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# Social Capital and Rotating Labor Associations: Evidence from China

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**Abstract**

In this paper I study whether social capital has an effect on household decisions to participate in Rotating Labor Associations (ROLAs) in rural China. I find that households in communities with higher levels of social capital are more likely to participate in ROLAs using household data collected from the Gansu province in China. The presence of village temple prior to 1949 is employed as an instrument for social capital. Numerous falsification exercises are performed to evaluate the efficacy of the instrumental variables approach.

**Keywords:** Social capital, Trust, Rotating labor associations, Mutual help

[1] I thank Patrick Francois, Kathy Baylis, Loren Brandt, and John F. Helliwell for their invaluable comments. Remaining errors are mine.

## 1 Introduction

Rotating associations in rural areas, such as rotating savings and credit associations (ROSCAs), have been intensively explored (Besley *et al*., 1993; Anderson and Baland, 2002; Anderson *et al*., 2009). But similar mutual-aid organizations organized around labor, rotating labor associations (ROLAs), have not received much attention. ROLAs are not only well-known in sub-Saharan Africa (van den Brink and Chavas, 1997), but also widely found in Rural China, and seem to be occurring with increased frequency. However, their effects on agricultural production in the Chinese context remain unclear. In this paper, I aim to explore the conditions for villagers' participation in ROLAs, using field data collected from Gansu province in northwest China.

In ROLAs, usually four to five households who reside in the same village, voluntarily gather together frequently to work on sowing or harvesting in peak farming seasons, or in some cases villagers help each other in building or maintaining their houses. Villagers exchanging labor for labor is the most common case, but some villagers also exchange labor for the use of production animals or machines. No material payment is incurred in the process. During a typical farming season, they work on one member's land one day, and then move to another member's the other day. The sequence of receiving the "pot" is neither predetermined nor randomly chosen, instead, it is usually determined by the urgency of members' demands through their internal negotiation. Unlike saving money in a "pot" to purchase durable goods in ROSCAs, villagers in ROLAs generate a labor "pot" for production.

There are many potential advantages for members joining ROLAs. Firstly, all the members can finish their work earlier than by working alone. Agricultural tasks can be finished quickly since each villager only has around one third of an acre of farmland. Since finishing sowing and harvesting in time is important, all villagers are potentially better off by participating in ROLAs. Secondly, labor pooling enables specialization since there are a lot of different activities within the tasks of sowing or harvesting. Thirdly, labor pooling can allow some agricultural activities to be undertaken that could not be done alone. For example, transporting agricultural outputs from the land to home typically requires more than one person. This is especially important for the old and female labor. Fourthly, villagers sometimes have different skills that make cooperation more efficient than working alone. For example, some villagers have agricultural machine specific skills, while others do not.

In contemporary China, a large proportion of rural laborers are conducting nonfarm work in cities and towns, leaving labor shortages especially in rural peak farming seasons[2]. It seems intuitive that such labor shortage may have triggered demand for ROLAs, and that this explains their recent growth. But demand is not sufficient to ensure their existence since the voluntarily-organized associations rely on strong internal enforcement mechanisms to sustain themselves. This has been formally demonstrated by Anderson *et al.* (2009) who show that members in ROSCAs who receive the first money "pot" always have incentive to deviate from the arrangement, even in an infinitely repeated game, without extra enforcement mechanisms to ensure compliance. Without going into much details of that theoretical contribution, the main reason underlying Anderson et al.'s (2009) result is that the threat of future omission from a ROSCA is insufficient to act as a deterrent from absconding with the pot. The intuition for this result is that the first receiver is at least always able to replicate the best he/she can hope for in a ROSCA by saving on her own.

The upshot is that these organizations cannot be sustained without relying on some sort of extra means of enforcement. An analogous enforcement problem applies directly to members of ROLAs[3], though in these cases the enforcement problem will even be worse because unlike the caste of ROSCAs where monetary contributions are provided to a pot, with ROLAs there is also the difficulty of ascertaining whether labor contributions, which are not perfectly observable due to potential shirking, have in fact been correctly provided.

It thus seems reasonable to hypothesize that social capital, which generally refers to "trust, concern for one's associates, a willingness to live by the norms of one's community and to punish those who do not" (Bowles and Gintis, 2002), may be key in allowing the formation of ROLAs. The effects of social capital has been posited previously in many such cooperative settings: On voluntary cooperation in the management of irrigation systems (Ostrom, 1990, 1992; Kähkönen, 1999; Isham and Kähkönen, 2002a,b; Meinzen-Dick *et al*., 2002), in watershed management (Krishna and Uphoff, 2002), Soil Conservation (Cramb, 2005), and Solid Waste Management

[2] There are some villagers having seasonal nonfarm jobs and go back home to perform agricultural activities, but most of them do not go back due to the opportunity cost including travel expenses and the loss of nonfarm work earnings.

[3] If higher efficiency can be achieved from specialization when working together, the exclusion punishment will play a more important role in ROLAs than ROSCAs, since the expected cost of being excluded will be larger.

(Pargal *et al*., 2002). However, the endogeneity of social capital is generally not taken fully into account in much of this empirical work, as discussed in Durlauf and Fafchamps (2005).

In the present study, similarly to previous ones, OLS results do show that social capital is significantly correlated with villagers' participation in ROLAs. However, there are many reasons for not interpreting this relationship as causal. The first concern is reverse causality that may have originated from: more experience of mutual help in ROLAs leading to the accumulation of higher social capital, or villagers tending to report higher level of trust (which will be the main measure of social capital here) when they are active members of ROLAs. Secondly, there are likely to be measurement errors in aggregating and constructing the indicator of social capital. Lastly, and perhaps most importantly, there may also be omitted determinants of participation that are correlated with social capital. A contribution of this paper is the attempt to addresses the endogeneity of social capital by employing the historical presence of village temple as an instrumental variable, as explained below[4].

In the arid and semi-arid areas in China, rituals centered around requesting rain from the Gods were historically an important collective undertaking, especially in areas that were subject to frequent weather disasters (Yang *et al*., 2005; Chau, 2006; Zhao and Bell, 2007). Village temples were constructed in dedication to the Dragon King who was believed to control the rain, and other local deities who were thought to guard the villages, as collective acts to appease the Gods and stave off adverse weather shocks.[5] Therefore one conjecture here is that the building of such temples, the long-lasting process of maintaining such temples, and the continual coming together collectively to pray for the support of the Gods to stave off inclement weather, lead to the building of social capital in areas that suffered more frequent weather disasters. Another conjecture is that it may be other factors make social capital higher in such villages and therefore the temples are a historical reflection of this higher social capital.

Although the majority of village temples were destroyed in the Cultural Revolution, social capital laid down over such long intervals is likely to have

[4] Droughts are the most common weather disasters which have great impact on agricultural activities in the research areas, but there are also some villages close to the Yellow River which experienced floods.

[5] There are very few literatures on the economic consequences of village temples. Tsai (2001) is among the first discussing the role of temple institutions in public goods provision in rural China.

persisted through the intergenerational transmission of internal values and beliefs. Durante (2010) provide evidence that bad weather in the history led to the accumulation of social trust, through the channel of mutual insurance triggered by the need to cope with climatic risk in the context of Europe. The hypothesis of long-term persistence of social capital is a theme in much previous work, and has received strong support in other contexts. Putnam *et al*. (1993) conjecture that the significant differences in social capital between the North and South of Italy today can be traced back to the history of independence that cities in the North experienced in the Middle Age. Guiso *et al*. (2008b) present strong evidence supporting the conjecture. Moreover, they find that the past free-city-state experience can explain the variations in social capital within the Northern regions. Tabellini (2010) shows that the levels of education and the extent of democracy in the 18th century within Europe are determinants of current trust. Durante (2009) shows that the variation of social trust in contemporary Europe is driven by historical rather than recent variability of weather. Nunn and Wantchekon (2011) attribute high levels of mistrust in current day Africa to the past slave trade which resulted in an environment of insecurity and mistrust among individuals.

Studies also show that the persistence of social capital is mainly through internal values and beliefs. Nunn and Wantchekon (2011) show that the internal channel accounts for around 75% of the slave trade's total effect on trust. Guiso *et al*. (2004) find that individual's financial decisions are not only affected by the social capital in the province where the individual is currently living, but also by social capital in the province where the individual was born. Giuliano (2007) shows that living arrangements of second generation migrants to the United States between 1970 and 2000 are affected not only by economic conditions, but also by the changes in the country of origin over the same time period. Theoretical analysis also emphasize the importance of the internal channel in the intergenerational transmission of social capital (Francois and Zabojnik, 2005; Guiso *et al*., 2008a).

This paper proceeds by first establishing that the presence of village temple prior to 1949 does strongly contribute to social capital at the village level. By then using the temple presence as the instrument, I perform 2SLS estimation of the effect of social capital on villagers' participation in ROLAs. The advantage of using this historical information is that the impacts of omitted variables reflecting contemporary economic or social conditions can be greatly isolated. The results show that social capital has a strong positive and causal effect on villagers' participation in ROLAs. The coefficients on social capital using the instrumental variables approach are significantly larger than those obtained via ordinary least squares.

I then conduct various robustness checks to substantiate the results. Firstly, I investigate whether social capital has effect on villagers' participation in ROLAs by controlling for additional variables which could potentially link with both social capital and mutual help. I find that none of these overturn the results, and the coefficients of social capital almost remain the same as in the baseline model when including a number of other such variables. Secondly, I use the reported frequency of weather disasters as an alternative instrument to do the robustness check. Thirdly, to tests the exogeneity of instruments, I include both the presence of temple and the frequency of weather disasters as instruments for social capital to perform an overidentification test. The results show that the null hypothesis of is not rejected, which provide extra evidence of the validity of the instrumental variables approach.

This paper is organized as follows. Section 2.2 provides the descriptive statistics of the field data, and the method of constructing the indicator of social capital. Section 2.3 estimates the correlation between social capital and villagers' participation in ROLAs. Section 2.4 estimates the causal effect of social capital on villagers' participation in ROLAs using an instrumental variable approach. Section 2.5 performs various robustness checks to substantiate the main results. Section 2.6 draws conclusions.

## 2 Data and Descriptive Statistics

The field work is conducted in the three river basins in Gansu province in northwest China. The research area comprises an arid and semi-arid region. The perennial average rainfall ranges from 100 to 250 mm and annual average evaporation ranges from 1600 to 2,600 mm. Irrigation water is generally not sufficient for agricultural production in most areas, hence the agricultural harvest is highly weather-dependant. The province is one of the poorest provinces in China. The GDP per capita in 2007 is 9,527 CNY (Chinese Yuan, approximately 1,361 US Dollars using the exchange rate 7:1), which ranks it 29$^{th}$ of the 31 provincial-level administrative units in mainland China. In the survey, there are 690 households randomly taken from 275 communities. Three counties are randomly selected from each river basin from upstream to downstream areas along with Yellow River, Shiyang River, and Heihe River respectively. The number of observations taken from each county is roughly proportional to the total agricultural population.

Social capital is constructed from villagers' responses to the following five statements on trust: (1) Generally speaking, most villagers can be trusted; (2) I can trust my neighbors to look after our house when we are away; (3) I can trust my neighbors to take care of my children when we are away; (4) In the future, I will still lend farming tools to villagers even though they had experience of not returning me the tools; 5) Most villagers can expect others to help them when they are in really difficult situations, such as when they are very sick or their houses are burned down. There are five levels of responses to the statements, in which 1 to 5 stands for "strongly disagree" to "strongly agree" respectively.

This set of measures of trust have some advantages over more general trust questions that are generally asked in other surveys such as the World Values Surveys and the General Social Surveys. The trust question in these Surveys is: "Generally speaking, would you say that most people can be trusted or that you can't be too careful when dealing with people?" The first question in my survey is similar to this one. The potential shortcoming of this measure is that when a respondent is asked about trusting others, it is not specified what they trust them to do. This is why I included the four extra measures which specify trust in specific contexts. These specific trust contexts are also designed to describe situations that have salience with the lives of these largely agrarian individuals. Table 1 shows that those trust measures are significantly correlated. ***, **, and * indicates significance at the 1, 5, and 10% level respectively. This rule is applicable throughout the following chapters.

To reduce the dimension of trust measures which are highly correlated, I perform factor analysis to generate one comprehensive measure of individual trust. Table 2 reports the factor loadings and the eigenvalue of the first principal factor. The first principle factor is the only one used to represent social capital since only the first eigenvalue is greater than one.

I then show that it is the community trust instead of individual trust that is associated with households' participation in ROLAs, by performing simple inter-group tests after generating a factor of individual trust through factor analysis. I first show that there is no significant difference in individual trust between the group of villagers participating in ROLAs and not in ROLAs, in the villages with ROLAs. I then show that the group of villagers in the villages without ROLAs has significantly lower trust than the group of villagers in the villages with ROLAs. Detailed results on the inter-group comparisons are reported in Table 3 and Table 4. Table 5 reports the descriptive statistics of these trust measures and the induced social capital measure.

Table 6 summarizes the dependent variable and other independent variables. The dependent variable in my regressions is a dummy variable indicating whether a household joins a ROLA. About 20% of households are members of ROLAs in the survey. The set of variables directly linked with households' demand for mutual help include the dummy variable indicating whether the respondent conducted non-farm work, the proportion of household laborers conducting nonfarm work,[6] land per household laborer, total number of household laborers, and the number of farm machines and transport machines. Intuitively more nonfarm work and larger farmland per laborer induce higher demand for ROLAs, but more household laborers and more machines lead to lower demand. Villagers' labor contribution to the construction and maintenance of canals might have positive effect on villagers' participation in ROLAs, since villagers might be more willing to cooperate if they are able to cooperate on the construction and maintenance of canals.

Demographic and geographic variables are also controlled for in the cross-sectional regressions. Individual controls include information on household head, such as age, age squared divided by 100, years of education, a dummy for marital status, and a dummy indicating whether the respondent is a village leader. These controls are intended to pick up factors likely to affect villagers' incentive to participate in ROLAs. The elderly and the non-married are likely to have larger incentive to join ROLAs, and years of education and village leader dummy are potential proxies of personal income. Household controls include a dummy for whether owing telephones, the estimated value of houses, and the estimated value of durable goods and family assets. These controls are intended to measure households' long term income, which are potentially correlated with social capital and villagers' participation in ROLAs.

Geographic controls include the distance to the farthest neighbor and the nearest neighbor in the same community, and the distance to the nearest big road. The distances to neighbors are intended to link with villagers' mutual help by their effects

[6] A household laborer is defined as an individual who has worked in 2007.

on transaction costs. The hypothesis is that if villagers live far away from each other, they tend to cooperate less. The distance to the nearest big road which indicates the level of connection with outside market and job opportunities will potentially affect villagers' incentive to participation in ROLAs. County dummies indicate the county where respondents live. The county fixed effects are included to capture county-specific factors.

## 3 Social Capital and Participation in ROLAs: OLS Estimates

I begin the analysis by first testing the empirical relationship between social capital and villagers' participation in ROLAs. The regressions are for a latent variable model:

$$y_{ij}^{*} = \alpha + \beta S_i + L_{ij}'\gamma + X_{ij}'\delta + \varepsilon_{ij},$$
$$Y_{ij} = \begin{cases} 1 & if \;\; y_{ij}^{*} > 0, \\ 0 & if \;\; y_{ij}^{*} \le 0, \end{cases} \qquad (2.1)$$

where $i$ and $j$ denote the village and the individual, $Y_{ij}$ is a dummy indicating whether the household is a member of ROLAs, $S_i$ denotes social capital, $L_{ij}'$ is the vector of variables denoting the demand for ROLAs and villagers' labor contribution to the construction and maintenance of canals, $X_{ij}'$ is a vector of other covariates, and $\varepsilon_{ij}$ is the random error term. The coefficient of interest is the impact of social capital, $\beta$.

There are four columns in Table 7 reporting the OLS results. The first three models include different sets of control variables. Column (1) only considers individual controls and county dummies; column (2) includes individual controls, household controls and county dummies; column (3) includes geographic controls besides individual controls, household controls, and county dummies. Column (4) includes all the controls but restricts the sample by excluding communities with only one observation. Standard errors in all the models are clustered at the village level to account for the possible intra-village correlations of errors, and ***, **, and * indicates significance at the 1, 5, and 10% level respectively. This rule is applicable to all the tables reporting statistical significance in this thesis.

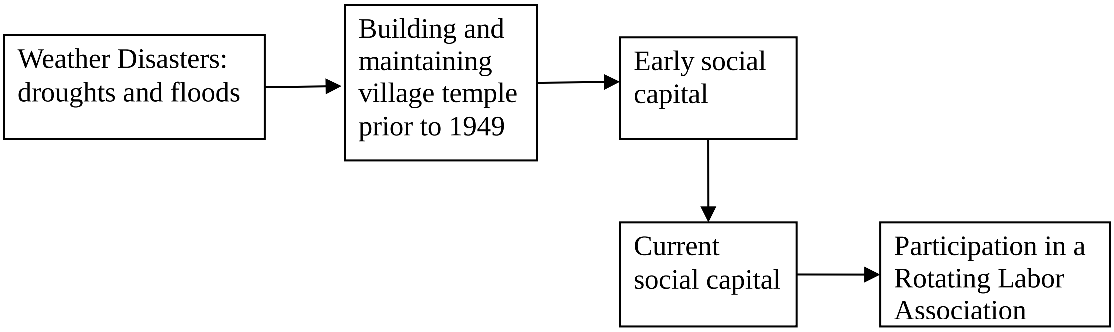
The results in Table 7 show that there is a strong correlation between the measure of social capital and households' participation in ROLAs. The coefficient of social capital is stable across models, ranging from 0.067 to 0.082. The adjusted R-squared ranges from 0.126 to 0.146 across different models, which implies that a significant proportion of variation in villagers' cooperation is associated with variation in the set of explanatory variables. All six variables indicating potential demand for ROLAs are not significant, which might imply that the potential demand for labor exchange does not always lead to the formation of ROLAs, due to social capital limitations, or that this demand is relatively homogeneous across the sample. Since the dependent variable is binary, I also perform probit regressions, with similar results reported in Table A1 in the appendix.

Table 7 demonstrates the strong correlation between social capital and villagers' participation in ROLAs, however, there are many important reasons for extreme caution in interpreting the relationship as causal. The first concern is reverse causality that may have originated from two sources: more experience of mutual help in ROLAs may lead to the accumulation of greater social capital, also villagers may tend to report higher levels of trust when they are active members of ROLAs. Secondly, there is likely to be measurement errors in aggregating and constructing the indicator of social capital. Lastly, there might be omitted determinants of participation that are correlated with social capital. To address these problems, instrumental variables, which have an impact on social capital but have no direct effect on voluntary labor exchange, can potentially be used. Section 4 proceeds to do this.

## 4 Social Capital and Participation in ROLAs: IV Results

### 4.1 Identification Strategy

The majority of households in the research area rely heavily on rainfall in irrigating their land. Weather disasters thus have great impact on livelihoods in such weather-dependant producing regions. Praying for rain historically became an important group ritual performed in areas with particularly severe and frequent weather disasters (Chau, 2006; Yang *et al*., 2005; Zhao and Bell, 2007).




Village temples, dedicated to the Dragon King, who was believed to control the rain, and other local deities who were thought to guard villages, are likely to have been built by villagers in regions where the need for such protection was seen as particularly pressing. The hypothesis here is that the building of such temples for the communal good, and the ongoing and long lived process of maintaining such temples and regularly coming together to hold rain-praying rituals, contributed to the accumulation of social capital in the areas subject to the most frequent weather disasters. Although the vast majority of village temples would have been destroyed in the 1960s, social capital is likely to continue to persist today through the intergenerational transmission of internal values and beliefs. The theory is described in the graph above.

The two equations below describe the relationship illustrated in the graph.

$$S_i = \alpha_R + \beta_R T_i + X'_{ij}\delta_R + v_{R_{ij}}, \qquad (2.2)$$

$$T_i = \alpha_T + \beta_T D_i + X'_{ij}\delta_T + v_{T_{ij}}, \qquad (2.3)$$

where $T_i$ is the dummy variable of historical existence of village temples, $D_i$ is the number of reported weather disasters in the past five years, $X'_{ij}$ is a vector of other covariates, and $v_{R_{ij}}$ and $v_{T_{ij}}$ are the random error terms.

I employ the instrument, a dummy variable indicating the existence of a village temple prior to 1949, to test the effect of social capital on participation. There are two advantages of using the historical existence of village temples. First, a lot of village temples were destroyed in the Cultural Revolution in 1960s, so those remaining today can not truly indicate the influence of contemporary weather disasters. Second, using the historical information can help to isolate the impacts of omitted variables reflecting contemporary economic or social conditions.

Table 8 reports regression results for the effects of the temple presence prior to 1949 on social capital. To save space, I only report the coefficients and standard errors of temple presence in the table. The OLS results show that temple presence have a strong positive impact on the level of social capital. Moreover, the coefficients of the temple presence prior to 1949 under the varying specifications are very stable.

### 4.2 IV Regressions

In this section I estimate the impact of social capital on villagers' voluntary participation in ROLAs by exploiting the historical existence of village temple as the instrumental variable, following equation (2.2). Specifically $T_i$ is defined as the presence of temple prior to 1949.

I perform the IV regressions mainly by using 2SLS. Angrist and Krueger (2001) and Wooldridge (2002) suggest that 2SLS is a robust estimation method even in the presence of a dichotomous dependent variable in the second stage, since strong specification assumptions are required to justify other nonlinear second-stage model specifications. In this case, the 2SLS typically capture an average effect of social capital analogous to the LATE parameter. To address the functional form issue, I employ a nonlinear regression method "IV-probit" which report conditional maximum-likelihood estimators to estimate the effect of social capital. The regressions reported in Table A2 in the appendix show similar qualitative results to those in 2SLS reported in Table 9.

Panel A shows the second-stage results of 2SLS regressions. The coefficients of social capital are stable across models, and all are significant at 5% confidence level except in the model (6). The results show that social capital has a significantly positive effect on villagers' participation in ROLAs. The coefficient of social capital in model (4), the baseline model, is 0.242, suggesting that the effect of social capital on villagers' participation is large. The point estimate indicates that a 1 percentage point increase in social capital increases the likelihood of participation by nearly 0.24 percentage points.

The coefficients and standard errors of the set of controls directly related with the demand for mutual help are also reported in panel A. The coefficients of the dummy indicating the respondent's non-farm employment, the percent of household laborers conducting nonfarm work, farm land per laborer, number of household laborers, as well as quantity of farm and transport machines are not significant in all the four models, suggesting that the demand for mutual help does not seem to play a significant role in determining villagers' participation.

Panel B shows the relationship between temple presence and social capital. I only report the coefficients and standard errors of weather disasters to save space. The coefficients on weather disasters in the different specifications are quite similar, and all of them are significant at 1% confidence levels. The results suggest that more weather disasters lead to higher levels of social capital, as consistent with the instrumenting hypothesis.

To show the strength of the instrumental variable, I report the partial R-squared of the instrument in the first stage regressions, and the Wald F statistic based on the Kleibergen and Paap (2006) rk statistic to test for weak identification in the presence of non i.i.d. residuals. Baum, Schaffer and Stillman (2007) suggest to apply the "rule of thumb" that the F statistic should be at least 10 for weak identification not to be considered as a problem (Staiger and Stock, 1997), since Stock and Yogo's (2005) critical values for the weak identification test are compiled for the case of i.i.d. residuals. The Kleibergen-Paap statistics in column (1) - (6) are 15.44, 12.70, 15.12, 12.75, 13.97, and 11.33 respectively. That no F statistic in the model is less 10 and the partial R-squared of the excluded instrument is relatively large together suggests that the weak instrument problem is not likely to be severe.

The coefficients of social capital using the instrument are larger than the coefficients using OLS, suggesting that reverse causality is not a major problem. To confirm this, and to account for the self-reporting problem, I construct a measure of social capital for each respondent which does not include his or her own reported trust. The 2SLS results using this measure of social capital reported in Table 10 show very similar results to those in the main regressions reported in Table 9, though the significance of social capital is slightly lower.

## 5 Robustness Checks

### 5.1 Additional Controls

The validity of the results in Table 9 depends on the assumption that temple presence has no direct effect on villagers' participation in ROLAs, or has no effect through channels other than social capital. Although this presumption appears reasonable, I proceed by substantiating it further by directly controlling for more variables that could plausibly be correlated with both villagers' participation and temple presence, and checking whether adding these variables affects the estimates. The summary statistics of these additional controls are reported in Table 11.

The first concern is that the historical temple presence might be correlated with the irrigation conditions such as the availability of alternative irrigation water, and alternative water resources which might influence villagers' voluntary cooperation. It is natural to suspect that villagers will be less likely to rely on village temples if there is enough irrigation water from reservoirs, rivers or wells. However, this is unlikely to be the case in the area of study. Shortages in irrigation water are still highly prevalent in the research area today. Although there has been improvement in irrigation facilities since the formation of P.R. China in 1949, the significantly increased demand for water from the industrial sector has marginalized irrigation water to the agricultural sector. Moreover, the increase in areas under croppage in rural areas, and the poor management of irrigation water have also contributed to sometimes acute shortages in irrigation water (Xu, 2001).

To formally account for the influence of the alternative water source, I add the dummy indicating whether the sub-lateral canal is concrete-lined[7], a dummy indicating whether the irrigation water is ground water, and village's distance to the water source when using ground water as additional control variables to the baseline model, i.e. model (4) in Table 9. Concrete-lined sub-lateral canals and smaller distance to the source of ground water are potentially linked with more alternative irrigation water. The results reported in column (1) of Table 12 show that none of these variables is statistically significant, and the coefficient of social capital is very close to the baseline estimate in model (4) of Table 9[8].

The second concern is that crop choice may be a function of perceived weather disasters and certain type of crops may require varying amounts of labor, so that the channel of effect of weather disasters and village temple on ROLA membership is through variation in crops, not social capital. If this were true, then we should observe large variations in crop choices amongst villagers. Moreover, there should also be differences in crop choices between groups in and not in ROLAs. However, the data shows that there is very little variation in villagers' crop choices. Corn and wheat are

[7] Almost all the main canals in the research areas are concrete-lined, but many sub-lateral canals are not.

[8] Only additional controls and social capital are reported in Table 12 to save space.

the two major crops in the research area, with 71.7% and 68.8% of households in the survey planting corn and wheat respectively. If we just restrict attention to households participating in ROLAs these numbers become 74.5% and 70.9% households planting corn and wheat. Though slightly higher than the sample averages, this is statistically indistinguishable at regular confidence levels, and seems much more supportive of the hypothesis that households both within and outside ROLAs grow equivalent crops. Moreover, I include dummy variables for corn, wheat, and cash crops as additional controls in column (2) of Table 12. The regression shows that all those variables are not statistically significant and have little impact on the coefficient of social capital.

There are some demographic variables such as the number of kids and the elderly aged 65+ in the household, which could also affect villagers' potential demand for mutual help. I add those variables in column (3) of Table 12. These variables are statistically insignificant, and the coefficient of social capital is very close to the baseline estimate. This implies that these variables have little impact on the basic results. I include all these additional controls together in column (4) and (5), in which column (5) reports the regression with restricted sample.

Despite the large number of controls, the coefficients of social capital are still significant at 5% confidence level (except in model (5)) and very close to that in the baseline model in Table 9. Overall, Table 12 shows that none of these additional controls overturn the effect of social capital. The results provide support for the assumptions underlying the instrument, i.e., the historical presence of village temple is not likely to have an effect on villagers' participation in ROLAs through these other posited channels.

### 5.2 An Alternative Instrumental Variable

According to this identification strategy proposed, historical weather disasters can be used as an alternative instrument for social capital. I then test the robustness of results using weather disasters in this section. Due to the non-availability of historical data on village-level weather disasters, I use current information on weather disasters over the past five years to obtain an estimate of the underlying propensity to be subject to such shocks. This adds noise to the measurement of shock propensity but not any clear biases since there have been no remarkable changes in climate in the research areas in recorded history (Lin and Lu, 2004; Wang *et al.*, 2009; Yang, 2005). I thus proceed to measure the frequency of weather disasters by the total number of major weather disasters including droughts and floods experienced in the past five years as reported by respondents and averaged up to the community level.

Table 13 reports the results of 2SLS regressions. The historical existence of village temple has a strong positive contribution to social capital today. The Kleibergen-Paap F statistics in all the modes are greater than 10, suggesting that there is no weak instrument problem. The coefficients of social capital in all models are significant at 1% confidence levels, but slightly larger than that in Table 9.

### 5.3 An Overidentification Test

To test the exogeneity of instruments, I include both the presence of temple and the frequency of weather disasters as instruments for social capital in this section to perform an overidentification test. Table 14 present the results. The Hansen J statistic and p-value indicate that the models are not over-identified. Though this test is supportive of the procedure used here, it should be noted that this method is not foolproof; such overidentification tests might not lead to a rejection even when all instrumental variables are not valid, provided they are highly correlated with each other.

## 6 Concluding Remarks

Macro country level studies presenting evidence of large and significant causal effects of social capital on development outcomes are increasingly common in the development literature; see for example Algan and Cahuc (2010) and Tabellini (2010) for persuasive recent studies. The present paper studies one channel through which such social capital might be having an effect at the micro level, by focusing on household decisions to participate in Rotating Labor Associations. Such associations have been seen to play a major role in rural daily life but, as with all such informal rotating associations, have been theoretically conjectured to depend critically on social connectedness in their establishment and functioning. By using novel instruments to elicit exogenous sources of variation in social capital, and by using household data collected from the Gansu province in China, I present evidence that social capital makes a strong positive contribution to villagers' participation in ROLAs. This finding survives numerous robustness checks, suggesting that such communal level associations may be an important channel through which social capital affects development outcomes.

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Table 1: Correlation Matrix of Community Trust

| | General trust | Trust neighbors to look after house | Trust neighbors to take care of children | Will lend farming tools to villagers | Most villagers can expect others to help them in really difficult situations |
|---|---|---|---|---|---|
| General trust | 1.000 | | | | |
| Trust neighbors to look after house | 0.371***<br>(0.000) | 1.000 | | | |
| Trust neighbors to take care of children | 0.388***<br>(0.000) | 0.830***<br>(0.000) | 1.000 | | |
| Will lend farming tools to villagers | 0.281***<br>(0.000) | 0.186***<br>(0.000) | 0.261***<br>(0.000) | 1.000 | |
| Most villagers can expect others to help them in really difficult situations | 0.441***<br>(0.000) | 0.334***<br>(0.000) | 0. 407***<br>(0.000) | 0.245***<br>(0.000) | 1.000 |

Table 2: Factor Loadings

| Community Trust | Factor1 |
|---|---|
| General trust | 0.532 |
| Trust neighbors to look after house | 0.824 |
| Trust neighbors to take care of children | 0.865 |
| Will lend farming tools to villagers | 0.333 |
| Most villagers can expect others to help them in really difficult situations | 0.518 |
| Eigenvalue | 2.088 |

Table 3: Comparison of Trust between Two Groups

| Group | Obs. | Mean | Std. Err. | Std. Dev. | 95% Confidence Interval | |
|---|---|---|---|---|---|---|
| 0 | 70 | 0.316 | 0.087 | 0.729 | 0.142 | 0.490 |
| 1 | 141 | 0.244 | 0.079 | 0.933 | 0.089 | 0.400 |
| Combined | 211 | 0.268 | 0.060 | 0.870 | 0.150 | 0.386 |
| Diff | | 0.0713 | 0.117 | | -0.160 | 0.303 |
| diff = mean(0) - mean(1) | t = 0.607 | | | | | |
| Ho: diff = 0 | | | Satterthwaite's degrees of freedom = 171.143 | | | |
| Ha: diff < 0 | | | Ha: diff != 0 | Ha: diff > 0 | | |
| Pr(T < t) = 0.728 | | | Pr(T > t) = 0.545 | Pr(T > t) = 0.272 | | |

*Notes*: Group 0 is comprised of villagers participating in ROLAs in the villages with ROLAs. Group 1 is comprised of villagers not participating in ROLAs in the villages with ROLAs.

Table 4: Comparison of Trust between Two Groups

| Group | Obs. | Mean | Std. Err. | Std. Dev. | 95% Confidence Interval | |
|---|---|---|---|---|---|---|
| 0 | 479 | -0.118 | 0.041 | 0.894 | -0.198 | -0.038 |
| 1 | 211 | 0.268 | 0.060 | 0.870 | 0.150 | 0.386 |
| Combined | 690 | 0.000 | 0.034 | 0.904 | -0.068 | 0.068 |
| Diff | | -0.386 | 0.073 | | -0.529 | -0.244 |
| diff = mean(0) - mean(1) | | t = -5.328 | | | | |
| Ho: diff = 0 | | Satterthwaite’s degrees of freedom = 411.88 | | | | |
| Ha: diff < 0 | | Ha: diff != 0 | | Ha: diff > 0 | | |
| Pr(T < t) = 0.000 | | Pr(T > t) = 0.000 | | Pr(T > t) = 1.000 | | |

*Notes*: Group 0 is comprised of villagers in the villages without ROLAs. Group 1 is comprised of villagers in the villages with ROLAs.

Table 5: Descriptive Statistics of Community Trust

| Variable | Obs | Mean | Std. Dev. | Min | Max |
|---|---|---|---|---|---|
| General trust | 275 | 4.052 | 0.542 | 2 | 5 |
| Trust neighbors to look after house | 275 | 3.732 | 0.728 | 1.75 | 5 |
| Trust neighbors to take care of children | 275 | 3.830 | 0.743 | 1.75 | 5 |
| Will lend farming tools to villagers | 275 | 3.334 | 0.795 | 1 | 5 |
| Most villagers can expect others to help them when in really difficult situations | 275 | 4.119 | 0.613 | 1 | 5 |
| Social capital | 275 | 0.067 | 0.964 | -2.674 | 2.101 |

Table 6: Descriptive Statistics of Variables

| Variable | Obs | Mean | Std. Dev. | Min | Max |
|---|---|---|---|---|---|
| ROLA's membership | 690 | 0.204 | 0.404 | 0 | 1 |
| Dummy indicating respondent's non-farm employment | 690 | 0.372 | 0.484 | 0 | 1 |
| Percent of household laborers conducting non-farm work | 676 | 0.347 | 0.307 | 0 | 1 |
| Land per household laborer | 690 | 3.564 | 2.845 | 0 | 23 |
| Labor contribution to the maintenance of canals | 682 | 0.922 | 2.267 | 0 | 16.667 |
| Number of household laborers | 690 | 2.891 | 1.114 | 1 | 7 |
| Number of farm machines | 690 | 0.271 | 0.573 | 0 | 4 |
| Number of transport machines | 690 | 0.816 | 0.562 | 0 | 3 |
| Age | 690 | 47.913 | 10.456 | 25 | 84 |
| Age squared/100 | 690 | 24.048 | 10.610 | 6.25 | 70.56 |
| Years of education | 690 | 6.862 | 3.451 | 0 | 15 |
| Married | 690 | 0.968 | 0.176 | 0 | 1 |
| Village leader | 690 | 0.110 | 0.313 | 0 | 1 |
| Telephones | 690 | 0.871 | 0.335 | 0 | 1 |
| Estimated value of houses | 678 | 3.513 | 3.569 | 0 | 20 |
| Estimated value of durable goods and family assets | 690 | 0.881 | 1.323 | 0.002 | 21.36 |
| The distance to the farthest neighbor | 690 | 0.859 | 1.004 | 0.001 | 6 |
| The distance to the nearest neighbor | 690 | 0.017 | 0.096 | 0 | 1.5 |
| The distance to the nearest big road | 690 | 1.207 | 2.409 | 0 | 15 |

*Notes*: The unit of land per household laborer is *mu* (a unit of land area generally used in China, 1 *mu* is approximately equal to 0.165 acre). The unit of labor contribution to maintenance of canals is hours/member. The unit of estimated value of houses and estimated value of durable goods and family assets is 10,000 CNY. The unit of distance to the farthest neighbor, nearest neighbor, and the nearest big road is kilometer.

Table 7: Determinants of Villagers' Participation in ROLAs

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| | Dependent Variable: Participation in a ROLA | | | |
| Social capital | 0.082*** | 0.078*** | 0.074*** | 0.067*** |
| | (0.021) | (0.021) | (0.021) | (0.023) |
| Dummy indicating respondent's | 0.030 | 0.024 | 0.023 | 0.001 |
| non-farm employment | (0.041) | (0.040) | (0.040) | (0.042) |
| Percent of household laborers | 0.028 | 0.029 | 0.034 | 0.036 |
| conducting non-farm work | (0.067) | (0.066) | (0.067) | (0.071) |
| Land area per laborer | 0.004 | 0.003 | 0.002 | 0.001 |
| | (0.007) | (0.007) | (0.007) | (0.008) |
| Number of household laborers | 0.000 | -0.001 | -0.003 | -0.003 |
| | (0.017) | (0.017) | (0.017) | (0.018) |
| Number of farm machines | 0.048 | 0.047 | 0.047 | 0.053 |
| | (0.041) | (0.041) | (0.041) | (0.042) |
| Number of transport machines | -0.010 | -0.009 | -0.007 | 0.007 |
| | (0.029) | (0.028) | (0.028) | (0.030) |
| Labor contribution to maintenance | 0.018* | 0.016 | 0.016 | 0.016 |
| of canals | (0.010) | (0.010) | (0.011) | (0.011) |
| Individual controls | Yes | Yes | Yes | Yes |
| Household controls | No | Yes | Yes | Yes |
| Geographic controls | No | No | Yes | Yes |
| County dummies | Yes | Yes | Yes | Yes |
| Restricted sample | No | No | No | Yes |
| Number of obs. | 668 | 656 | 656 | 581 |
| Number of clusters | 272 | 270 | 270 | 195 |
| Adjusted R-squared | 0.126 | 0.130 | 0.141 | 0.146 |

Table 8: Temple Presence Prior to 1949 and Social capital

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| | Dependent Variable: Social Capital | | | |
| Temple presence prior to 1949 | 0.423*** | 0.416*** | 0.415*** | 0.430*** |
| | (0.116) | (0.117) | (0.116) | (0.128) |
| Individual controls | Yes | Yes | Yes | Yes |
| Household controls | No | Yes | Yes | Yes |
| Geographic controls | No | No | Yes | Yes |
| County dummies | Yes | Yes | Yes | Yes |
| Restricted sample | No | No | No | Yes |
| Number of obs. | 668 | 656 | 656 | 581 |
| Number of clusters | 272 | 270 | 270 | 195 |
| Adjusted R-squared | 0.129 | 0.134 | 0.140 | 0.146 |

Table 9: IV Regressions of Participation in ROLAs

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| Panel A | Dependent Variable: Participation in a ROLA | | | | | |
| Social capital | 0.306*** | 0.243** | 0.287*** | 0.242** | 0.272** | 0.217* |
| | (0.108) | (0.116) | (0.108) | (0.115) | (0.110) | (0.119) |
| Dummy indicating respondent's non-farm work | -0.012 | -0.014 | -0.014 | -0.015 | -0.046 | -0.038 |
| | (0.055) | (0.050) | (0.054) | (0.050) | (0.058) | (0.054) |
| Percent of household laborers conducting non-farm work | 0.037 | 0.038 | 0.043 | 0.044 | 0.046 | 0.035 |
| | (0.077) | (0.070) | (0.076) | (0.071) | (0.082) | (0.075) |
| Land area per laborer | -0.000 | 0.006 | -0.002 | 0.004 | -0.003 | 0.002 |
| | (0.008) | (0.008) | (0.008) | (0.008) | (0.008) | (0.008) |
| Number of household laborers | 0.017* | 0.014 | 0.013 | 0.014 | 0.010 | 0.012 |
| | (0.010) | (0.010) | (0.011) | (0.011) | (0.012) | (0.012) |
| Number of farm machines | 0.011 | 0.003 | 0.008 | 0.002 | 0.003 | -0.001 |
| | (0.018) | (0.017) | (0.019) | (0.018) | (0.019) | (0.018) |
| Number of transport machines | 0.026 | 0.025 | 0.030 | 0.023 | 0.035 | 0.030 |
| | (0.045) | (0.045) | (0.045) | (0.045) | (0.046) | (0.046) |
| Labor contribution to maintenance of canals | -0.039 | -0.011 | -0.035 | -0.009 | -0.024 | 0.003 |
| | (0.035) | (0.031) | (0.033) | (0.031) | (0.037) | (0.033) |
| Panel B | Dependent Variable: Social Capital | | | | | |
| Temple presence prior to 1949 | 0.455*** | 0.416*** | 0.442*** | 0.415*** | 0.463*** | 0.430*** |
| | (0.116) | (0.117) | (0.114) | (0.116) | (0.124) | (0.128) |
| Individual controls | Yes | Yes | Yes | Yes | Yes | Yes |
| Household controls | Yes | Yes | Yes | Yes | Yes | Yes |
| Geographic controls | No | No | Yes | Yes | Yes | Yes |
| County dummies | No | Yes | No | Yes | No | Yes |
| Restricted sample | No | No | No | No | Yes | Yes |
| Number of obs. | 656 | 656 | 656 | 656 | 581 | 581 |
| Number of clusters | 270 | 270 | 270 | 270 | 195 | 195 |
| Partial R-squared of the excluded instrument | 0.056 | 0.047 | 0.054 | 0.047 | 0.061 | 0.052 |
| Kleibergen-Paap Wald rk F statistic | 15.44*** | 12.70*** | 15.12*** | 12.75*** | 13.97*** | 11.33*** |

Table 10: Determinants of Villagers' Participation in ROLAs

| | (1) | (2) | (3) |
|---|---|---|---|
| Panel A | Dependent Variable: Participation in a ROLA | | |
| Social capital (excluding personal trust) | 0.271** | 0.252* | 0.253* |
| | (0.138) | (0.138) | (0.138) |
| Dummy indicating respondent's non-farm employment | -0.014 | -0.013 | -0.016 |
| | (0.055) | (0.052) | (0.052) |
| Percent of household laborers conducting non-farm work | 0.064 | 0.062 | 0.071 |
| | (0.080) | (0.078) | (0.080) |
| Land area per laborer | 0.003 | 0.003 | 0.001 |
| | (0.009) | (0.009) | (0.009) |
| Number of household laborers | 0.002 | 0.003 | 0.002 |
| | (0.020) | (0.019) | (0.019) |
| Number of farm machines | 0.042 | 0.046 | 0.045 |
| | (0.044) | (0.045) | (0.044) |
| Number of transport machines | 0.012 | 0.008 | 0.008 |
| | (0.035) | (0.035) | (0.034) |
| Labor contribution to maintenance of canals | 0.016 | 0.015 | 0.013 |
| | (0.011) | (0.011) | (0.012) |
| Panel B | Dependent Variable: Social Capital | | |
| The presence of temple prior to 1949 | 0.383*** | 0.377*** | 0.368*** |
| | (0.102) | (0.103) | (0.102) |
| Individual controls | Yes | Yes | Yes |
| Household controls | No | Yes | Yes |
| Geographic controls | No | No | Yes |
| County dummies | Yes | Yes | Yes |
| Number of obs. | 591 | 581 | 581 |
| Number of clusters | 195 | 195 | 195 |
| Partial R-squared of the excluded instrument | 0.036 | 0.035 | 0.034 |
| Kleibergen-Paap Wald rk F statistic | 13.99*** | 13.51*** | 12.94*** |

Table 11: Summary Statistics of Additional Controls

| Variable | Obs | Mean | Std. Dev. | Min | Max |
|---|---|---|---|---|---|
| Number of kids aged 0 to 6 | 690 | 0.326 | 0.587 | 0 | 3 |
| Number of kids aged 7 to 14 | 690 | 0.430 | 0.657 | 0 | 3 |
| Number of the elderly (65+) | 690 | 0.307 | 0.596 | 0 | 2 |
| Dummy for wheat | 690 | 0.688 | 0.463 | 0 | 1 |
| Dummy for corn | 690 | 0.717 | 0.451 | 0 | 1 |
| Dummy for cash crops | 690 | 0.667 | 0.472 | 0 | 1 |
| Dummy for concrete-lined canal | 275 | 0.298 | 0.458 | 0 | 1 |
| Dummy for underground water | 687 | 0.141 | 0.348 | 0 | 1 |
| Distance to the ground water source | 274 | 0.341 | 0.423 | 0 | 1.85 |
| Awareness of the existence of WUAs | 690 | 0.312 | 0.463 | 0 | 1 |
| Ratio of surface water | 690 | 0.671 | 0.415 | 0 | 1 |

*Note*: The unit of distance to the ground water source is kilometer.

Table 12: Robustness Checks: Inclusion of Additional Controls

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| Panel A | Dependent Variable: Participation in a ROLA | | | | |
| Social capital | 0.251** | 0.249** | 0.248** | 0.265** | 0.225* |
| | (0.117) | (0.113) | (0.117) | (0.120) | (0.124) |
| Dummy for concrete-lined canal | 0.023 | | | 0.023 | 0.024 |
| | (0.053) | | | (0.054) | (0.059) |
| Dummy for underground water | -0.007 | | | -0.027 | 0.019 |
| | (0.081) | | | (0.087) | (0.083) |
| Distance to the source of ground water | -0.133 | | | -0.130 | -0.132 |
| | (0.091) | | | (0.099) | (0.111) |
| Dummy for wheat | | -0.006 | | -0.005 | 0.047 |
| | | (0.044) | | (0.047) | (0.048) |
| Dummy for corn | | 0.055 | | 0.004 | 0.038 |
| | | (0.052) | | (0.057) | (0.058) |
| Dummy for cash crops | | 0.063 | | 0.047 | 0.046 |
| | | (0.042) | | (0.043) | (0.042) |
| Number of kids aged 0 to 6 | | | 0.027 | 0.026 | 0.025 |
| | | | (0.028) | (0.029) | (0.031) |
| Number of kids aged 7 to 14 | | | -0.033 | -0.034 | -0.026 |
| | | | (0.025) | (0.025) | (0.026) |
| Number of the elderly (65+) | | | -0.009 | -0.012 | -0.000 |
| | | | (0.031) | (0.030) | (0.031) |
| Panel B | Dependent Variable: Social Capital | | | | |
| The presence of temple prior to 1949 | 0.410*** | 0.426*** | 0.410*** | 0.409*** | 0.428** |
| | (0.118) | (0.113) | (0.116) | (0.116) | (0.128) |
| Number of obs. | 653 | 656 | 656 | 653 | 578 |
| Number of clusters | 269 | 270 | 270 | 269 | 194 |
| Partial R-squared of the excluded instrument | 0.045 | 0.048 | 0.046 | 0.044 | 0.048 |
| Kleibergen-Paap Wald rk F statistic | 12.09*** | 14.33*** | 12.41*** | 12.49*** | 11.19** |

Table 13: IV Regressions: Weather Disasters as An Instrument

| | (1) | (2) | (3) |
|---|---|---|---|
| Panel A | Dependent Variable: Participation in a ROLA | | |
| Social capital | 0.396*** | 0.414*** | 0.323** |
| | (0.144) | (0.145) | (0.144) |
| Dummy indicating respondent's non-farm employment | -0.032 | -0.039 | -0.023 |
| | (0.069) | (0.069) | (0.062) |
| Percent of household laborers conducting non-farm work | 0.046 | 0.047 | 0.046 |
| | (0.087) | (0.088) | (0.080) |
| Land area per laborer | -0.001 | -0.001 | -0.002 |
| | (0.008) | (0.009) | (0.008) |
| Number of household laborers | 0.010 | 0.012 | 0.009 |
| | (0.020) | (0.021) | (0.019) |
| Number of farm machines | 0.022 | 0.019 | 0.027 |
| | (0.046) | (0.047) | (0.045) |
| Number of transport machines | -0.045 | -0.045 | -0.037 |
| | (0.039) | (0.040) | (0.036) |
| Labor contribution to maintenance of canals | 0.016 | 0.015 | 0.012 |
| | (0.011) | (0.011) | (0.011) |
| Panel B | Dependent Variable: Social Capital | | |
| Weather disasters | 0.093*** | 0.094*** | 0.088*** |
| | (0.025) | (0.025) | (0.027) |
| Individual controls | Yes | Yes | Yes |
| Household controls | No | Yes | Yes |
| Geographic controls | No | No | Yes |
| Number of observations | 675 | 663 | 663 |
| Number of clusters | 274 | 272 | 272 |
| Partial R-squared of the excluded instrument | 0.044 | 0.045 | 0.032 |
| Kleibergen-Paap Wald rk F statistic | 13.76*** | 13.94*** | 10.77*** |

Table 14: An Overidentification Test

| | (1) | (2) | (3) |
|---|---|---|---|
| Panel A | Dependent Variable: Participation in a ROLA | | |
| Social capital | 0.218*** | 0.202*** | 0.200** |
| | (0.091) | (0.092) | (0.094) |
| Panel B | Dependent Variable: Social Capital | | |
| The temple presence prior to 1949 | 0.432*** | 0.425*** | 0.423*** |
| | (0.117) | (0.118) | (0.117) |
| Weather disasters | 0.077** | 0.076** | 0.068** |
| | (0.034) | (0.025) | (0.034) |
| Individual controls | Yes | Yes | Yes |
| Household controls | No | Yes | Yes |
| Geographic controls | No | No | Yes |
| County dummies | Yes | Yes | Yes |
| Number of observations | 668 | 656 | 656 |
| Number of clusters | 272 | 270 | 270 |
| Partial R-squared of the excluded instrument | 0.065 | 0.063 | 0.060 |
| Kleibergen-Paap Wald rk F statistic | 7.85*** | 7.69*** | 7.33*** |
| Hansen J statistic and p-value | 0.572 | 0.457 | 0.659 |
| | (0.450) | (0.450) | (0.417) |

Table A1: Determinants of Villagers' Participation in ROLAs (Probit Models)

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| | Dependent Variable: Participation in a ROLA | | | |
| Social capital | 0.437*** | 0.420*** | 0.412*** | 0.399*** |
| | (0.107) | (0.108) | (0.104) | (0.121) |
| Dummy indicating respondent's non-farm employment | 0.133 | 0.103 | 0.110 | 0.032 |
| | (0.160) | (0.157) | (0.160) | (0.171) |
| Percent of household laborers conducting non-farm work | 0.104 | 0.114 | 0.119 | 0.109 |
| | (0.260) | (0.269) | (0.276) | (0.291) |
| Land area per laborer | 0.016 | 0.012 | 0.008 | 0.009 |
| | (0.027) | (0.027) | (0.027) | (0.028) |
| Labor contribution to maintenance of canals | 0.067** | 0.059** | 0.059** | 0.056* |
| | (0.028) | (0.027) | (0.030) | (0.031) |
| Number of household laborers | 0.021 | 0.010 | 0.000 | 0.006 |
| | (0.067) | (0.067) | (0.069) | (0.073) |
| Number of farm machines | 0.192 | 0.185 | 0.188 | 0.230* |
| | (0.133) | (0.137) | (0.134) | (0.135) |
| Number of transport machines | -0.044 | -0.019 | -0.004 | 0.072 |
| | (0.122) | (0.124) | (0.126) | (0.141) |
| Individual controls | Yes | Yes | Yes | Yes |
| Household controls | No | Yes | Yes | Yes |
| Geographic controls | No | No | Yes | Yes |
| County dummies | Yes | Yes | Yes | Yes |
| Restricted sample | No | No | No | Yes |
| Number of obs. | 668 | 656 | 656 | 581 |
| Number of clusters | 272 | 270 | 270 | 195 |
| Pseudo R-squared | 0.163 | 0.175 | 0.187 | 0.199 |

Table A2: Determinants of Villagers' Participation in ROLAs (IV-Probit Models)

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| Panel A | Dependent Variable: Participation in a ROLA | | | |
| Social capital | 1.101*** | 1.069*** | 1.072*** | 1.048*** |
| | (0.166) | (0.188) | (0.186) | (0.225) |
| Dummy indicating respondent's non-farm employment | -0.076 | -0.080 | -0.076 | -0.157 |
| | (0.172) | (0.170) | (0.171) | (0.187) |
| Percent of household laborers conducting non-farm work | 0.132 | 0.139 | 0.144 | 0.093 |
| | (0.237) | (0.245) | (0.250) | (0.270) |
| Land area per laborer | 0.021 | 0.020 | 0.019 | 0.013 |
| | (0.024) | (0.025) | (0.025) | (0.026) |
| Number of household laborers | 0.025 | 0.021 | 0.018 | 0.012 |
| | (0.059) | (0.059) | (0.061) | (0.065) |
| Number of farm machines | 0.049 | 0.048 | 0.045 | 0.078 |
| | (0.134) | (0.141) | (0.139) | (0.157) |
| Number of transport machines | -0.041 | -0.025 | -0.013 | 0.030 |
| | (0.111) | (0.114) | (0.114) | (0.131) |
| Labor contribution to maintenance of canals | 0.037 | 0.036 | 0.035 | 0.026 |
| | (0.029) | (0.028) | (0.030) | (0.034) |
| Panel B | Dependent variable: social capital | | | |
| The presence of temple prior to 1949 | 0.423*** | 0. 416*** | 0.415*** | 0.430*** |
| | (0.114) | (0.115) | (0.114) | (0.125) |
| Individual controls | Yes | Yes | Yes | Yes |
| Household controls | No | Yes | Yes | Yes |
| Geographic controls | No | Yes | Yes | Yes |
| Restricted sample | No | No | No | Yes |
| Number of obs. | 668 | 656 | 656 | 581 |
| Number of clusters | 272 | 270 | 270 | 195 |

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