Does Social Capital Help Households Cope with Natural Disaster During Marketization? Evidence from Rural China

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Abstract

This paper evaluates the role of social capital in helping households insure consumption after natural disaster during the marketization process in rural China. Using the China Household Income Project 2002 rural survey, our empirical results show that three kinds of social capital, mutual help, civic participation and trust, did not help households insure their consumption after natural disaster in rural China. This finding does not depend on the degree of covariance of natural disaster within villages. We also provide additional evidence that the effect of social capital on risk-sharing decreases as the marketization level increases.

Key words: Consumption smoothing; Natural disaster; Social capital; Marketization

1. Introduction

Economists have long discussed how households in developing countries cope with negative shocks. Economics theory suggests that if there is a complete market for households to share the risks of identical stochastic processes, household consumption only depends on aggregate income in the society, but not on household current income (Wilson, 1968; Ljungqvist and Sargent, 2000). Under this perfect setting, households are fully insured against idiosyncratic risk, so that they can smooth their consumption over time. The hypothesis of full risk sharing was rejected but partial risk sharing was found in empirical studies on developing countries (Townsend, 1994; Udry, 1994; Ligon, 1998; Gertler and Gruber, 2002), and also for China (Jalan and Ravallion, 1999). Given the particularly weak formal credit and insurance markets in developing countries, informal insurance is found to be one of the most important ways for households to partially insure their consumption (Rosenzweig and Stark, 1989; Fafchamps and Lund, 2002).

Recent studies tested how important social capital is for families in risk sharing. The availability of informal insurance after negative shocks largely depends on the connection between the families affected and their extended families and communities. The answer based on existing empirical evidence, however, is still unclear. The positive effect of social capital on mitigating the impact of negative shocks was found in South Africa (Carter and Maluccio, 2003) and Ethiopia (Mogues, 2006), but Gertler, Levine and Moretti (2006) find little evidence that social capital helps households insure consumption against health shocks in Indonesia. Gertler, Levine and Moretti (2006) casts doubt on the statement that social capital is the poor's capital in Woolcock and Narayan (2000).

Why are these findings different? The relationship between social capital and the market economy could provide a clue. First, social capital is less useful against natural disaster in villages where marketization level is high and households have more accessible and better formal insurance. Stiglitz (1999) argues that at the early stage of development, social capital may be very effective, while at the later stage, market forces will decrease the role of social capital as an informal institution. Durlauf and Fafchamps (2004) suggest that whether or not social capital raises efficiency depends on the level of formal institution development. Fafchamps (2006) further indicates that cross-country regression on social capital is likely to yield incorrect results if the research does not control for differences in formal institutions across countries. The real challenge of testing whether formal institutions substitute social capital as an informal institution

in cross-country regressions is collecting the specific information on the development of formal institutions. Second, marketization creates more opportunities of employment and different income sources can also act as informal insurance instead of cross-household insurance. Third, for rural people, rural–urban migration during marketization and development decreases the social interaction among villagers, which results in low levels of social capital during marketization.

Our study aims to answer two questions. First, does social capital help households insure consumption after natural disaster in rural China? We also examine whether households are more able to diversify away risks when the natural disaster is less covariant within a village. Second, if social capital works, how is the effect changing during marketization in China; or if it does not work, why?

The key feature of this study is to reveal the role of social capital in insuring household consumption after negative shocks when market is developed in the rural economy. The ongoing process of marketization in China is unbalanced, which results in different levels of formal institution development across regions, such as eastern, central and western China. It provides an excellent background for this study. Taking advantage of the variance of marketization levels, we capture the process of formal institution development based on cross-sectional data. Our study is expected to provide new insights to interpret the different findings on the role of social capital in insuring consumption.

Using a nationally representative survey in rural China by the China Household Income Project (CHIP) in 2002, we have the following findings. First, social capital, regardless of how it is measured, has little effect on helping households cope with natural disaster in rural China. Furthermore, this finding doesn’t depend on the degree of covariance of natural disaster among villagers. Second, the role of social capital, though weak on average, differs significantly across villages with different levels of marketization. Social capital is less useful in risk sharing where the marketization level is relatively high. The policy implication of this finding is: when the role of informal insurance has been weakened during marketization process, the gap should be filled by formal insurance and credit in rural China.

This paper is structured as following. The second section provides a literature review. The third section presents our data set. The fourth section presents the econometric specification. The empirical results are reported in Section 5. The sixth section provides additional robust check. The final section concludes.

2. Literature Review

Two fields of literature motivate our study. The first includes both theoretical and empirical studies on whether social capital helps households cope with negative shocks in developing countries, including China. The second considers the relationship between social capital, an informal institution, and formal institutions during economic development.

To begin with, our first question on the role of social capital in risk sharing has been raised in the existing literature. Households seek to mitigate negative shocks and partially insure their consumption using both formal and informal strategies (Morduch, 1995). In developing countries, the formal credit and insurance markets are usually absent, or if they do exist, many are not full and complete. Therefore, households, particularly the poor, rely largely on informal risk-sharing mechanisms, such as mutual insurance (Coate and Ravallion, 1993; Morduch, 2003). Informal credit and insurance, in turn, depend on the social capital in one's extended family and community (Fafchamps, 2006). The person receiving unforeseen adverse shocks is expected to help others in the network when they are needed. This reciprocity is raised by repeated games in social networks (Fafchamps, 1992). Besley (1995) suggests that nonmarket insurance has the advantage that people who often interact in a network, which promotes people's expectation of reciprocity, know and monitor each other better than formal insurance does.

The existing empirical evidence, however, has not reached a consensus on the role of social capital. Rosenzweig (1988) suggests that kinship ties in India can be sustained over space and over time by implicit insurance-based transfer schemes that contribute to consumption smoothing in the face of covariant income risks. In South Africa, trust at the community level, which was measured by using experiments, was found to have mitigated the effect of weather shocks on child nutritional status (Carter and Maluccio, 2003). Social network plays an important role in asset recovery and growth after environmental shocks in Ethiopia (Mogues, 2006). Trust, as the norm in a community, also helped households in asset recovery and growth after Hurricane Mitch in the Honduras (Carter and Castillo, 2006). A surprising finding in Indonesia, however, showed little effect of social capital, captured by several kinds of concepts and measurements, on coping with health shocks (Gertler, Levine and Moretti, 2006).

Households in rural China live in highly risky environments and may be vulnerable to weather shocks, illness and other sources of income variability. Evidence on risk sharing from China, however, is very limited. Jalan and Ravallion (2001) find that households are not fully insured in rural China, and a small share of wealth is used as a precaution against income shocks.

Previous literature in sociology and anthropology (e.g. Wang, 1996; Yan, 2000) recognize the importance of social capital in risk sharing in China, thus providing the following field studies.

[Case 1]

> In Xi village in Fujian province, mutual help always works within each household's networks, which is also called reciprocal help. Borrowing, labor exchange and information sharing are the main forms households help each other in risk-sharing. People are willing to lend to the borrowers who once lent to them in the past, and such borrowing is without interest. Besides monetary transfer, members in a network also provide each other with labor and information when they need. Households with more networks are better able to seek and receive help when shocks happen. The unequal distribution of social network among households leads to inequality in this village. (Wang, 1996)

[Case 2]

> During the Great Famine from 1958 to1960, people in Xiajia village suffered a lot from natural disaster. Food was extremely scarce in this village. Some people with social networks outside Xiajia village benefited from others' help, while more people without such networks starved. For example, Mr. Guo's sister married and migrated to another village where the disaster was not so terrible. She provides Mr. Guo sufficient food to help his family survive during the Great Famine. From that time on, people there have high belief on the importance of social networks in risk-sharing, and reinforce their networks even during the culture revolution. (Yan, 2000)

Besides these case studies, Morduch and Sicular (2001) investigate rural households in Zouping County, Shandong Province, and find that households that suffered a disaster received more financial and in-kind transfers during 1990 to 1993. Yet, more evidence is needed on whether social capital provides informal insurance in rural China. Firstly, it should be noted that these studies were conducted in less developed villages in western and northern China, where formal insurance is usually absent or extremely ineffective. Secondly, their findings were recorded in the early 1990s or even earlier, before the fast marketization process took place after the early 1990s. It would be interesting to ask whether the role of social networks on mitigating negative socioeconomic shocks has been changing along with the deepening of market transition in rural China.

Idiosyncratic shocks are assumed easier to cope with than covariant shocks by using the social capital within a community. When households suffer from idiosyncratic shock, intravillage transfers work as informal insurance for the affected households (Carter, 1997). Intuitively, when most of the households in a community suffer from a covariant shock at the same time, they face income loss at the aggregate level, so that they are less able to mutually help between each other. Carter and Maluccio (2003) find that a household's capacity to cope with an income

shock is weakened when the losses of its neighbors were very large. In our study, we also consider whether the effect of social capital is affected by the degree of covariance of natural disaster.

Another field of literature also motivated our study. Stiglitz (1999) indicates that as a society develops economically, its social capital must adapt as well, allowing the interpersonal networks to be partially replaced with the formal institutions of a market-based economy. Durlauf and Fafchamps (2004) suggest that social capital can be a second-best response to the absence of formal institutions, which is the first-best solution. However, should formal institutions be more effective, relying on interpersonal exchange may become unnecessary (Kranton, 1996). The finding of Putnam (2000) partially coincides with this reasoning: a widespread decrease in measures of association at a time when the US economy was growing rapidly.[1]

In these studies, the relationship between social capital, as an informal institution, and formal institutions is substitute during economic development. It can be shown as a conditional expectation in function (1), based on the basic function in Fafchamps (2006). O_{ij} is the performance of social capital S_{ij} of household i in community j, and F_j represents the development level of formal institutions in community j. The performance of social capital is conditional on the level of formal institutions.

$$E[O_{ij} \mid S_{ij}, HighF_j] \; < \; E[O_{ij} \mid S_{ij}, LowF_j] \tag{1}$$

Inspired by function (1), we assume that social capital is a substitute for formal institutions to provide insurance against natural disaster. So, O_{ij} here denotes the performance of social capital on risk sharing. When there is a higher level of formal institutions, such as formal credit, insurance markets and governmental transfers, the effect of social capital on risk sharing is smaller than that in communities with lower levels of formal institutions. Estimation on this conditional expectation, however, is rather challenging, because it is difficult to collect data on formal institutions across countries (Fafchamps, 2006). Furthermore, in most country-specific studies, the variance of the level of formal institutions within a country in a given period is relatively small, such as in the US or Africa. In our study, taking advantage of the marketization process in China, the variance of marketization levels is used to capture the development of formal institutions. We argue that people have more access to formal credit and insurance markets where marketization levels are higher.

[1] Putnam (2000) also suggests that if the measurement of social capital is changed, the decline in social capital may be insignificant.

Notably, the marketization process does not only represent the development of formal institutions, but also change in the way people interact with others. For example, there is large-scale rural–urban migration occurring during marketization in China, which results in less social interaction among villagers. It is also possible that the role of social capital is weakened by outward migration but not by formal institutions development. Furthermore, marketization also brings diversified income resources and employment opportunities which are themselves informal insurance mechanisms.

3. Econometric Specification

3.1 Full or partial risk sharing?

As our baseline, we examine whether or not household consumption is fully insured against natural disaster in rural China. Following the classical model of consumption smoothing of Townsend (1994), we regress the change in log consumption per capita on natural disasters and other control variables:

$$\Delta(Ln\frac{C_{ij}}{n_{ij}}) = \alpha_0 + \alpha_1 Shock_{ij} + \alpha_2 X_{ij} + \alpha_3 Z_j + \varepsilon_{ij} \quad . \qquad \text{——(2)}$$

Consumption of household i in village j is C_{ij} and is divided by its household size n_{ij}, the number of household members. The dependent variable is the change of log consumption per capita between the years 2002 and 2001. The dependent variable is determined by whether the household suffered from natural disaster $Shock_{ij}$ in the year 2002. Instead of using income changes to capture shock indirectly, we use the natural disaster itself to measure the negative shock directly. If households are able to fully insure consumption between 2002 and 2001 after the natural disaster in 2002, the coefficient α_1 is not statistically different from zero; otherwise, α_1 is significantly negative, which means full risk-sharing cannot be achieved in rural China.

In Equ. (2), we also controlled some household characteristics X_{ij} and village characteristics Z_j. County fixed effects are also controlled for in all regressions. In the permanent income theory of consumption, given wealth and credit availability, consumption should follow a random walk, varying only when new information changes perceptions of permanent income, e.g. a long-lasting random shock (Townsend, 1980; Ljungqvist and Sargent, 2000, Ch. 18). However, if local credit market is imperfect, consumption change will depend on the factors contributing to current income, e.g. the levels of schooling, non-farm work, and village roads, etc.

3.2 Does social capital help households cope with natural disaster?

Next, we test whether households with more social capital are better able to insure consumption against natural disaster. Here is equation (3):

$$\Delta(Ln\frac{C_{ij}}{n_{ij}}) = \beta_0 + \beta_1 Shock_{ij} + \beta_2 SC_{ij} + \beta_3 Shock_{ij} * SC_{ij} + \beta_4 X_{ij} + \beta_5 Z_j + \varepsilon_{ij} \quad . \qquad \text{——(3)}$$

Social capital of household i in village j is SC_{ij}. The key variable in equation (3) is the interaction term between natural disaster and social capital, $Shock_{ij} * SC_{ij}$. If social capital is effective against natural disaster, β_3 is significantly positive; if it is ineffective, β_3 is not different from zero. In this paper, we examine the roles of the three kinds of social capital, mutual cooperation, civic participation and trust, in risk-sharing in rural China. By specifying different kinds of social capital, we may identify whether some kinds of social capital work while others do not in coping with natural disaster.

To examine whether or not the effect of social capital depends on the degree of covariance of natural disaster, we introduce an additional interaction term, $Shock_{ij} * SC_{ij} * NeighborShock_{ij}$. The variable $NeighborShock_{ij}$ is measured as the percentage of other households in a village who suffered from natural disaster in 2002. Intuitively, if the natural disaster is highly covariant, this percentage will be high, so that it is less likely for households to mutually help after a natural disaster within the same village. We regress equation (4) as follows:

$$\Delta(Ln\frac{C_{ij}}{n_{ij}}) = \beta_0 + \beta_1 Shock_{ij} + \beta_2 SC_{ij} + \beta_3 Shock_{ij} * SC_{ij} + \beta_4 Shock_{ij} * SC_{ij} * NeighborShock_{ij} + \beta_5 X_{ij} + \beta_6 Z_j + \varepsilon_{ij}$$

. ——(4)

Our concern is with β_4. If the role of social capital in risk-sharing becomes less important when the natural disaster is highly covariant, $\beta_4 < 0$, or if the effect of social capital does not depend on how covariant the natural disaster is, then β_4 is not different from zero.

3.3 Is the role of social capital changing during marketization?

Our analysis focuses on the third part, the most important effect in this paper. It is to investigate how the effect of social capital on risk-sharing changes during marketization. It is estimated based on equation (5) as follows:

$$\Delta(Ln\frac{C_{ij}}{n_{ij}}) = \gamma_0 + \gamma_1 Shock_{ij} + \gamma_2 SC_{ij} + \gamma_3 Shock_{ij} * SC_{ij} + \gamma_4 Shock_{ij} * SC_{ij} * M_j + \gamma_5 X_{ij} + \gamma_6 M_j + \gamma_7 Z_j + \varepsilon_{ij}$$

——(5)

We combine the interaction term $Shock_{ij} * SC_{ij}$ in equation (3) with the marketization level M_j in village j to obtain $Shock_{ij} * SC_{ij} * M_j$. Two proxy variables, the percentage of nonfarm workers in a village and the percentage of outward migration in a village, are used to measure marketization at the village level. If social capital works less effectively in providing informal insurance when the marketization level increases, the coefficient γ_4 should be significantly negative. However, the efficiency of social capital against natural disaster is not weakened when market force grows, if γ_4 is indifferent from zero or is positive. This empirical test has the advantage over past studies that we explicitly tested how the development of market, proxied by non-agricultural employment share, affects the role of social capital in risk sharing. It is worth keeping in mind that our proxies capture not only the formal institution development, but also the outward migration, which may weaken the role of local social capital as well. In this regression, we could not separate these two possible mechanisms from each other.

4. Data

Our data source is a nationally representative rural household and village survey conducted by the Chinese Household Income Project (CHIP) Team at the Institute of Economics, the Chinese Academy of Social Science (CASS), in 2002 (the 2002 CHIP Survey). This survey covers 9200 households living in 961 villages in 22 provinces[2]. The sample for this survey is a subsample of the official rural household survey from the National Bureau of Statistics (NBS). About 10 households were randomly selected and surveyed in each village. Measurements of the variables in our empirical framework are explained below and Table 1 presents the summary statistics for these variables.

<Insert Table 1 here.>

Social capital

[2] These provinces are: Beijing, Hebei, Shanxi, Liaoning, Jilin, Jiangsu, Zhejiang, Anhui, Jiangxi, Shandong, Henan, Guangdong, Guangxi, Chongqing, Sichuan, Guizhou, Yunnan, Shaanxi, Gansu, and Xinjiang. The unique feature of the 2002 CHIP survey is that it includes a village (*xingzhengcun*, or administrative village) questionnaire, as well as a household questionnaire. That enables us to obtain rich information on social capital both at the household level and the village level. For details of the sampling framework and sampling method of the CHIP 2002 survey, see Gustafsson, Li and Sicular (2008).

The highlight of this data set is the rich measurements of social capital. In the literature, mutual cooperation, civic participation and trust are three kinds of social capital, which are assumed to be effective in risk sharing in developing countries. Mutual cooperation, such as labor and information exchange, in informal ties might assist households in risk-sharing (Gertler, Levine and Moretti, 2006). The participation in social organizations, can effectively reduce the effects of negative shocks (Carter and Maluccio, 2003; Mogues, 2006). Trust of other people promotes household's recovery and asset growth after hurricanes (Carter and Castillo, 2006). These three concepts of social capital are measured specifically in our study.

First, we measure mutual cooperation by labor exchange and information exchange among relatives and neighbors. Labor exchange is measured by the average number of days a family member engaged in mutual help in the year 2002. Furthermore, information exchange is measured by how frequently households exchange information on nonfarm jobs. The frequency ranges from 1 to 5, representing none/few, sometimes, just so-so, often and very frequently, respectively.

Second, we measure civic participation by how many civic meetings a household attended in the year 2002. Empirical studies in other developing countries often use participation in social organizations (Gertler, Levine and Moretti, 2006). Actually, this is not a good measure in China. Our data show that very few social organizations exist in rural China; or if there are some, people's participation is particularly low. Alternatively, people participate in civic meetings within villages, such as meetings of the community, the Party or other associations. Attending meetings is an important way for rural people to interact with others and thus form their networks in the village.

The third measurement is trust. The questionnaire asks "Do you agree that most people cannot be trusted?" The answer ranges from 1 to 4, indicating strongly agree, agree, disagree, strongly disagree, respectively. The higher the score, the more people trust most other people. The average trust level in rural China is 2.9, which is surprisingly high.

Natural disaster

We use natural disasters to proxy the negative shock for households in rural China. Natural disaster, mainly caused by the weather and environment, is exogenous to household characteristics, which makes us safe from endogenous bias to some extent.[3] It is measured by whether or not the household suffered from a severe natural disaster in 2002. If yes, the negative

[3] In contrast, health shocks, another kind of negative shock, as an explanatory variable may suffer from the endogeneity problem.

shock is 1; and if not, the negative shock is 0.

A significant feature of natural disaster is that it might be covariant within a village. Natural disasters, such as droughts and floods, usually influence households in a whole area instead of in scattered ones. If a family suffered from a natural disaster, other families in the same village were very likely to experience this natural disaster at the same time. However, our data show that, a natural disaster is not a completely covariant shock. The correlation between whether a household suffered and whether his/her village suffered is only 0.2. Moreover, the average percentage of one's neighbors who suffered from a natural disaster in a village is 40%. Figure 1 presents the kernel density of the percentage of one's neighbors affected by nature disasters in 2002. It shows the degree of covariance of nature disaster within villages. A U-shaped is found is found in our sample. The density from 0 to 0.2 and from 0.8 to 1 is relatively high. This means that although natural disasters are covariant in some villages, they could also be idiosyncratic in other villages. Because of the complex geographic and agricultural features in China, the degree of covariance of natural disasters varies significantly across villages.

<Insert Figure 1 here.>

Marketization

The variance of the marketization level in China is used to capture the development of formal institutions in our study. In a transitional country as big as China, the marketization level varies across different provinces. Wang *et al.* (2007) constructed a marketization index using 23 subindexes in five categories, including government–market relations, development of the nonstate enterprise sector, development of commodity markets, development of factor markets and the intermediate/legal framework. In 2002, province-level marketization indices range from 0.625 in Tibet to 8.627 in Guangdong. In the sample provinces in CHIP 2002, Guizhou had the lowest marketization index value of 3.044.

This province-level index has limited information on the marketization process in rural areas, however. In our study, we measure marketization at the village level. The development of markets at the village level might also vary within a province. During the economic transition in rural China, the most important features are the growing nonfarm sectors and rural–urban migration. Rural industries and enterprises have attracted many people to find nonfarm jobs instead of farming. We use the proportion of nonfarm workers[4] in a village to measure the first

[4] Nonfarm workers here mean those who are mainly employed in the nonfarm sector. As official village level

feature. In addition, large numbers of rural workers migrate to cities for better job opportunities. The proportion of labor migrants in a village is used to measure the second feature.

Control variables

Besides these key variables above, we also control for household and village characteristics in our econometric specification, including the household head's age, age squared, gender, marital status, education, party membership, occupation and minority group. We also control for the household's land and fixed assets. Most of these control variables determine the lifetime income of a household. At the village level, income per capita, distance to the nearest county, whether the village has roads, are all controlled for. All of our regressions also control for county fixed effects using county dummies.

5. Empirical Results

Table 2 presents the results based on equation (2). The households were not able to fully smooth their consumption in rural China. This is consistent with the findings of Jalan and Ravallion (1999), which rejected the hypothesis of full insurance in rural China. Households that suffered from natural disaster in the year 2002 have a 2.4% larger decline in consumption per capita between 2002 and 2001, compared with households who did not suffer from natural disaster, other things being equal.

<Insert Table 2 here.>

Does social capital play a role in risk-sharing in rural China? Surprisingly, the results in Table 3 tell us that the answer is no. We find that households with more civic participation and higher levels of trust have higher growth in consumption. However, all the interaction terms associated with social capital and natural disaster are statistically insignificant. Households with more mutual cooperation, civic participation and higher trust did not have significantly smaller declines in consumption after natural disasters compared with households with less social capital. Social capital might raise household's consumption through a mechanism, e.g. increasing household income, other than risk-sharing after natural disaster.

<Insert Table 3 here.>

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documents no longer report statistics on employment structure, number of nonfarm workers in the village is based on estimation by village cadres.

We doubt that the results in Table 3 were affected by the covariance of natural disaster within villages. When most of the households in a village suffer from natural disaster at the same time, social capital is less effective in providing mutual insurance between households. Therefore, we are interested in the interaction term containing social capital; that is, whether or not a household suffered from natural disaster and the percentage of its neighbors who suffered from natural disaster in Table 4. All these interaction terms are negative, which means that the effect of social capital is likely to decrease after highly covariant shocks. However, none of them is statistically significant. The effect of social capital in coping with natural disaster did not vary across villages where the covariance of natural disaster is different. It further supports the robustness of our finding in Table 3 that little evidence exists to support the role of social capital against natural disaster in rural China.

<Insert Table 4 here.>

Why did social capital not help households insure consumption after natural disaster in rural China? This finding is a bit controversial in light of the early results of sociological and anthropological studies in rural China. The importance of social capital in providing informal insurance was revealed in detailed field studies (Wang, 1996; Yan, 2000). However, the limitation of space and time on these studies could lead to biased understanding. First, most field studies were conducted in less-developed villages in western and northern China, where formal insurance is usually absent or extremely poor. Second, their analysis was conducted in the early 1990s or earlier, before the fast marketization process began at the start of the 2000s. In other words, the development of market was not taken into consideration in Wang (1996) and Yan (2000). We are most interested in this question: to what extent has the development of market in rural China affected the significance of social capital?

Next, we explicitly examine whether the role of social capital in risk-sharing differs in villages with different levels of marketization. We use two proxies for marketization level. Table 5.1 reports the results using the percentage of nonfarm workers in a village as the proxy for marketization level. Table 5.2 uses the percentage of outward migrants in a village as the proxy. The key concern in these two tables is the interaction terms between social capital, natural disaster and marketization level. Table 5.1 shows that in the villages with a higher percentage of nonfarm workers, the effect of labor exchange and civic participation on risk-sharing after natural disaster is significantly reduced. In Table 5.2, in those villages with higher percentages of

outward migrants, the effects of labor exchange, information exchange and trust on risk-sharing decrease. Based on our measurements of marketization level, we have three possible interpretations for this finding. First, social capital is less useful against natural disaster in villages where marketization level is high and households have more accessible and better formal insurance. Second, marketization creates more opportunities of employment and different income sources can also act as informal insurance instead of cross-household insurance.[5] Third, rural–urban migration decreases the social interaction among villagers, which results in low levels of social capital during marketization. However, we could not separate these three possibilities from each other in this regression.

<Insert Tables 5.1 and 5.2 here.>

6. Robust Check

We did several robust checks and report the results in the Appendix. First, we use an alternative measurement of formal institution: credit availability. Second, we construct a subsample, including villages where less than 80% households suffered from nature disaster in 2002. We re-estimate our empirical equations in the third section by using this subsample. It is to check whether our results hold when the risk is more heterogeneous. Third, another subsample excluding the top 20% richest villages is used to check the robustness of our results for poorer households.

The results of using credit availability as a proxy of formal institution are reported in A.3. The definition of credit availability in our data comes from this question: If you need 5000 Yuan RMB immediately, how can you raise it? If a household can borrow from bank, credit union or private credit institution, the variable credit availability is 1, otherwise is 0. 12% households in our sample can borrow from bank and credit union when necessary, and only 0.05% households borrow from private credit institution. Other households either use their own saving, or borrow from family members, or have no methods. This measurement captures the development of financial market to some extent. Intuitively, if formal credit is more available, the social capital may play a weaker role on risk-sharing for households. When we just add it as an additional control variable, the results in Tables 5.1 and 5.2 do not change much. While credit availability itself has a significantly positive coefficient, seven out of eight regressions in Table A.1 and A.2 have negative coefficients for the interaction term of social capital, natural disaster and marketization, among which 4 are significant. We also tried to test whether the role of social

[5] Yang and Choi (2007) provided evidence from Philippines that remittances sent by overseas migrants serve as insurance for recipient households.

capital change with this measurement of credit availability. The answer is: not significantly. (See Table A.3.) This could be because this measurement only captures different households' abilities to get credit, since it's poorly correlated with village-level migration ratio and non-farm activity ratio. So, in the following robust checks, we only include credit availability as a control variable.

Next, we repeat our estimation for villages where less than 80% households suffered from nature disaster in 2002. In the eight regressions in Table A. 4 and A.5, seven have negative coefficients for the interaction term of social capital, natural disaster and marketization, among which 4 are significant. They give us very similar results as we find in fifth section.

Being aware of that social capital only works in lagged areas, we also checked whether our results still hold if we exclude the top richest villages. Table A.6 and A.7 showed that all the eight regressions have negative coefficients for the interaction term of social capital, natural disaster and marketization, among which 5 are significant. The effect of interaction terms is even greater by using this sample, which suggests that our finding is more robust for poor households in rural China.

For the measurement of social capital, we also tried whether a household belongs to the largest surname family in a village. We do not report this result, because almost no variables we focus on are significant.

7. Conclusions and Policy Implications

This paper evaluated the role of social capital in helping households insure consumption after natural disaster during the marketization process in rural China. It provided a new perspective in understanding why social capital works in risk-sharing in some contexts but does not work in others.

Our findings showed that three kinds of social capital, i.e. mutual help, civic participation and trust, did not help households insure their consumption after natural disaster in rural China. This finding does not depend on the degree of covariance of natural disasters among villagers. We provide additional evidence to interpret this result: the effect of social capital in risk-sharing decreases significantly as the marketization level increases.

Notably, these findings just refer to the three kinds of social capital and natural disaster, and also depend on the proxies we use for marketization level. Other forms of social capital probably provide informal insurance for rural households to recover from natural disaster, or they are likely to work against other kinds of negative shocks, such as severe illness. Our proxies for marketization level could be replaced by better ones that can truly capture the formal institutions

development in rural China, if available in the future. We are most interested in separating the formal institutions from other mechanisms in future research.

Based on this study, we could also provide policy implications for improving household welfare in rural China. Rural China is halfway through its development process. The old and informal institutions are losing their important role as security mechanisms in protecting people. The new and formal institutions are still underdeveloped in many areas, particularly the poorest regions in China. If the role of social capital to provide informal insurance has been substituted by formal insurance during marketization in China, our finding is optimistic. At least in some regions with a higher level of marketization, households are protected by formal insurance instead of informal insurance. Moreover, it is hopeful to see the emergence of formal insurance in less-developed regions as the market grows. However, if our findings are caused by outward migration and weakened social interaction in rural areas, households might face the absence of both informal and formal protection. Households in less developed regions are particularly vulnerable to negative shocks. Without the protection of both informal and formal insurance, they are more likely to fall into the poverty trap. Formal credit and insurance markets should cover the whole of China to play their roles as people's safety guards against negative shocks. The government should also intervene by transferring and building safety nets to alleviate the effects of the negative shocks that rural people may face.

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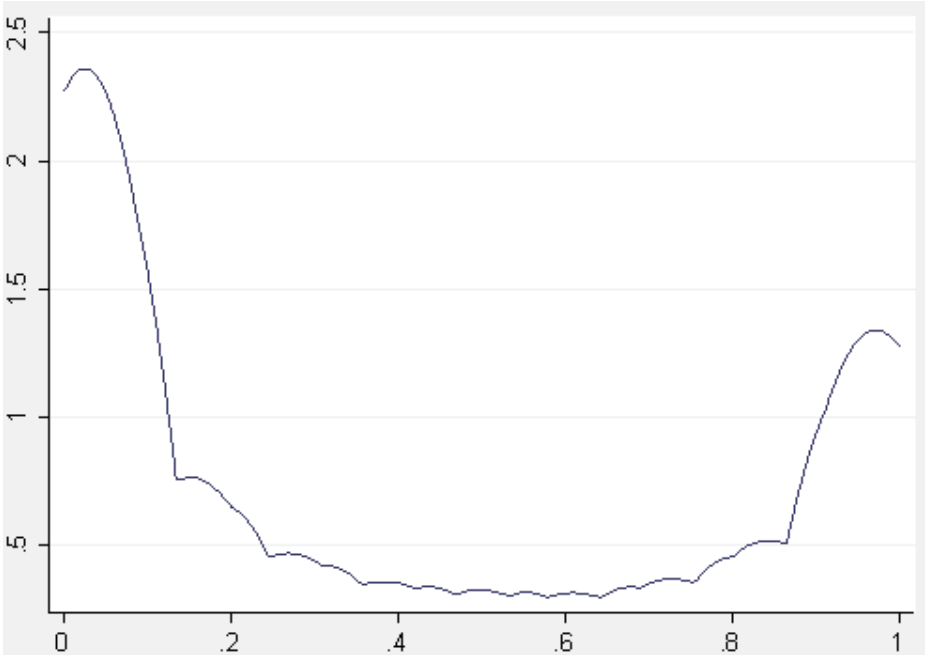
Figure 1:

Kernel density of the percentage of neighbors affected by natural disaster in 2002



Percentage of neighbors affected

Table1: Summary statistics

Variables	Mean	Std. Dev.
1. Individual and household characteristics		
Age of the household head	46	0.3
The household head is male	0.96	0.2
The household head is married	0.96	0.2
The household head is a minority	0.12	0.32
Years of schooling of household head	7.24	2.51
The household head is a communist party member	0.18	0.38
Income per capita in a family (*yuan*)	2729	2283
Value of fixed assets (*yuan*)	1229	3524
Share of nonfarm workers in a family	0.28	0.22
Size of land per capita (*mu*)	3.37	3.72
2. Social capital		
Labor exchange: number of days for labor exchanges with others per capita in 2002	16	18
Information exchange: frequency of information exchange with others	3.6	1.2
Participation: times participated in civic meetings in the village in 2002	5	9.6
Trust: trusts most people	2.9	0.96
3. Village characteristics		
Income per capita in a village (*yuan*)	2846	1831
Percentage of households who suffered from natural disaster in a village	0.4	0.4
Percentage of nonfarm workers in a village	0.33	0.22
Percentage of outward migrants in a village	0.22	0.19
Percentage of village with roads	0.96	0.2
Distance to the nearest county seat (*km*)	24.1	20.6

Table 2: Regression on the change in log consumption per capita on natural disasters

Dependent variable: change in log consumption per capita	
Natural disaster	–0.024*
	(0.014)
Age	0.0007
	(0.004)
Age squared	–0.00002
	(0.00004)
Male	0.04
	(0.03)
Married	–0.03
	(0.03)
Party Member	0.025*
	(0.014)
Schooling	0.008***
	(0.0024)
Nonfarm Work	0.024***
	(0.009)
Land	0.003
	(0.002)
Fixed Assets	0.0004
	(0.002)
Village Income	0.03
	(0.02)
Roads	0.085***
	(0.03)
Distance to Market	–0.0003
	(0.0003)
Constant	0.1
	(0.2)
Observation	8653
R-squared	0.086

Notes: (1) County dummies have been included in all the regressions.

(2) Standard error in parentheses.

(3) *** denotes significance at the 1% level, ** at the 5% level, * at the 10% level.

Table 3: Regression testing the role of social capital on risk-sharing

Dependent variable: change in log consumption per capita				
	(1)	(2)	(3)	(4)
Natural disaster	–0.03	–0.03	–0.008	0.01
	(0.02)	(0.04)	(0.016)	(0.04)
Labor exchange	0.0003			
	(0.0005)			
Labor exchange*Natural disaster	0.0003			
	(0.0006)			
Information exchange		0.004		
		(0.006)		
Information exchange*Natural disaster		0.002		
		(0.009)		
Participation			0.002***	
			(0.0008)	
Participation*Natural disaster			–0.001	
			(0.001)	
Trust				0.02***
				(0.008)
Trust*Natural disaster				–0.01
				(0.01)
Observations	8653	8653	7201	7934
R-squared	0.086	0.087	0.094	0.087

Notes: (1) All the control variables in Table 2 are included but not reported here. County dummies are also controlled.

(2) Standard errors in parentheses.

(3) *** denotes significance at the 1% level, ** at the 5% level, * at the 10% level.

Table 4: Regression including the degree of covariance of natural disaster

Dependent variable: change in log consumption per capita				
	(1)	(2)	(3)	(4)
Natural disaster	–0.03	–0.03	–0.01	0.005
	(0.02)	(0.04)	(0.02)	(0.04)
Labor exchange	0.0003			
	(0.0005)			
Labor exchange*Natural disaster	0.001			
	(0.001)			
Labor exchange*Natural disaster*Percentage of suffered neighbors	–0.001			
	(0.001)			
Information exchange		0.004		
		(0.006)		
Information exchange*Natural disaster		0.01		
		(0.01)		
Information exchange*Natural disaster*Percentage of suffered neighbors		–0.01		
		(0.01)		
Participation			0.002***	
			(0.0008)	
Participation*Natural disaster			0.002	
			(0.002)	
Participation*Natural disaster*Share of suffered neighbors			–0.005	
			(0.003)	
Trust				0.02***
				(0.008)
Trust*Natural disaster				–0.001
				(0.02)
Trust*Natural disaster*Percentage of suffered neighbors				–0.01
				(0.01)
Observations	8653	8653	7201	7934
R-squared	0.087	0.087	0.094	0.087

Notes: (1) All the control variables in Table 2 are included but not reported here. County dummies are also controlled.

(2) Standard errors in parentheses.

(3) *** denotes significance at the 1% level, ** at the 5% level, * at the 10% level.

Table 5.1: Use Percentage of nonfarm workers in villages as the proxy for marketization

Dependent variable: change in log consumption per capita				
	(1)	(2)	(3)	(4)
Natural disaster	–0.03	–0.03	–0.01	0.01
	(0.02)	(0.05)	(0.02)	(0.04)
Labor exchange	0.0003			
	(0.0005)			
Labor exchange*Natural disaster	0.001			
	(0.001)			
Labor exchange*Natural disaster*Percentage of nonfarm workers	–0.003*			
	(0.0018)			
Information exchange		0.004		
		(0.006)		
Information exchange*Natural disaster		0.001		
		(0.01)		
Information exchange*Natural disaster*Percentage of nonfarm workers		–0.002		
		(0.02)		
Participation			0.002***	
			(0.0008)	
Participation*Natural disaster			0.001	
			(0.002)	
Participation*Natural disaster*Percentage of nonfarm workers			–0.008**	
			(0.004)	
Trust				0.02***
				(0.007)
Trust*Natural disaster				–0.006
				(0.01)
Trust*Natural disaster*Percentage of non farm workers				–0.02
				(0.017)
Observations	8614	8614	7165	7899
R-squared	0.086	0.086	0.094	0.07

Notes: (1) All the control variables in Table 2 are included but not reported here. County dummies are also controlled.

(2) Standard errors in parentheses.

(3) *** denotes significance at the 1% level, ** at the 5% level, * at the 10% level.

Table 5.2: Percentage of outward migrants in villages as the proxy for marketization

Dependent variable: change in log consumption per capita				
	(1)	(2)	(3)	(4)
Natural disaster	–0.03*	–0.03	–0.007	0.008
	(0.018)	(0.04)	(0.02)	(0.04)
Labor exchange	0.0003			
	(0.0005)			
Labor exchange*Natural disaster	0.001			
	(0.0007)			
Labor exchange*Natural disaster*Percentage of outward migrants	–0.004*			
	(0.0024)			
Information exchange		0.004		
		(0.006)		
Information exchange*Natural disaster		0.006		
		(0.01)		
Information exchange*Natural disaster*Percentage of outward migrants		–0.03*		
		(0.016)		
Participation			0.002***	
			(0.0008)	
Participation*Natural disaster			–0.001	
			(0.001)	
Participation*Natural disaster*Percentage of outward migrants			–0.003	
			(0.006)	
Trust				0.017**
				(0.008)
Trust*Natural disaster				–0.004
				(0.01)
Trust*Natural disaster*Percentage of outward migrants				–0.04**
				(0.02)
Observations	8593	8593	7149	7879
R-squared	0.087	0.086	0.093	0.087

Notes: (1) All the control variables in Table 2 are included but not reported here. County dummies are also controlled.

(2) Standard errors in parentheses.

(3) *** denotes significance at the 1% level, ** at the 5% level, * at the 10% level.

APPENDIX

Table A.1: Whole Sample
Non-farm Ratio is used as a Proxy of Marketization

Dependent Variable: Change in Log Consumption per Capita				
	(1)	(2)	(3)	(4)
Nature Disaster	-0.021	-0.034	-0.009	0.021
	(0.018)	(0.048)	(0.016)	(0.037)
Labor Exchange	0.0004			
	(0.0004)			
Labor Exchange*Nature Disaster	0.001			
	(0.001)			
Labor Exchange*Nature Disaster*Percentage of Non-farm Workers	-0.0031*			
	(0.0018)			
Information Exchange		0.006		
		(0.006)		
Information Exchange*Nature Disaster		0.004		
		(0.011)		
Information Exchange*Nature Disaster*Percentage of Non-farm Workers		0.001		
		(0.018)		
Participation			0.002**	
			(0.0009)	
Participation*Nature Disaster			0.001	
			(0.002)	
Participation*Nature Disaster*Percentage of Non-farm Workers			-0.007*	
			(0.004)	
Trust				0.018**
				(0.008)
Trust*Nature Disaster				-0.008
				(0.013)
Trust*Nature Disaster*Percentage of Non-farm Workers				-0.022
				(0.017)
Credit Availability	**0.048****	**0.047****	**0.045***	**0.058*****
	(0.017)	**(0.017)**	**(0.019)**	**(0.018)**
Observation	8518	8518	7079	7810
Adj. R-squared	0.07	0.07	0.08	0.07

Notes: (1) All the control variables in Table 2 are included but not reported here. County dummies are also controlled.

(2) Standard errors in parentheses.

(3) *** denotes significance at the 1% level, ** at the 5% level, * at the 10% level.

Table A.2: Whole Sample
Migration Ratio is used as a Proxy of Marketization

Dependent Variable: Change in Log Consumption per Capita				
	(1)	(2)	(3)	(4)
Nature Disaster	-0.025	-0.03	-0.007	0.016
	(0.017)	(0.036)	(0.016)	(0.037)
Labor Exchange	0.0004			
	(0.0004)			
Labor Exchange*Nature Disaster	0.001			
	(0.001)			
Labor Exchange*Nature Disaster*Percentage of Out-Migrants	-0.004*			
	(0.002)			
Information Exchange		0.007		
		(0.006)		
Information Exchange*Nature Disaster		0.008		
		(0.01)		
Information Exchange*Nature Disaster*Percentage of Out-Migrants		-0.024		
		(0.016)		
Participation			0.002**	
			(0.0009)	
Participation*Nature Disaster			-0.001	
			(0.001)	
Participation*Nature Disaster*Percentage of Out-Migrants			-0.001	
			(0.006)	
Trust				0.017**
				(0.008)
Trust*Nature Disaster				-0.005
				(0.013)
Trust*Nature Disaster*Percentage of Out-Migrants				-0.034*
				(0.019)
Credit Availability	**0.048****	**0.047****	**0.045****	**0.058*****
	(0.017)	**(0.017)**	**(0.019)**	**(0.018)**
Observation	8497	8497	7063	7790
Adj. R-squared	0.07	0.07	0.08	0.07

Notes: The notes to Table A.1 apply.

Table A.3: Credit Availability is used as a Proxy of Formal Institution

Dependent Variable: Change in Log Consumption per Capita				
	(1)	(2)	(3)	(4)
Nature Disaster	-0.026	-0.033	-0.008	0.017
	(0.017)	(0.036)	(0.016)	(0.037)
Labor Exchange	0.0004			
	(0.001)			
Labor Exchange*Nature Disaster	0.0003			
	(0.001)			
Labor Exchange*Nature Disaster*Credit Availability	0.0004			
	(0.001)			
Information Exchange		0.006		
		(0.006)		
Information Exchange*Nature Disaster		0.004		
		(0.009)		
Information Exchange*Nature Disaster*Credit Availability		-0.003		
		(0.009)		
Participation			0.002*	
			(0.001)	
Participation*Nature Disaster			-0.001	
			(0.001)	
Participation*Nature Disaster*Credit Availability			0.003	
			(0.004)	
Trust				0.018*
				(0.008)
Trust*Nature Disaster				-0.013
				(0.012)
Trust*Nature Disaster*Credit Availability				-0.004
				(0.019)
Credit Availability	0.044*	0.051**	0.044*	0.067
	(0.020)	(0.022)	(0.020)	(0.056)
Observation	8557	8557	7115	7845
Adj. R-squared	0.07	0.07	0.08	0.07

Notes: The notes to Table A.1 apply.

Table A.4: Villages where less than 80% households suffered from nature disaster in 2002 Non-farm Ratio is used as a Proxy of Marketization

Dependent Variable: Change in Log Consumption per Capita				
	(1)	(2)	(3)	(4)
Nature Disaster	-0.018	0.052	0	0.04
	(0.024)	(0.075)	(0.021)	(0.052)
Labor Exchange	0.0004			
	(0.0004)			
Labor Exchange*Nature Disaster	0.003**			
	(0.001)			
Labor Exchange*Nature Disaster*Percentage of Non-farm Workers	-0.008*			
	(0.004)			
Information Exchange		0.007		
		(0.006)		
Information Exchange*Nature Disaster		-0.005		
		(0.016)		
Information Exchange*Nature Disaster*Percentage of Non-farm Workers		-0.047		
		(0.031)		
Participation			0.002	
			(0.001)	
Paticipation*Nature Disaster			0.003	
			(0.002)	
Paticipation*Nature Disaster*Percentage of Non-farm Workers			-0.01*	
			(0.005)	
Trust				0.020*
				(0.008)
Trust*Nature Disaster				0.002
				(0.019)
Trust*Nature Disaster*Percentage of Non-farm Workers				-0.052*
				(0.029)
Credit Availability	0.046**	0.046**	0.048**	0.050**
	(0.021)	(0.021)	(0.023)	(0.022)
Observation	6219	6219	5169	5701
Adj. R-squared	0.08	0.08	0.08	0.08

Notes: The notes to Table A.1 apply.

Table A.5: Villages where less than 80% households suffered from nature disaster in 2002 Migration Ratio is used as a Proxy of Marketization

Dependent Variable: Change in Log Consumption per Capita				
	(1)	(2)	(3)	(4)
Nature Disaster	-0.027	-0.032	0.004	0.029
	(0.023)	(0.051)	(0.022)	(0.052)
Labor Exchange	0.0002			
	(0.0004)			
Labor Exchange*Nature Disaster	0.003**			
	(0.001)			
Labor Exchange*Nature Disaster*Percentage of Out-Migrants	-0.007*			
	(0.004)			
Information Exchange		0.007		
		(0.006)		
Information Exchange*Nature Disaster		0.014		
		(0.014)		
Information Exchange*Nature Disaster*Percentage of Out-Migrants		-0.026		
		(0.026)		
Participation			0.002	
			(0.001)	
Participation*Nature Disaster			-0.001	
			(0.002)	
Participation*Nature Disaster*Percentage of Out-Migrants			0.003	
			(0.010)	
Trust				0.019*
				(0.008)
Trust*Nature Disaster				-0.002
				(0.018)
Trust*Nature Disaster*Percentage of Out-Migrants				-0.037
				(0.033)
Credit Availability	0.045**	0.044**	0.048**	0.049**
	(0.021)	(0.021)	(0.023)	(0.022)
Observation	6193	6193	5148	5677
Adj. R-squared	0.08	0.08	0.08	0.08

Notes: The notes to Table A.1 apply.

Table A.6: The top 20% richest villages excluded
Non-farm Ratio is used as a Proxy of Marketization

Dependent Variable: Change in Log Consumption per Capita				
	(1)	(2)	(3)	(4)
Nature Disaster	-0.038*	-0.032	-0.013	0.035
	(0.019)	(0.050)	(0.018)	(0.040)
Labor Exchange	-0.0003			
	(0.001)			
Labor Exchange*Nature Disaster	0.003*			
	(0.001)			
Labor Exchange*Nature Disaster*Percentage of Non-farm Workers	-0.003*			
	(0.0018)			
Information Exchange		0.003		
		(0.007)		
Information Exchange*Nature Disaster		0.005		
		(0.011)		
Information Exchange*Nature Disaster*Percentage of Non-farm Workers		-0.012		
		(0.019)		
Participation			0.002	
			(0.001)	
Participation*Nature Disaster			0.002	
			(0.002)	
Participation*Nature Disaster*Percentage of Non-farm Workers			-0.009	
			(0.006)	
Trust				0.022**
				(0.008)
Trust*Nature Disaster				-0.009
				(0.014)
Trust*Nature Disaster*Percentage of Non-farm Workers				-0.044**
				(0.018)
Credit Availability	0.040*	0.040*	0.04*	0.051**
	(0.018)	(0.018)	(0.020)	(0.019)
Observation	6219	6219	5169	5701
Adj. R-squared	0.08	0.08	0.08	0.08

Notes: The notes to Table A.1 apply.

Table A.7: The top 20% richest villages excluded
Migration Ratio is used as a Proxy of Marketization

Dependent Variable: Change in Log Consumption per Capita				
	(1)	(2)	(3)	(4)
Nature Disaster	-0.038*	-0.046	-0.011	0.037
	(0.019)	(0.038)	(0.018)	(0.040)
Labor Exchange	-0.0004			
	(0.001)			
Labor Exchange*Nature Disaster	0.002*			
	(0.001)			
Labor Exchange*Nature Disaster*Percentage of Out-Migrants	-0.005*			
	(0.002)			
Information Exchange		0.004		
		(0.007)		
Information Exchange*Nature Disaster		0.014		
		(0.010)		
Information Exchange*Nature Disaster*Percentage of Out-Migrants		-0.034*		
		(0.016)		
Participation			0.002	
			(0.001)	
Participation*Nature Disaster			0.001	
			(0.002)	
Participation*Nature Disaster*Percentage of Out-Migrants			-0.005	
			(0.007)	
Trust				0.022*
				(0.008)
Trust*Nature Disaster				-0.013
				(0.014)
Trust*Nature Disaster*Percentage of Out-Migrants				-0.036*
				(0.018)
Credit Availability	0.041*	0.042*	0.042*	0.052**
	(0.018)	(0.018)	(0.020)	(0.019)
Observation	6792	6792	5598	6210
Adj. R-squared	0.08	0.08	0.08	0.08

Notes: The notes to Table A.1 apply.