Yes	Yes	Yes
Observations	6575	6575	6575	1582	6575	6575
Number of villages (FE)						659
Adjusted R-squared	0.0780	0.0795	0.306	0.337	0.314	0.260

Significance level : * 10%, ** 5%, *** 1%. Standard errors (in parentheses) are clustered at the county level in (1)-(4), at the village level in (5). (5) includes village fixed effects. **Household characteristics** includes the age of the household head, the proportion of dependent members in the household, the proportion of women in the household, household size and ethnicity, average education, access to water (via pump, well or tap water), and whether energy is provided by coal, firewood or fuel. **Long run conditions** include terrain condition (whether the village terrain is plain, hilly or mountainous; the slope, elevation, and shape of the nearby environment), agricultural suitability (the share of clayey soil, of sandy soil, of sloping land and of plain land in the county, the amount of land per capita in the village), the distance to the county seat, whether the village was a former CCP base, the mean and the standard deviation of precipitations in the county throughout the XXst century, whether the province is a coastal, a central or a western one. **Rain shocks history** comprises of the averages of yearly rain anomalies (z-score) in the 1980s and in the 1990s in the county. **Recent rain shocks** are yearly rain anomalies (z-score) in 1999, 2000 and 2001 in the village. **Growth** is the growth of the village population and of the average salary of village cadres between 1998 and 2002, and the average of county GDP growth between 1998 and 2002. **Land** is the amount of cultivated land by the household and the amount of total land (including forest, pasture, fishponds) per household in the village in 1998. **Income** includes dummies indicating the quartile of income distribution to which the household belongs, whether the village implemented the tax reform, and the amount of cadres salary in 2002. **Migration** is the number of migrants in the household. Column (4) is restricted to households whose oldest member is born after the famine (after 1962).

Table 8. *Savings ratio and famine - first stage regressions - The dependent variable is the famine survival index. The famine survival index is computed using cohorts with at least 10 members.*

	(1)	(2)	(3)	(4)	(5)
County rain shock in 1958 (z-score)	0.106***	0.106***	0.106***	0.091**	0.090**
	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
1959 county shock X prov. area hit by disasters	-0.250	-0.191	-0.198	-0.163	-0.317
	(0.53)	(0.53)	(0.53)	(0.51)	(0.49)
1958 county shock X prov. area hit by disasters	-0.002	-0.024	-0.018	0.202	0.405
	(1.19)	(1.17)	(1.17)	(1.17)	(1.34)
Province area hit by natural disasters in 1959	-5.540***	-5.586***	-5.581***	-5.639***	-5.234***
	(0.85)	(0.83)	(0.83)	(0.87)	(0.84)
Number of disasters in 1956 and 1957	-0.055***	-0.056***	-0.055***	-0.054***	-0.057***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Number of disasters in 1958 and 1959	0.021*	0.021*	0.021*	0.019	0.020
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
A 1956 project was a waste	0.163**	0.167**	0.168**	0.230***	0.191***
	(0.07)	(0.07)	(0.07)	(0.07)	(0.06)
A 1957 project was a waste	-0.073	-0.094	-0.094	-0.145*	-0.116
	(0.09)	(0.09)	(0.09)	(0.08)	(0.09)
Irrigation project in 1958	-0.007	-0.011	-0.011	-0.019	-0.018
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
One child policy index					Yes
Controls	Yes	Yes	Yes	Yes	Yes
Growth	No	Yes	Yes	Yes	Yes
Land, income and migration	No	No	Yes	Yes	Yes
Observations	6575	6575	6575	1582	6575
Adjusted R-squared	0.578	0.582	0.582	0.618	0.610

Standard errors (in parentheses) are clustered at the county level. Significance level : * 10%, ** 5%, *** 1%. The last column is restricted to households whose oldest member is born after 1962.

Table 9. *Robustness - 2SLS regressions - The dependent variable is log(Y/C)*

	(1)	(2)	(3)	(4)	(5)	(6)
Famine survival index	-0.357**	-0.327**	-0.342**	-0.342**	-0.352**	-0.352**
	(0.15)	(0.15)	(0.15)	(0.15)	(0.15)	(0.15)
Household head CCP	-0.079***					
	(0.02)					
Agricultural population share in 1953		0.607				
		(0.49)				
Head or spouse are in bad health			-0.065***	-0.063***		
			(0.02)	(0.02)		
Head's parents are in bad health				-0.272		
				(0.38)		
Kids are in bad health				-0.055		
				(0.05)		
Age of eldest child					-0.003	
					(0.00)	
Age of eldest child squared					0.000*	
					(0.00)	
Eldest child is a boy					0.004	
					(0.08)	
County level sex ratio						-0.058
						(0.56)
Household characteristics	Yes	Yes	Yes	Yes	Yes	Yes
Long run conditions	Yes	Yes	Yes	Yes	Yes	Yes
Rain shocks history (80s, 90s)	Yes	Yes	Yes	Yes	Yes	Yes
Recent rain shocks (1999-2001)	Yes	Yes	Yes	Yes	Yes	Yes
Growth	Yes	Yes	Yes	Yes	Yes	Yes
Land, income and migration	Yes	Yes	Yes	Yes	Yes	Yes
Observations	6575	6575	6575	6575	6575	6575
Adjusted R-squared	0.0372	0.0378	0.0356	0.0356	0.0340	0.0339
KP F-stat	12.64	13.41	12.58	12.62	12.71	12.21
Hansen J p-value	0.225	0.229	0.237	0.238	0.232	0.246

Significance level : * 10%, ** 5%, *** 1%. Standard errors (in parentheses) are clustered at the county level in (1)-(5), at the village level in (6). (6) includes village fixed effects. **Household characteristics** includes the age and the age squared of the hh head, the proportion of dependent members in the household, the proportion of women in the household, household size and ethnicity, average education, access to water (via pump, well or tap water), and whether energy is provided by coal, firewood or fuel. **Long run conditions** include terrain condition (whether the village terrain is plain, hilly or mountainous; the slope, elevation, and shape of the nearby environment), agricultural suitability (the share of clayey soil, of sandy soil, of sloping land and of plain land in the county), the distance to the county seat, whether the village was a former CCP base, the mean and the standard deviation of precipitations in the county throughout the XXst century, whether the province is a coastal, a central or a western one. main region to which the province belong. **Rain shocks history** comprises of the averages of yearly rain anomalies (z-score) in the 1980s and in the 1990s in the county. **Recent rain shocks** are yearly rain anomalies (z-score) in 1999, 2000 and 2001 in the village. **Growth** is the growth of the village population and of the average salary of village cadres between 1998 and 2002, and the average of county GDP growth between 1998 and 2002. **Land** is the amount of cultivated land by the household and the amount of total land (including forest, pasture, fishponds) per household in the village as of 1998. **Income** includes dummies indicating the quartile of income distribution to wich the household belongs, whether the village implemented the tax reform, and the log of cadres salary in 2002. **Migration** is the number of migrants in the household. Column (4) is restricted to households whose oldest member is born after the famine (after 1962) **Excluded instruments** : there are 9 instruments in specifications (1)-(3). Col (4) includes these instruments and some of their interactions with income quartiles which makes 30 instruments for 4 endogenous variables. In col. (5) the set of 15 instruments (for 3 endogenous) includes only interactions with income quartiles. **Interpretation** : if the famine survival index decreases (famine cohorts survived less than non famine ones) by one standard deviation, the savings ratio increases by % to % (col (2) and (3)).

Table 10. *Savings ratio and famine - 2SLS regressions - The dependent variable is the log of the savings ratio (income/consumption). The income variable is computed from various items reported in the survey.*

	(1)	(2)	(3)	(4)	(5)	(6)
Famine survival index	-0.343**	-0.358**	-0.347**	-0.244	-0.345**	
	(0.15)	(0.15)	(0.15)	(0.17)	(0.15)	
famine X 1 inc. quart.						-0.158
						(0.14)
famine X 2 inc. quart.						-0.132
						(0.13)
One child policy index					-0.274*	
					(0.14)	
Household characteristics	Yes	Yes	Yes	Yes	Yes	Yes
Long run conditions	Yes	Yes	Yes	Yes	Yes	No
Rain shocks history (80s, 90s)	Yes	Yes	Yes	Yes	Yes	No
Recent rain shocks (1999-2001)	Yes	Yes	Yes	Yes	Yes	No
Growth	No	Yes	Yes	Yes	Yes	No
Land, income and migration	No	No	Yes	Yes	Yes	Yes
Observations	6575	6575	6575	1582	6575	6575
Number of villages (FE)						659
Adjusted R-squared	0.0218	0.0196	0.0300	0.0444	0.0357	0.0792
KP F-stat	12.40	12.80	12.66	13.72	13.25	39.04
Hansen J p-value	0.281	0.250	0.195	0.436	0.191	0.0684

Significance level : * 10%, ** 5%, *** 1%. Standard errors (in parentheses) are clustered at the county level in (1)-(5), at the village level in (6). (6) includes village fixed effects. **Household characteristics** includes the age and the age squared of the hh head, the proportion of dependent members in the household, the proportion of women in the household, household size and ethnicity, average education, access to water (via pump, well or tap water), and whether energy is provided by coal, firewood or fuel. **Long run conditions** include terrain condition (whether the village terrain is plain, hilly or mountainous; the slope, elevation, and shape of the nearby environment), agricultural suitability (the share of clayey soil, of sandy soil, of sloping land and of plain land in the county), the distance to the county seat, whether the village was a former CCP base, the mean and the standard deviation of precipitations in the county throughout the XXst century, whether the province is a coastal, a central or a western one. **Rain shocks history** comprises of the averages of yearly rain anomalies (z-score) in the 1980s and in the 1990s in the county. **Recent rain shocks** are yearly rain anomalies (z-score) in 1999, 2000 and 2001 in the village. **Growth** is the growth of the village population and of the average salary of village cadres between 1998 and 2002, and the average of county GDP growth between 1998 and 2002. **Land** is the amount of cultivated land by the household and the amount of total land (including forest, pasture, fishponds) per household in the village as of 1998. **Income** includes dummies indicating the quartile of income distribution to wich the household belongs, whether the village implemented the tax reform, and the amount of cadres salary in 2002. **Migration** is the number of migrants in the household. Column (4) is restricted to households whose oldest member is born after the famine (after 1962).

Table 11. *Savings ratio and famine - 2SLS regressions - The dependent variable is the log of the savings ratio (income/consumption). Expenditures include the medical care paid by the government.*

	(1)	(2)	(3)	(4)	(5)	(6)
Famine survival index	-0.343**	-0.358**	-0.346**	-0.300*	-0.344**	
	(0.15)	(0.15)	(0.15)	(0.17)	(0.15)	
famine X 1 inc. quart.						-0.274*
						(0.14)
famine X 2 inc. quart.						-0.059
						(0.11)
One child policy index					-0.271*	
					(0.14)	
Household characteristics	Yes	Yes	Yes	Yes	Yes	Yes
Long run conditions	Yes	Yes	Yes	Yes	Yes	No
Rain shocks history (80s, 90s)	Yes	Yes	Yes	Yes	Yes	No
Recent rain shocks (1999-2001)	Yes	Yes	Yes	Yes	Yes	No
Growth	No	Yes	Yes	Yes	Yes	No
Land, income and migration	No	No	Yes	Yes	Yes	Yes
Observations	6575	6575	6575	1582	6575	6575
Number of villages (FE)						659
Adjusted R-squared	0.0218	0.0196	0.0346	0.0485	0.0409	0.173
KP F-stat	12.40	12.80	12.66	13.78	13.25	40.10
Hansen J p-value	0.281	0.250	0.225	0.460	0.215	0.108

Significance level : * 10%, ** 5%, *** 1%. Standard errors (in parentheses) are clustered at the county level in (1)-(5), at the village level in (6). (6) includes village fixed effects. **Household characteristics** includes the age and the age squared of the hh head, the proportion of dependent members in the household, the proportion of women in the household, household size and ethnicity, average education, access to water (via pump, well or tap water), and whether energy is provided by coal, firewood or fuel. **Long run conditions** include terrain condition (whether the village terrain is plain, hilly or mountainous; the slope, elevation, and shape of the nearby environment), agricultural suitability (the share of clayey soil, of sandy soil, of sloping land and of plain land in the county), the distance to the county seat, whether the village was a former CCP base, the mean and the standard deviation of precipitations in the county throughout the XXst century, whether the province is a coastal, a central or a western one. **Rain shocks history** comprises of the averages of yearly rain anomalies (z-score) in the 1980s and in the 1990s in the county. **Recent rain shocks** are yearly rain anomalies (z-score) in 1999, 2000 and 2001 in the village. **Growth** is the growth of the village population and of the average salary of village cadres between 1998 and 2002, and the average of county GDP growth between 1998 and 2002. **Land** is the amount of cultivated land by the household and the amount of total land (including forest, pasture, fishponds) per household in the village as of 1998. **Income** includes dummies indicating the quartile of income distribution to wich the household belongs, whether the village implemented the tax reform, and the amount of cadres salary in 2002. **Migration** is the number of migrants in the household. Column (4) is restricted to households whose oldest member is born after the famine (after 1962) **Excluded instruments** : there are 9 instruments in specifications (1)-(3). Col (4) includes these instruments and some of their interactions with income quartiles which makes 30 instruments for 4 endogenous variables. In col. (5) the set of 15 instruments (for 3 endogenous) includes only interactions with income quartiles. **Interpretation** : if the famine survival index decreases (famine cohorts survived less than non famine ones) by one standard deviation, the savings ratio increases by 8.7 % to 9 % (col (2) and (3)).

Table 12. *Savings ratio and famine - 2SLS regressions - The dependent variable is the log of the savings ratio (income/consumption). The famine survival index is computed using cohorts with at least 5 members.*

	(1)	(2)	(3)	(4)	(5)	(6)
Famine survival index	-0.340**	-0.357**	-0.354**	-0.316*	-0.353**	
	(0.15)	(0.15)	(0.15)	(0.18)	(0.15)	
famine X 1 inc. quart.						-0.281**
						(0.14)
famine X 2 inc. quart.						-0.062
						(0.11)
One child policy index					-0.272*	
					(0.14)	
Household characteristics	Yes	Yes	Yes	Yes	Yes	Yes
Long run conditions	Yes	Yes	Yes	Yes	Yes	No
Rain shocks history (80s, 90s)	Yes	Yes	Yes	Yes	Yes	No
Recent rain shocks (1999-2001)	Yes	Yes	Yes	Yes	Yes	No
Growth	No	Yes	Yes	Yes	Yes	No
Land, income and migration	No	No	Yes	Yes	Yes	Yes
Observations	6575	6575	6575	1582	6575	6575
Number of villages (FE)						659
Adjusted R-squared	0.0205	0.0184	0.0328	0.0463	0.0391	0.174
KP F-stat	12.26	12.67	12.09	12.84	12.73	40.28
Hansen J p-value	0.273	0.241	0.224	0.476	0.223	0.109

Significance level : * 10%, ** 5%, *** 1%. Standard errors (in parentheses) are clustered at the county level in (1)-(5), at the village level in (6). (6) includes village fixed effects. **Household characteristics** includes the age and the age squared of the hh head, the proportion of dependent members in the household, the proportion of women in the household, household size and ethnicity, average education, access to water (via pump, well or tap water), and whether energy is provided by coal, firewood or fuel. **Long run conditions** include terrain condition (whether the village terrain is plain, hilly or mountainous; the slope, elevation, and shape of the nearby environment), agricultural suitability (the share of clayey soil, of sandy soil, of sloping land and of plain land in the county), the distance to the county seat, whether the village was a former CCP base, the mean and the standard deviation of precipitations in the county throughout the XXst century, whether the province is a coastal, a central or a western one. **Rain shocks history** comprises of the averages of yearly rain anomalies (z-score) in the 1980s and in the 1990s in the county. **Recent rain shocks** are yearly rain anomalies (z-score) in 1999, 2000 and 2001 in the village. **Growth** is the growth of the village population and of the average salary of village cadres between 1998 and 2002, and the average of county GDP growth between 1998 and 2002. **Land** is the amount of cultivated land by the household and the amount of total land (including forest, pasture, fishponds) per household in the village as of 1998. **Income** includes dummies indicating the quartile of income distribution to which the household belongs, whether the village implemented the tax reform, and the amount of cadres salary in 2002. **Migration** is the number of migrants in the household. Column (4) is restricted to households whose oldest member is born after the famine (after 1962).

Table 13. *Savings ratio and famine - 2SLS regressions - The dependent variable is the log of the savings ratio (income/consumption). The famine survival index is computed using cohorts with at least 10 members.*

	(1)	(2)	(3)	(4)	(5)	(6)
Famine survival index	-0.331**	-0.348**	-0.334**	-0.298*	-0.334**	
	(0.15)	(0.15)	(0.15)	(0.17)	(0.15)	
famine X 1 inc. quart.						-0.266*
						(0.14)
famine X 2 inc. quart.						-0.059
						(0.11)
One child policy index					-0.276**	
					(0.14)	
Household characteristics	Yes	Yes	Yes	Yes	Yes	Yes
Long run conditions	Yes	Yes	Yes	Yes	Yes	No
Rain shocks history (80s, 90s)	Yes	Yes	Yes	Yes	Yes	No
Recent rain shocks (1999-2001)	Yes	Yes	Yes	Yes	Yes	No
Growth	No	Yes	Yes	Yes	Yes	No
Land, income and migration	No	No	Yes	Yes	Yes	Yes
Observations	6575	6575	6575	1582	6575	6575
Number of villages (FE)						659
Adjusted R-squared	0.0223	0.0203	0.0350	0.0481	0.0414	0.174
KP F-stat	13.14	13.50	13.19	14.22	13.86	41.54
Hansen J p-value	0.243	0.214	0.194	0.450	0.180	0.105

Significance level : * 10%, ** 5%, *** 1%. Standard errors (in parentheses) are clustered at the county level in (1)-(5), at the village level in (6). (6) includes village fixed effects. **Household characteristics** includes the age and the age squared of the hh head, the proportion of dependent members in the household, the proportion of women in the household, household size and ethnicity, average education, access to water (via pump, well or tap water), and whether energy is provided by coal, firewood or fuel. **Long run conditions** include terrain condition (whether the village terrain is plain, hilly or mountainous; the slope, elevation, and shape of the nearby environment), agricultural suitability (the share of clayey soil, of sandy soil, of sloping land and of plain land in the county), the distance to the county seat, whether the village was a former CCP base, the mean and the standard deviation of precipitations in the county throughout the XXst century, whether the province is a coastal, a central or a western one. **Rain shocks history** comprises of the averages of yearly rain anomalies (z-score) in the 1980s and in the 1990s in the county. **Recent rain shocks** are yearly rain anomalies (z-score) in 1999, 2000 and 2001 in the village. **Growth** is the growth of the village population and of the average salary of village cadres between 1998 and 2002, and the average of county GDP growth between 1998 and 2002. **Land** is the amount of cultivated land by the household and the amount of total land (including forest, pasture, fishponds) per household in the village as of 1998. **Income** includes dummies indicating the quartile of income distribution to which the household belongs, whether the village implemented the tax reform, and the amount of cadres salary in 2002. **Migration** is the number of migrants in the household. Column (4) is restricted to households whose oldest member is born after the famine (after 1962).

Table 14. *Famine and Saving deposits.*

	log(deposit per capita)				log(deposit per hh)	
	(1)	(2)	(3)	(4)	(5)	(6)
Log of GDP per capita	0.134***	0.134***	0.115***	0.134***		
	(0.02)	(0.02)	(0.02)	(0.02)		
Log GDP pc X 1st quartile survival	0.121***	0.120***	0.121***	0.120***		
	(0.02)	(0.02)	(0.02)	(0.02)		
Log population		0.031	-0.030	0.031		
		(0.09)	(0.09)	(0.09)		
Log of GDP per hh					0.120***	0.118***
					(0.02)	(0.02)
Log GDP p hh X 1st quartile of survival					0.107***	0.105***
					(0.02)	(0.02)
Log of number of hh						-0.019
						(0.06)
Log GDP pc X 1st quartile of GDP			0.066***			
			(0.01)			
Log GDP pc X agr pop $>$ 95%				-0.002		
				(0.01)		
Rainfall anomaly		-0.00002***	-0.00002***	-0.00002***		-0.00002**
		(0.00)	(0.00)	(0.00)		(0.00)
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
County fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	21905	21646	21581	21646	20176	19930
Within R-squared	0.862	0.862	0.862	0.862	0.822	0.821

Standard errors (in parentheses) are clustered at the county level. County fixed Effect models. Dependent variable is log of savings per capita ((1) to (4)) and per household ((5) and (6)). GDP are lagged for one period.

Table 15. *Dynamic panel estimated by conditional maximum likelihood.*

	(1)	(2)	(3)
Log of GDP per capita	0.165***	0.161***	0.166***
	(0.02)	(0.02)	(0.02)
Log GDP pc X 1st quartile survival	0.125***	0.125***	0.125***
	(0.02)	(0.02)	(0.02)
Rainfall anomaly	-0.00002***	-0.00002**	-0.00002***
	(0.00)	(0.00)	(0.00)
Log population	0.131	0.088	0.132
	(0.15)	(0.14)	(0.15)
Log GDP pc X 1st quartile of GDP		0.063***	
		(0.01)	
Log GDP pc X agr pop $>$ 95%			-0.003
			(0.01)
Average value of independent variables	Yes	Yes	Yes
Past value of dependent variable	Yes	Yes	Yes
Dummy for lowest quartile	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
Observations	21854	21753	21854
Within R-squared	0.855	0.856	0.855

Standard errors (in parentheses) are clustered at the county level. Estimator proposed by Verardi and Desbordes (2015). It is a modified random effects estimator including a past value of the dependent variable and the mean of the independent variables. Significance level : * 10%, ** 5%, *** 1%.

Table 16. *Descriptive statistics: household level variables*

Variable	All sample		OLS sample		IV sample	
	Mean	Median	Mean	Median	Mean	Median
ratio log(netincome/consumption)	.46	.46	.46	.47	.46	.47
	(.58)		(.58)		(.59)	
Famine survival index	.7	.7	.69	.7	.69	.71
	(.24)		(.24)		(.21)	
Household size	4.13	4	4.14	4	4.14	4
	(1.29)		(1.29)		(1.26)	
Prop. of dependents in hh	1.17	1	1.18	1	1.17	1
	(1.01)		(1.01)		(1)	
Age of household head	46.36	46	46.29	46	46.24	46
	(10.37)		(10.35)		(10.2)	
Ethnic minority	.14	0	.14	0	.12	0
	(.34)		(.35)		(.32)	
Prop. of women in hh	.53	.5	.53	.5	.53	.5
	(.15)		(.15)		(.15)	
Age of head squared	2256	2116	2249	2116	2241	2116
	(1001)		(997)		(978)	
Average education	6.98	7	6.98	7	7.02	7
	(2.24)		(2.25)		(2.21)	
Water from tap (ref cat. : well)	.34	0	.34	0	.31	0
	(.47)		(.47)		(.46)	
Water from pump (ref cat. : well)	.23	0	.23	0	.24	0
	(.42)		(.42)		(.43)	
Energy : coal (ref : fuel)	.32	0	.32	0	.33	0
	(.47)		(.47)		(.47)	
Energy : firewood (ref : fuel)	.58	1	.6	1	.58	1
	(.49)		(.49)		(.49)	
2nd income quartile	.25	0	.25	0	.25	0
	(.43)		(.43)		(.43)	
3rd income quartile	.25	0	.25	0	.25	0
	(.43)		(.43)		(.43)	
4th income quartile	.25	0	.25	0	.25	0
	(.43)		(.43)		(.43)	
Number of migrants	.54	0	.53	0	.55	0
	(.76)		(.75)		(.76)	
Observations	9200		8425		6575	

Descriptive statistics for the three samples used in the paper.

Table 17. *Descriptive statistics: village and county level variables (continued)*

Variable	All sample		OLS sample		IV sample	
	Mean	Median	Mean	Median	Mean	Median
Rain anomaly in village in 1999	.2	.04	.1	-.01	.05	-.01
	(1.2)		(1.15)		(1.06)	
Rain anomaly in village in 2000	.25	.26	.24	.25	.27	.25
	(.98)		(.99)		(1.01)	
Rain anomaly in village in 2001	-.15	-.47	-.18	-.48	-.11	-.47
	(1.16)		(1.19)		(1.24)	
Average rain anomalies in the 1980s	-.09	-.1	-.08	-.09	-.09	-.1
	(.28)		(.29)		(.28)	
Average rain anomalies in the 1990s	.25	.26	.25	.27	.26	.29
	(.22)		(.22)		(.23)	
Village implemented tax reform	.74	1	.74	1	.76	1
	(.44)		(.44)		(.43)	
Cadres salary in village in 2002	11.54	9	10.97	9	11.14	9
	(9.46)		(7.91)		(8.38)	
Village land per hh in 1998	9.33	6.12	9.4	6.14	8.73	6.11
	(11.43)		(11.56)		(9.1)	
Share of plain land in the county	.59	.7	.6	.75	.6	.75
	(.38)		(.37)		(.37)	
Share of sloping land in the county	.3	.2	.31	.2	.32	.2
	(.32)		(.32)		(.33)	
Share of sandy soil in the county	.05	.01	.05	.01	.05	0
	(.08)		(.08)		(.08)	
Share of clayey soil in the county	.06	0	.07	0	.06	0
	(.13)		(.13)		(.12)	
Mean of annual growth rate 1998-2002	.07	.07	.07	.07	.07	.07
	(.06)		(.06)		(.06)	
Village cadres salary growth 98-2002	-.05	0	-.06	0	-.07	0
	(.39)		(.39)		(.28)	
Village population growth	.03	.01	.02	.01	.02	.01
	(.13)		(.1)		(.09)	
Observations	9200		8425		6575	

Descriptive statistics for the three samples used in the paper.