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The Relationship between Social Capital and Health in China

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Abstract
This paper uses the 2005 and 2006 China General Social Survey (CGSS) to study the relationship between social capital and health in China. It is the most comprehensive analysis of this subject to date, both in the sizes of the samples it analyses, in the number of social capital variables it investigates, and in its treatment of endogeneity. The authors identify social trust, social relationships, and social networks as important determinants of self-reported health. The magnitude of the estimated effects are economically important, in some cases being of the same size or larger than the effects associated with age and income. Their findings suggest that there is scope for social capital to be a significant policy tool for improving health outcomes in China.

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Keywords Social capital; trust; self-reported health; China; ordered probit regression; heteroskedastic ordered probit regression; interaction effects; endogeneity

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I. INTRODUCTION

This study reports the results of an analysis of social capital and health in China. It is the most comprehensive analysis of this subject to date, both in sample size[1], in the number of social capital variables it investigates[2], and in its treatment of endogeneity. The relationship between social capital and health has been extensively studied in both the economics and public health literatures (e.g., Kawachi et al., 2008; Kawachi et al., 2013). A consistent finding in this literature is that social capital – measured in an assortment of ways – is positively and significantly associated with various health outcomes. Most studies have focused on western countries. Relatively few have focused on developing countries, and only a very few have focused on China (Yip et al., 2007; Wang et al., 2009; Meng and Chen, 2014).

The study of social capital and health in China is important for a number of reasons. China contains almost one-fifth of the world's population. China also recently became the world's largest economy. Therefore, any systematic study of social capital and health that neglects China omits a significant portion of the health experiences of the world's population. A second reason relates to an observation by Kawachi (2006, page 989) that the evidence suggests that social capital matters "less for the health of residents in comparatively egalitarian societies in contrast to highly unequal societies with inadequate safety nets." China's inequality is roughly approximate to that of the US and the Russian Federation (OECD, 2013). Thus, China also bears study because it provides another look at the relationship between social capital and health for a country with a substantial degree of inequality and a poorly developed safety net.

[1] Yip et al. (2007), Wang et al. (2009), and Meng and Chen (2014) analyze approximately 1200, 9600, and 10,400 observations, respectively. Only the Meng and Chen study is nationally representative. Our study analyzes over 18,000 observations.

[2] Yip et al. (2007)'s social capital variables consist of organizational membership and trust. Wang et al. (2009) focuses on trust and mistrust. And Meng and Chen (2014) study trust, social participation, and Chinese Communist Party membership. Our social capital variables consist of social trust, social relationships, social participation, and social networks. We also include Communist Party membership but do not classify it is a social capital variable because it confounds a number of factors.

Following previous research on China, we use self-reported health (SRH) as our measure of health status.[3] Our analysis produces the following empirical findings about social capital and self-reported heath in China.

- *Social Trust* has a large and statistically significant effect on SRH in both urban and rural samples.
- *Social Relationship* has a large and statistically significant effect on SRH for rural respondents, but is statistically insignificant for urban respondents after correcting for endogeneity.
- *Social Network* has a moderately large and significant effect on SRH for rural respondents, but is statistically insignificant in the urban sample after correcting for endogeneity.
- *Social Participation* is statistically insignificant in both urban and rural samples.
- While women report significantly poorer health than men, the relationship between social capital and health is unaffected by gender.

Our findings on trust and social participation are consistent with previous research on China, though previous studies do not allow a comparison of the magnitude of the estimated effects.[4] Our findings on social relationships and social networks are new to the literature.

Our empirical analysis progresses through a number of stages. We begin by using an ordered probit procedure to accommodate the fact that the SRH variables are multiple response, Likert items. As has been noted elsewhere (Williams 2010), heteroskedasticity can produce biased coefficient estimates in nonlinear models like ordered probit. To investigate this possibility, we adopt a generalization of the ordered probit model that incorporates heteroskedastity -- heteroskedastic ordered probit (*HO-Probit*).

While *HO-Probit* is appropriate for the data, it is difficult to interpret the magnitudes of the estimated effects. Therefore, the next stage of our analysis recodes the SRH variables as binary, positive/negative health outcomes. This allows us to calculate marginal effects for

[3] Yip et al. (2007), Wang et al., (2009), and Meng and Chen (2014) all use self-reported measures of health.
[4] Yip et al. (2007), Wang et al. (2009) and Meng and Chen (2014) all report that trust is positively associated with SRH. Meng and Chen (2014) also find that social participation is not significantly related to SRH.

our key variables so that we can gauge their respective magnitudes. Further analysis allows us to conclude (i) that marginal effects are largely unaffected by heteroskedasticity, and (ii) that a linear probability model (*LPM*) produces marginal effects very close to the probit estimates. As a result, in the last stage of our analysis, we adopt the *LPM* framework and use 2SLS to address endogeneity.

The paper proceeds as follows. Section II discusses the data source, variables, and estimation methods used in our analysis. Section III presents and discusses our main results on social capital and health. Section IV provides further analysis examining the influence of gender on the social capital – health relationship. Section V summarizes our results.

II. AN OVERVIEW OF PREVIOUS RESEARCH ON SOCIAL CAPITAL AND HEALTH

Social capital (SC) is a multi-disciplinary concept. It was first proposed by Boudieu (1986) and further popularized by Coleman (1990) and Putnam (1993). Despite some disagreements on how it should be defined, SC is commonly understood to encompass a combination of norms, trust and social support that facilitates coordination and cooperation of individuals in a community (Putnam, 1995; d'Hombres et al., 2011; Goryakin et al, 2013). SC can be categorized into cognitive and structural components (Harpham et al., 2002); or bonding, bridging and linking components (Szreter and Woolcock, 2004). Cognitive SC includes ethics, value systems, and religious beliefs; while structural SC refers primarily to social structures, such as the density of social relationships and networks. Bonding SC refers to the horizontal relationships between members of a network who share similar socio-demographic characteristics. Bridging SC refers to the relationships that exist between heterogeneous people. Linking SC reflects the relationships between groups at different hierarchical levels.

Although a large literature documents a positive relationship between SC and health in general, the evidence on specific types of SC is mixed. Three types of SC have received the most attention in the empirical literature: social trust, social network and social participation.

The relationship between health and social trust has been examined in numerous countries, including the US (Subramanian et al., 2002; Kim and Kawachi, 2006; Folland, 2007, 2008; Schultz et al., 2008), Europe (Poortinga, 2006; Rostila, 2007; Rocco, 2014), the United Kingdom (Petrou and Kupek, 2008; Snelgove et al., 2009; Borgonovi, 2010), Sweden (Hyyppa et al., 2003; Giordano and Lindstrom, 2011), and the Former Soviet Union countries (D'Hombres et al., 2010; Habibov and Afandi, 2011; Goryakin et al., 2013). Most studies find a positive association between social trust and health.[5]

The evidence with regard to health and social network, and health and social participation, is less one-sided. Olsen and Dahl (2007), Schultz et al. (2008), and Carpiano and Fitterer (2014) report a positive association between health and social network. In contrast, Giordano and Lindstrom (2010) and Hurtado et al. (2011) find that the relationship is statistically insignificant. With respect to social participation, Miller et al. (2006), Petrou and Kupek (2008), Sirven and Debrand (2008, 2012), Borgonovi (2010), Berry and Welsh (2010), Hurtado et al. (2011), and Yamamura (2011) find evidence of a positive association with health. D'Hombres et al. (2010) and Snelgrove et al. (2009) are examples of studies that do not.

Three major studies have addressed SC and health in China. Yip et al. (2007) study the relationship between SC and health in rural China. They create two SC variables. Structual SC is measured by organizational membership. Cognitive SC is an index variable formed from measures of trust, reciprocity and mutual help. They find that cognitive SC is positively associated with health, while structural SC is not statistically significant. Wang et al. (2009) also focus on rural China. They focus on trust, and draw a distinction between trust and

[5] Two exceptions are Kennelly et al. (2003) and Veenstra (2005).

mistrust. They find that both are significantly associated with health. Meng and Chen (2014) study a number of SC variables in both rural and urban China, including trust and social participation. They find that trust is positively related to health in both rural and urban China, but social participation is insignificant. None of these studies address endogeneity.

II. DATA SOURCE, VARIABLES, AND METHODS

IIA. Data Source

We use data from the 2005 and 2006 China General Social Surveys (CGSSs). The CGSS is the oldest and one of the most comprehensive national social surveys of China (Chinese General Social Survey Project at National Survey Research Center of Renmin University of China, 2009). It is administered jointly by Renmin University and Hong Kong University of Science and Technology. Cycle I of the CGSS was administered in 2003, 2004, 2005, 2006 and 2008. The 2005 and 2006 surveys used a four-stage, stratified random sampling strategy. The primary sampling units (PSUs) consisted of 125 county-level units from across the country. The secondary sampling units (SSUs) consisted of 4 township-level units randomly sampled from each PSU. The tertiary sampling units (TSUs) drew two neighbourhood-level units from each SSU. Finally, ten households were randomly selected from each TSUs and a face-to-face survey was administered to one of the adult household members.

The 2005 and 2006 surveys are unique in that they asked questions related to various dimensions of SC. The surveys further elicited information on health status, individual characteristics (e.g., education, age, marital status, socio-economic status, income), and a variety of behaviours and activities. These two surveys are the only nationally representative surveys of China that address issues of SC and health.

A challenge to anybody working with the CGSS is to obtain geographical location data on respondents. This is particularly important in the SC literature, because the SC infrastructure at the community-level is believed to be correlated with individual SC responses.

Community-level SC variables have often been used as instrumental variables.[6] We are fortunate to have been able to obtain geographical location data for the 2005 and 2006 CGSS respondents and to merge these with the publically available survey data. Among other things, this will enable us to implement instrumental variable procedures.

IIB. Variables

Dependent Variables. We use self-reported health (SRH) status to measure individual health outcomes. SRH is widely used in the SC literature.[7] Respondents in the 2005 CGSS were asked: "In general, how would you assess your health last month?" The six possible answers were: Very Bad(=1), Bad(=2), Fair(=3), Good(=4), Very Good(=5), and Excellent(=6). In the 2006 CGSS, respondents were asked: "In general, how satisfied are you with your personal health?" There were four possible answers: Very Dissatisfied (=1), Not Satisfied(=2), Satisfied(=3), and Very Satisfied(=4).

Social Capital Variables. The 2005 and 2006 CGSSs include a variety of questions that we combine into four separate variables: (i) social trust (*ST*), (ii) social relationships (*SR*), (iii) social participation (*SP*), and (iv) social networks (*SN*). The first three measures are constructed from questions from the 2005 CGSS. The last measure comes from the 2006 CGSS. Some of the questions were asked differently depending on whether the respondent lived in an urban or rural area. Each of these variables is described in more detail below.

Three of our measures (*ST*, *SP*, and *SN*) consist of an index created by summing responses across a variety of questions. Cronbach's α was used to check the reliability of the variables used to construct each of the SC indices. The α values were 0.675 for the *ST*-related questions, 0.755 for the *SP*-related questions, and 0.817 for the *SN*-related questions. While

[6] See Appendix B and the corresponding discussion in the text.
[7] Meng and Chen (2014, p.39) note: "SRH [Self-reported health] is a powerful and independent predictor of disability and mortality (Fayers and Sprangers, 2002; Idler and Benyamini, 1997). SRH is also one of the most frequently used health indicators in the studies on the relationship between social capital and health (Kawachi et al., 2004).

there are no formal standards for acceptable values of α, these values are consistent with previous research on SC (e.g., Yip et al., 2007; Schulz et al., 2008; Hurtado et al., 2011). All four SC variables were standardized so that the units of measurement were standard deviation units.[8] This was done to facilitate an assessment of their economic importance.

The social trust (*ST*) index measures an individual's assessment of the trustworthiness of others. Respondents were asked the following question: “In your ordinary social interactions, how many of the following kinds of people can be trusted?” Thirteen kinds of people were listed: close neighbours, neighbours, village residents with a different family name, village residents with the same family name, relatives, colleagues, ordinary friends, classmates, fellow townsmen in outside places, strangers, people taking part in leisure activities, people taking part in religious activities, and people taking part in social or public welfare activities. It is noted that "village residents with different family name" and "village residents with the same family name" were not applicable for urban respondents. The five response options were: The Vast Majority Cannot Be Trusted(=1), Most Cannot Be Trusted(=2), Half Can Be Trusted(=3), Most Can Be Trusted(=4) and The Vast Majority Can Be Trusted(=5). We treated the option “Not Applicable” as a missing value. An index was formed by summing the numerical values of the individual responses across the different people types.

The social relationships (*SR*) measure was constructed from a single question. Respondents were asked: “How close is your relationship with your relatives and friends?" There were five possible responses: Very Distant(=1), Not Close(=2), Fair(=3), Close(=4), and Very Close(=5). The numerical value of the response was taken as a measure of the quality/quantity of the respondent’s social relationships.

[8] See Schulze et al. (2008) for an example of a study that uses an identical procedure to calculate social capital variables.

The social participation (*SP*) index measures the frequency with which respondents participated in organized activities during their spare time. Seven different questions asked respondents to rate the frequency of their participation across different group activities. These ranged from sports/gym groups; recreation groups; alumni/fellow villagers (townsmen) professional associations; religious groups; educational groups for children; educational groups for the respondent; and public service organizations. Each question allowed five responses: Never(=1), Several Times a Year(=2), Once a Month(=3), Once a Week(=4), and Many Times a Week(=5). The index was formed by summing individual values across the seven questions.

The social networks (*SN*) index was constructed from questions about the different kinds of people the respondent interacted with in their work. In view of the urban–rural dual structure in China, the survey lists different types of people for urban and rural respondents. For example, urban respondents were asked how often they interacted with leaders and colleagues in the course of their work. Rural residents were asked how often they interacted with village or township cadres, and how often they interacted with other village people. The four response options for each type of people were: Never(=1), Seldom(=2), Sometimes(=3), and Often(=4). Individual responses were summed across the different questions.

<u>Control variables</u>. Our empirical specification specifies a wide range of control variables. These include age (continuous); gender (female=1, male=0); race (Han=1, other=0); whether the respondent is a member of the Chinese Communist Party (CPC) (CPC member=1, otherwise=0); the natural log of per capita, household income (consisting of wages, operating revenues, awards, allowances, bonuses, and gifts); the family's socioeconomic status (low, middle, high); marital status (unmarried, married, divorced and widowed); educational achievement (no formal education, primary, secondary, university or above); and county-level measures of per capital, household income and income inequality.

Descriptive Statistics. The description above foreshadows the fact that our analysis uses four separate samples: urban and rural respondents from the 2005 CGSS, and urban and rural respondents from the 2006 CGSS. The necessity for dividing the samples into urban and rural derives from the fact that some of the SC-related questions are different depending on whether the respondent lived in an urban or rural area. Further, the 2005 and 2006 surveys differed in the categories of SC they addressed in their questions. The 2005 CGSS included questions on social trust, social relationships, and social participation; while the 2006 survey included questions about social networks, with a focus on work. Moreover, the two surveys used different questions when asking respondents to assess their health.

FIGURE 1 pools urban and rural respondents to present histograms of the responses to the respective SRH questions.[9] The histograms illustrate that the 2005 and 2006 SRH questions allowed multiple responses. Our analysis will adopt empirical procedures that can accommodate the nature of these data.

TABLE 1A and 1B presents means for all of the variables by respondents' SRH values. For example, amongst all the respondents in the 2005 CGSS survey who reported a "1" for SRH ("Health very bad"), the average value of the *ST* variable was -0.56. For those reporting an SRH value of "2" ("Health bad"), the average *ST* value was -0.18. The average *ST* value rises consistently as respondents more favourably assess their health. This positive association between SRH and social capital is evident for all four of the SC variables.

The respective control variables also evidence the kinds of association one would expect. SRH is declining in age. It is increasing in income. It is increasing in socio-economic and educational status. Further, some types of marital status also appear to be associated with SRH (e.g. unmarried). Of course, these pairwise associations do not control for the influence

[9] The data and Stata .do files used to produce the figures and tables in this paper are available from the authors upon request.

of the other variables. The next section discusses the empirical methods we use to identify the independent associations between social capital and SRH.[10]

IIC. Methods

The SRH variable in the 2005 (2006) CGSS allows for six (four) responses in increasing order of good health. The multi-level nature of the SRH variable calls for nonlinear procedures to estimate the relationship between SC and health. One complication of using nonlinear models is that it introduces potential problems caused by heteroskedasticity.

Unlike linear models, heteroskedasticity in nonlinear models can cause inconsistent estimation of model coefficients if it is not properly accommodated. As a result, analyses of nonlinear models should investigate whether the associated estimates are affected by the presence of heteroskedasticity.

Let y_i be the observed SRH value for the i^{th} respondent, $y_i = 1,2,3, \ldots, J$, $i = 1,2, \ldots, N$; and J is either 6 or 4 depending on whether we are modelling the 2005 or 2006 CGSS. Given the discrete nature of y_i, we assume there is a latent continuous variable, $y_i^* = \boldsymbol{x_i \beta} + \sigma\varepsilon_i$, where $\boldsymbol{x_i}$ is a row vector consisting of a constant term and K characteristics associated with respondent i, $\boldsymbol{\beta}$ is a $K+1$ column vector of coefficients, ε_i is an error term. Homoskedasticity is reflected in the fact that σ is not subscripted by i. The error term is commonly assumed to be distributed according to either the logistic or standard normal distributions.

The relationship between the observed SRH value, y_i, and its unobserved, latent value, y_i^*, is given by the following.

$$
\text{1)} \qquad
\begin{array}{lll}
y_i = 1 & \text{if} & -\infty < y_i^*/\sigma < \kappa_1/\sigma \\
y_i = 2 & \text{if} & \kappa_1/\sigma < y_i^*/\sigma < \kappa_2/\sigma \\
y_i = 3 & \text{if} & \kappa_2/\sigma < y_i^*/\sigma < \kappa_3/\sigma \\
\quad \ldots & & \\
y_i = J & \text{if} & \kappa_3/\sigma < y_i^*/\sigma < +\infty
\end{array}
$$

[10] Descriptive statistics for each of the four samples used in our analysis are reported in Appendix A.

where the κ_j/σ are the "cutpoints" that cause the observed value of the respondent's SRH to change in discrete units.

The model above is known as the "ordered logistic/probit regression model". Note that it is unable to identify the coefficients β_k, $k = 0,1,\ldots,K$. It is only able to estimate the standardized coefficients and cutpoints, $\tilde{\beta}_k = \beta_k/\sigma$ and $\tilde{\kappa}_j = \kappa_j/\sigma$, This is not necessarily a problem when the error terms are homoskedastic. Statistical inference is still valid, and the standardized parameters can be consistently estimated. Define

2) $$p_{ij} = Prob(y_i = j) = Prob(\tilde{\kappa}_{j-1} < y_i{}^*/\sigma < \tilde{\kappa}_j)$$

where $j = 1,2,3,\ldots,J$, and $\tilde{\kappa}_0$ and $\tilde{\kappa}_J$ are defined as $-\infty$ and $+\infty$ respectively. Estimation of $\tilde{\beta}_k$ and $\tilde{\kappa}_j$ is achieved by maximizing the associated log likelihood function,

3) $$lnL = \sum_{i=1}^{N}\sum_{j=1}^{J} I_j(y_i) \cdot ln(p_{ij})$$

where $I_j(y_i) = \begin{cases} 1 & if\ y_i = j \\ 0 & otherwise \end{cases}$.

Heteroskedasticity occurs when $\sigma_i \neq \sigma$ for all respondents *i*. In this case, the coefficients β_k/σ_i are no longer constant parameters, but vary across observations. This causes the model to be misspecified, with attendant problems for estimation and inference (Hoetker, 2007).

The "heteroskedastic ordered logistic/probit regression model" specifies the individual-specific scale parameters as

4) $$\sigma_i = \sigma \cdot exp(\textstyle\sum_{k=1}^{K} x_{ik}\gamma_k).$$ [11]

[11] More generally, the variables in the mean and variance components of the likelihood function may be the same, have overlap, or be mutually exclusive.

Maximization of the corresponding log likelihood function with respect to the parameters $\tilde{\beta}_k$, $\tilde{\kappa}_j$, and γ_j produces consistent estimates of the respective parameters if the heteroskedasticity is correctly specified (Williams, 2010).[12]

A widely used approach to test for heteroskedasticity is to test whether the $\tilde{\boldsymbol{\beta}}$ are constant across the different levels of response, j. The assumption of constant $\tilde{\boldsymbol{\beta}}$ values is known by a number of names: the "proportional odds" assumption (Wolfe and Gould, 1998), the "parallel regressions" assumption (Long and Freese, 2006), and the "parallel lines" assumption (Norusis, 2005). Our analysis employs the user-written, Stata program *gologit2* (Williams, 2006) to test the parallel lines assumption. In every case, we found evidence of heteroskedasticity. Accordingly, the subsequent analysis reports the results of estimating the social capital/health relationship using the heteroskedasticity ordered probit regression model (*HO-Probit*).[13]

III. MAIN RESULTS

IIIA. ESTIMATED RELATIONSHIPS BETWEEN SOCIAL CAPITAL AND HEALTH

TABLE 2 reports the results from estimating the ordered probit (*O-Probit*) and heteroskedastic ordered probit (*HO-Probit*) regression models for each of the four samples (2005 Urban, 2005 Rural, 2006 Urban, and 2006 Rural). Standard errors, here and subsequently, are robust estimates allowing for clustering at the county level. The results generally, but not entirely, corroborate the pairwise results reported in TABLE 1.

Beginning with the control variables, we see that the coefficients for *Age* and *Female* are negative and significant across all four samples and both estimation procedures. The

[12] Note that the ordered logistic regression model arises as a special case of the heteroskedastic ordered logistic regression model when the γ_j are all zero.
[13] Estimation was undertaken using the user-written, Stata procedure *oglm* (Williams, 2010). Similar results were obtained using logistic procedures and are available from the authors upon request.

coefficient for Communist Party (*CPC*) membership is negative and significant for the urban samples, but insignificant in the rural samples. Income (*Log Family PC Income*) is generally positively and significantly related to SRH, but not in the 2005 urban sample. Han ethnicity is generally insignificant, except in the 2005 rural sample, where it is significant and negative.

As multiple variables are each associated with measures of socio-economic (*SES*), marital, and educational status, one must refer to the joint hypothesis tests at the bottom of the table. The positive coefficients for *Middle SES* and *High SES* (the omitted category is *Low SES*), along with the low *p*-values associated with the corresponding joint hypothesis indicate that socio-economic status is a positive and significant determinant of SRH. On the other hand, we generally fail to reject the null hypothesis that the marital status variables are jointly equal to zero. The results on education are mixed. There is some evidence from the joint hypothesis tests that education is linked to SRH, especially in the rural samples, though the individual education variables are rarely significant.

The final two control variables are *Log County PC Income* and *County Gini*. The results for these variables are also mixed. County-level per capita income is only significant at the 5% level in the 2005 urban sample. Income inequality is negatively associated with SRH at the 10%, but only in the 2006 samples.

Turning to the SC variables, we find that three of the four variables are positively and significantly associated with SRH: social trust, (*ST*) social relationships (*SR*), and social networks (*SN*). The coefficient estimates for social participation (*SP*) are always statistically insignificant.

While the preceding analysis establishes that there is a strong statistical correlation between SRH and some of the SC variables, the ordered probit regression coefficients do not lend themselves to easy interpretation. This is due to both (i) the nonlinear nature of the model, and (ii) the multiple-response nature of the dependent variable. To get a sense of the economic significance of these variables, we respecified the dependent variables to be binary variables. For the 2005 SRH measure, the responses Good, Very Good, and Excellent were recoded as "1"; and the responses Very Bad, Bad, and Fair were recoded as "0". For the 2006 measure, the responses Satisfied and Very Satisfied were recoded as "1"; and Not Satisfied and Very Dissatisfied were coded as "0". Accordingly, a value of "1" in the recoded SRH variables can be interpreted as an indicator of "good health", with "0" being an indicator of "bad health." Approximately 61 percent of respondents reported being in "good health" in the 2005 sample. The corresponding number for the 2006 sample was 78 percent.

We then re-estimated the heteroskedastic ordered probit models (*HO-Probit*) models, using the same specifications as in TABLE 2, with the only change being substitution of the recoded SRH variables. Average marginal effects were then calculated for each of the (standardized) SC variables. These are reported in TABLE 3 under the *HetProbit* column headings. The adjoining columns report estimates from a linear probability model (*LPM*). These will be discussed further below.

The coefficients for the SC variables represent the estimated effect on the probability of a respondent reporting "good health" associated with a one-standard deviation increase in the respective variable. For example, using the 2005 urban sample, a one-standard deviation unit increase in *ST* is associated with a 4.5 percentage point increase in the probability that a respondent reports that he/she is in good health. Ignoring the *SP* variable, which is statistically insignificant at the 5% level, we see that all of the estimates for the other SC variables indicate that a one-standard deviation unit increase is associated with an increase of approximately 2 to 4 percentage points in the probability that the respondent reports good health.

To give a sense of the importance of social capital relative to other determinants of SRH, we also report the average marginal effects for *Age*, *Log Family PC Income*, and *Female*. Across the different samples, the results indicate that a ten-year increase in age is associated with a decrease of approximately 6 to 10 percentage points in the probability that a respondent evaluates their health as good. A doubling of a respondent's per capita family income is estimated to increase the probability of self-reporting good health anywhere from 0 to 3.6 percentage points.[14] And being female lowers SRH between 2 and 8 percentage points. Seen in this context, the effects associated with social capital (excluding social participation) are generally of the same order of magnitude as those associated with age, income, and gender. However, these estimates are merely indicative, because we have not yet addressed endogeneity.

The estimates from the linear probability models (*LPM*) allow a comparison to the average marginal effects from the heteroskedastic probit models. It is clear that there is little difference between the two. This is convenient, because it provides confidence that marginal effect estimates in the next section are robust to the more restrictive assumptions of the OLS/2SLS model.

IIIB. ENDOGENEITY

While our estimates indicate that we have uncovered some significant associations, we must be careful not to interpret these results as implying causality. Most studies that estimate the relationship between SC and health ignore causality. More recent studies have attempted to address this problem.

Appendix B reviews instrumental variables (IVs) that have been used in the SC literature, along with a brief description of the effect of correcting for endogeneity. Some of the variables that have been used in the literature to instrument SC variables are:

- Community-level averages of SC variables (d'Hombres et al., 2010; Goryakin et al., 2013; Fiorillo and Sabatini, 2015)
- Attendance at religious services (Schultz et al., 2008; Habibov and Weaver, 2014; Fiorillo and Sabatini, 2015)
- Neighbors look out for each other (Howley, 2015)

[14] A unit increase in logged variables represents increase by a multiple of 2.72. To obtain an estimate of the effect of doubling income, multiply the respective coefficients by 2/2.72.

- Availability of public transportation (Ronconi et al., 2012)

Two observations are noteworthy from Appendix B. First, a common IV is to take the average value of the respective SC variable at the "community" level. Second, correcting for endogeneity generally results in larger coefficient estimates.

This latter result is surprising, as one might expect simultaneity to have the opposite effect. Greater health allows respondents to engage more in social activities and relationships, inducing a positive bias. Correcting for this type of simultaneity bias should produce smaller, not larger estimates. Most studies do not offer an explanation for their discrepant results.

An exception is Yamamura (2011). He found that respondents who were unemployed were more likely to participate in neighborhood community activities. He attributed this to (i) lower opportunity costs in building SC, and (ii) a greater incentive to invest in informal SC since unemployment cut them off from other relationships/networks that could promote healthy outcomes. This produces a negative endogeneity bias in the SC-health relationship because workers with poor health are more likely to be unemployed. A related explanation is that people with relatively poor health have an increased incentive to maintain social networks. For example, visits from family/friends would be relatively more important because these can provide health as well as social benefits.[15]

With Appendix B as context, we explored the 2005 and 2006 CGSS datasets for possible instrumental variables. Community-level averages of the respective SC variables was one obvious choice.[16] But this only allowed our systems to be "just identified." Accordingly, we searched for other potential IVs. TABLE 4 reports the IVs that we used in the subsequent analysis.

[15] We thank Peter Howley for suggesting this explanation.

[16] To calculate community-level averages, we averaged over all respondents residing in the same county. The median number of respondents per county was 80 and 65 in the urban and rural samples of the 2005 CGSS; and 68 and 60 in the 2006 CGSS, respectively.

We looked for variables that were likely to be correlated with the SC variables, and uncorrelated with health outcomes. Characteristics of the respondent's community or environment made especially good candidates. For example, *Phone_CountyMean* gives the average number of phones per household in the respondent's county. The availability of telephones where a respondent lives lowers the cost of interacting with others, allowing more frequent contact, and creating more and better opportunities to develop trust relationships.

It is difficult *a priori* to determine whether this variable is correlated with an individual's health status. It is possible that it could be. Counties with more telephones may be wealthier counties with more health facilities. Even though we control for per capita county income, it is possible that this variable could pick up other features of the county's economic development not controlled for by the income variable. On the other hand, we need not worry about an individual's health status affecting the number of telephones in the county. As a result, we determined that this variable has the potential to be an appropriate IV. Ultimately, it is an empirical question. The subsequent analysis examines the appropriateness of the respective IVs through a large variety of diagnostic checks.

TABLES 5A and 5B report the 2SLS estimates for the 2005 and 2006 CGSS datasets. For each sample we report three columns of estimates. The first column is the LPM estimates from TABLE 3. These are reproduced to facilitate comparison with the 2SLS estimates. The "Just-Identified" 2SLS estimates use the county-averaged SC variables as IVs. The "Over-Identified" 2SLS estimates use the additional IVs described in TABLE 4.

The recent literature on IVs emphasizes the importance of diagnostic testing to confirm their validity. Five sets of diagnostic measures are reported in TABLES 5A and 5B: (i) First-stage tests of significance of the excluded instruments; (ii) First-stage tests for underidentification; (iii) First-stage tests for weak instruments; (iv) Hansen's *J*-test for instrument exogeneity, and (v) a test for endogeneity of the SC variables;. Unless otherwise noted, tests are robust to clustering in the error variance-covariance matrix. We briefly describe these before proceeding to the estimates.[17]

The first-stage tests of significance of the excluded instruments is the familiar *F*-test associated with the joint hypothesis that all the excluded instruments have zero coefficients in the respective first stage regression. It is common to assume that an *F* value greater than 10 is sufficient to establish the relevance of the instrumental variables. However, this overlays two issues. The first is identification. For example, two instruments that are highly correlated may produce a large *F* statistic, but they are practically indistinguishable from one instrument. In this case the equation is effectively underidentified. The second issue is bias in coefficient and standard error estimates due to the instruments being insufficiently correlated with the endogenous variable(s).

We evaluate the first issue using the *Angrist-Pischke (A-P)* χ^2 and *Kleibergen-Paap (K-P) rk LM* tests. Both tests have a null hypothesis that the instrumented equation is underidentified. Rejection of the null indicates that the respective equation(s) are identified. We evaluate the second issue using the *Angrist-Pischke* and *Kleibergen-Paap rk F* tests. The corresponding *F*-values are compared to Stock and Yogo's (2005) critical *F*-values to determine the maximum bias in the coefficient and standard error estimates. Values greater than the respective critical values indicate that the associated biases are less than the corresponding maximal values, assuming that the equations are correctly specified. Note that critical values do not exist for all estimation scenarios, and that those that do exist assume that the error terms are iid.

[17] These tests were calculated using the user-written Stata program *ivreg210*. They are described in greater detail in Baum et al. (2015).

The next test is the familiar Hansen's *J*-test for overidentifying restrictions. The null hypothesis here is that the excluded instruments are correctly excluded from the main equation. Failure to reject is consistent with the instruments being orthogonal to the error term.

The preceding diagnostics are designed to determine if the IVs satisfy the twin properties of instrument relevance and instrument exogeneity. In contrast, the last test is designed to test whether the suspected endogenous variable(s) are, in fact, endogenous. The appropriate diagnostic here is a test for exogeneity. The χ^2 test for exogeneity is a robust version of the Hausman test. Under conditional homoskedasticity, this test is numerically equivalent to Hausman's test. It tests whether the 2SLS estimates are statistically different from the OLS/*LPM* estimates. Rejection of the null indicates that the SC variable(s) are endogenous. Failure to reject indicates that the SC variable(s) may be exogenous. Under the assumption of exogeneity, OLS is efficient and the *LPM* estimates are preferred to the 2SLS estimates.

Turning now to TABLE 5A, we first examine the validity of the IVs used in the 2SLS estimates. The first-stage tests of significance all report sample *F*-values well in excess of 10. As noted above, though, the diagnostics for underidentification and weak instruments are more informative. Both the *A-P* χ^2 test for the individual SC variables, and the *K-P rk LM* joint test for the SC variables soundly reject the null of underidentification in all 2SLS equations using the 2005 CGSS data.

Likewise, all the evidence suggests that the instruments are not weak. For example, The *A-P* test produces a sample *F*-value of 9568.15 in the 2SLS Just-Identified, first-stage regression for *Social Trust*. This compares to Stock and Yogo's (2005) critical values of 13.91 for 5% maximal relative bias, and 16.38 for 10% maximal size bias. In other words, under the null that the equations are correctly specified and the errors are iid, we can have confidence that the size of the coefficient bias is no larger than 5%; and that the effective, Type I error rate associated with a 5% significance level is no greater than 10%. The fact that the *F*-values are substantially larger than the Stock and Yogo critical values indicates that weak instruments is not a concern in any of the cases.

Likewise, we find support for the second property of instrument validity, namely exogeneity. The Hansen *J*-tests fail to reject the null hypothesis of instrument exogeneity in the over-identified 2SLS equations for the 2005 urban and rural samples. Finally, the χ^2 tests for exogeneity indicate that the SC variables are jointly endogenous in both samples, with p-values all below 0.05.

Having determined that the instruments are valid, and that the SC variables are endogenous, we now turn to the 2SLS estimates. The results of correcting for endogeneity are not the same across the three SC variables, nor the same across the two samples. For the 2005 urban sample, the estimated average marginal effect for the *Social Trust* variable increases from 4.3 percentage points, to 11.8 percentage points. In other words, after we correct for endogeneity, a one-standard deviation in *Social Trust* is estimated to increase the percent of respondents who report "good health" by 11.8 percentage points. Correcting for endogeneity in the rural sample also increases the estimated marginal effect of an increase in *Social Trust,* albeit not by quite as much. The 2SLS estimates for *Social Trust* are approximately 7.7 percentage points, compared to the *LPM* estimate of 3.7 percentage points.

A different result emerges for the *Social Relationships* variable. Here, correcting for endogeneity in the urban sample causes the estimated effect of a one-standard deviation increase to decrease from 2.3 percentage points to a statistically insignificant, and negative, value. In contrast, the estimated effect increases in the rural sample, from 3.7 percentage points to over 15 percentage points. The *Social Participation* variable remains insignificant in both samples after correcting for endogeneity.

Summarizing for the 2005 CGSS samples, correcting for endogeneity results in a much larger estimate for the effect of *Social Trust*, especially in the urban sample. It has contrasting effects for the *Social Relationships* variable, causing the estimated effect to be small and insignificant in the urban sample, but much larger in the rural sample. And there is little change in the estimated effect for *Social Participation*, which remains insignificant in both samples.

We can only speculate about the reason for the different effects across samples. One possibility is that residents of urban areas have many opportunities for interactions with other residents. More important is whether one can trust other residents. In contrast, residents in rural areas may have fewer possibilities for contact. Thus the quantity of social relationships may of itself be sufficient to enhance health.

Turning now to TABLE 5B and the 2006 CGSS samples, we once again see that our instruments pass the gauntlet of tests to confirm their validity. *F*-values are much larger than 10, the tests for underidentification and weak instruments do not identify any problems with instrument relevance, and we fail to reject the hypothesis of instrument exogeneity in the over-identified equations.

However, we cannot reject the null hypothesis that the *Social Network* variable is exogenous in both samples. The associated *p*-values range from 0.18 to 0.27. Of course, failure to reject does not mean accept, so that there is ambiguity as to which set of estimates should be preferred.

For the 2006 rural sample, the qualitative results are similar whether one uses the *LPM* or 2SLS estimates. In both cases, the estimated effect of *Social Network* is positive and significant. The *LPM* estimate indicates that a one-standard deviation increase in *Social Network* increases the probability of a respondent reporting “good health” by 2.3 percentage points. The 2SLS results estimate an increase of 4.8 to 4.9 percentage points. The results for the 2006 urban sample are mixed. The *LPM* estimate is 2.3 percent and is statistically significant. The 2SLS estimates are close to zero and insignificant.

IIIB. FURTHER ANALYSIS: THE ROLE OF GENDER AS A MEDIATOR OF SOCIAL CAPITAL AND HEALTH

An estimated gender effect. One noteworthy finding from above that is not related to social capital is that women have lower SRH than men. TABLE 3 reports that this gender effect can be substantial. The coefficient estimates indicate that women's SRH is approximately 2 to 8 percentage points below men's, holding other factors constant. The explanation for this finding is not clear. This section follows up this result by investigating whether the lower SRH of women is related to the interaction of gender and social capital.

A number of studies have investigated the extent to which gender affects the relationship between social capital and health. The evidence is mixed. Antonucci and Akiyama (1987), using a sample of older men and women from the U.S., conclude that social capital benefits men, but not women. They find that, for men, social capital and mortality rates are inversely related. There is no evidence of a relationship between social capital and mortality rates for women. Ferlander and Mäkinen (2009) obtain similar results using Russian data. They find that formal and informal social interactions are negatively related to men's mortality rate. They also find no significant correlation for women. In contrast, Stafford et al. (2005), using a sample from the United Kingdom, report that trust and community integration have a significant influence on women's self-rated health status. They find no statistically significant relationship for men. Kavanagh et al. (2006) and Eriksson et al. (2011) obtain similar results.

Method. A straightforward test of the role of gender on the relationship between social capital and SRH consists of including an interaction term between the female dummy variable and the respective social capital variable(s) in the previous *LPM* and 2SLS model specifications. TABLE 4 reports the corresponding IVs for the interaction effects. The estimation results are reported in TABLE 6.

As reported in APPENDIX C, in all cases the instruments satisfy the diagnostic checks for validity with respect to underidentification, weak instruments, and instrument exogeneity. However, as above, there is evidence in the 2006 samples that suggests the *Social Network* variable is not endogenous. While this creates ambiguity as to whether the *LPM* or 2SLS estimates should be preferred, as a practical matter, the results are largely unaffected. For every SC variable, in every sample, we fail to reject the null hypothesis that the female interaction term(s) are equal to zero at the 5% significance level. That being said, we note that the female interaction term is significant at the 10% level in the 2SLS equation for the 2006 rural sample. Nevertheless, overall, it appears that the effect of social capital on SRH is the same for men and women. Our results indicate that whatever reason explains the lower SRH of women, it is unrelated to social capital.

IV. CONCLUSION

As the most populous country in the world, China faces a wide array of social challenges associated with the process of economic development. In recent decades, the Chinese government has focused increasing attention to health promotion. For example, in a proposal for the 13th five-year plan (2016-2020), the Community Party of China pledged to build a healthier China (Xinhua News, 2015). Social capital is one avenue that researchers and policy-makers have identified as a possible means to improving health outcomes.

The first step towards identifying whether there is potential for social capital to be a policy instrument for health promotion is to establish the empirical relationship between social capital and health in China. Our analysis produced the following findings:

- *Social Trust* has a large and statistically significant effect on SRH in both urban and rural samples of the 2005 CGSS.

- *Social Relationship* has a large and statistically significant effect on SRH in the rural sample of the 2005 CGSS, but is statistically insignificant in the urban sample after correcting for endogeneity.

- *Social Participation* is statistically insignificant in both urban and rural samples of the 2005 CGSS.

- *Social Network* has a moderately large and significant effect on SRH in the 2006 rural sample, but is statistically insignificant in the urban sample after correcting for endogeneity.

- The relationship between social capital and health is not statistically different for men and women.

Previous research has primarily relied on establishing statistical significance of the relationship between social capital and health. Our study has taken pains to estimate the magnitude of these relationships in order to ascertain their economic significance. The effects that we estimate indicate that there is scope for social capital to be a significant policy tool for improving health. Assuming that other studies can confirm these results, the next step is to develop policies in the Chinese context that can exploit this relationship. Well-designed field and laboratory experiments could be used to identify such policies.

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TABLE 1A
Variable Means by Self Reported Health from the 2005 CGSS

	SELF REPORTED HEALTH (SRH)					
	= 1	***= 2***	***= 3***	***= 4***	***= 5***	***= 6***
SOCIAL CAPITAL MEASURES						
Social Trust (ST)	-0.56	-0.18	-0.09	-0.01	0.12	0.16
Social Relationships (SR)	-0.54	-0.11	-0.11	-0.02	0.04	0.24
Social Participation (SP)	-0.35	-0.24	0.02	0.04	0.02	0.12
CONTROL VARIABLES						
Age	54.0	52.9	48.8	44.7	41.9	36.8
Female	0.53	0.61	0.55	0.54	0.49	0.46
Han	0.92	0.95	0.94	0.95	0.95	0.92
CPC Membership	0.09	0.10	0.13	0.12	0.11	0.08
Log Family PC Income	7.50	7.71	8.08	8.24	8.21	8.31
Low SES	0.78	0.64	0.61	0.50	0.44	0.44
Middle SES	0.19	0.30	0.34	0.43	0.47	0.45
High SES	0.03	0.05	0.05	0.06	0.09	0.11
Unmarried	0.06	0.03	0.05	0.08	0.10	0.19
Married	0.77	0.85	0.87	0.85	0.86	0.79
Divorced	0.04	0.02	0.02	0.02	0.02	0.02
Widowed	0.14	0.10	0.07	0.05	0.03	0.01
No Education	0.27	0.23	0.12	0.11	0.07	0.06
Primary	0.40	0.36	0.27	0.24	0.23	0.19
Junior	0.30	0.33	0.51	0.54	0.57	0.63
University	0.03	0.04	0.09	0.11	0.12	0.13
Log County PC Income	8.21	8.20	8.40	8.44	8.41	8.45
County Gini	0.46	0.44	0.44	0.43	0.44	0.45

TABLE 1B
Variable Means by Self Reported Health from the 2006 CGSS

	SELF REPORTED HEALTH (SRH)			
	= 1	**= 2**	**= 3**	**= 4**
SOCIAL CAPITAL MEASURE				
Social Networks (SN)	-0.31	-0.21	-0.05	0.05
CONTROL VARIABLES				
Age	50.0	48.4	42.0	38.2
Female	0.56	0.58	0.54	0.49
Han	0.92	0.94	0.93	0.94
CPC Membership	0.19	0.21	0.25	0.22
Log Family PC Income	7.82	8.21	8.40	8.61
Low SES	0.84	0.76	0.67	0.58
Middle SES	0.13	0.20	0.28	0.36
High SES	0.03	0.02	0.04	0.05
Unmarried	0.09	0.06	0.10	0.17
Married	0.80	0.87	0.85	0.79
Divorced	0.04	0.02	0.02	0.01
Widowed	0.07	0.05	0.03	0.02
No Education	0.17	0.13	0.08	0.06
Primary Education	0.37	0.31	0.24	0.18
Secondary Education	0.42	0.49	0.57	0.61
University Education	0.07	0.07	0.11	0.15
Log County PC Income	8.55	8.62	8.63	8.66
County Gini	0.48	0.48	0.47	0.46

TABLE 2
Ordered Probit and Heteroskedastic Ordered Probit Results

	2005 Urban		***2005 Rural***		***2006 Urban***		***2006 Rural***	
	O-Probit	***HO-Probit***	***O-Probit***	***HO-Probit***	***O-Probit***	***HO-Probit***	***O-Probit***	***HO-Probit***
MEAN:								
Social Trust (ST)	0.1216*** (4.87)	0.0874*** (3.90)	0.0973*** (3.71)	0.0948*** (3.82)	---	---	---	---
Social Relationships (SR)	0.0980*** (5.04)	0.0731*** (4.59)	0.1108*** (4.71)	0.1082*** (4.91)	---	---	---	---
Social Participation (SP)	0.0042 (0.17)	0.0021 (0.12)	-0.0509 (-1.21)	-0.0491 (-1.22)	---	---	---	---
Social Networks (SN)	---	---	---	---	0.0660*** (3.25)	0.0528*** (3.09)	0.0674** (2.43)	0.0629** (2.41)
Age	-0.0275*** (-17.90)	-0.0201*** (-6.01)	-0.0229*** (-12.45)	-0.0217*** (-11.72)	-0.0206*** (-11.84)	-0.0169*** (-8.06)	-0.0183*** (-9.68)	-0.0170*** (-9.94)
Female	-0.2180*** (-7.70)	-0.1655*** (-5.49)	-0.2046*** (-6.98)	-0.1976*** (-7.03)	-0.1524*** (-4.76)	-0.1260*** (-4.79)	-0.1208*** (-2.59)	-0.1123*** (-2.61)
Han	-0.0450 (-0.42)	-0.0220 (-0.27)	-0.2216** (-2.34)	-0.2075** (-2.40)	-0.0320 (-0.44)	-0.0206 (-0.35)	0.1411 (1.40)	0.1359 (1.46)
CPC Membership	-0.0830** (-2.17)	-0.0684** (-2.37)	0.0398 (0.69)	0.0419 (0.78)	-0.0659** (-2.37)	-0.0516** (-2.30)	0.0312 (0.97)	0.0286 (0.94)
Log Family PC Income	0.0364 (1.29)	0.0179 (0.84)	0.1058*** (3.57)	0.1024*** (3.65)	0.0538** (2.25)	0.0400** (2.01)	0.0863*** (3.06)	0.0808*** (2.99)

	2005 Urban		2005 Rural		2006 Urban		2006 Rural	
	O-Probit	***HO-Probit***	***O-Probit***	***HO-Probit***	***O-Probit***	***HO-Probit***	***O-Probit***	***HO-Probit***
Middle SES	0.2611*** (7.08)	0.1908*** (5.03)	0.1766*** (4.17)	0.1599*** (3.93)	0.1781*** (3.30)	0.1493*** (3.36)	0.2516*** (4.69)	0.2307*** (4.47)
High SES	0.4181*** (5.78)	0.3104*** (4.36)	0.3287*** (3.32)	0.3160*** (3.30)	0.1088 (1.08)	0.0935 (1.12)	0.3494*** (3.15)	0.3291*** (3.21)
Unmarried	0.0067 (0.11)	0.0329 (0.63)	0.0083 (0.10)	0.0032 (0.04)	-0.1224 (-1.61)	-0.1002 (-1.62)	-0.1351* (-1.73)	-0.1181 (-1.64)
Divorced	-0.0870 (-0.90)	-0.0637 (-0.90)	0.1041 (0.62)	0.0913 (0.59)	-0.1089 (-1.23)	-0.0937 (-1.28)	-0.1504 (-0.86)	-0.1545 (-0.95)
Widowed	-0.1310** (-2.13)	-0.0950** (-2.09)	-0.0607 (-0.78)	-0.0429 (-0.59)	0.0585 (0.61)	0.0475 (0.60)	0.0107 (0.11)	0.0051 (0.05)
Primary Education	-0.0840 (-1.14)	-0.0715 (-1.26)	0.0041 (0.07)	0.0074 (0.13)	-0.0593 (-0.52)	-0.0401 (-0.43)	-0.0201 (-0.32)	-0.0261 (-0.44)
Secondary Education	-0.0108 (-0.14)	-0.0124 (-0.22)	0.1404** (2.36)	0.1362** (2.38)	0.0448 (0.43)	0.0323 (0.38)	0.1279* (1.90)	0.1111* (1.69)
University Education	-0.0540 (-0.68)	-0.0521 (-0.88)	-0.0606 (-0.28)	-0.0606 (-0.30)	0.1087 (0.97)	0.0829 (0.91)	-0.0653 (-0.47)	-0.0631 (-0.48)
Log County PC Income	0.1539*** (3.48)	0.1219*** (3.14)	0.1459* (1.86)	0.1294* (1.75)	-0.0223 (-0.51)	-0.0098 (-0.28)	0.0445 (0.84)	0.0401 (0.81)
County Gini	0.2507 (0.61)	0.0882 (0.28)	0.2454 (0.52)	0.2700 (0.60)	-0.5749* (-1.92)	-0.5166** (-2.20)	-0.4429* (-1.68)	-0.4184* (-1.66)

	2005 URBAN		2005 RURAL		2006 URBAN		2006 RURAL	
	O-Probit	***HO-Probit***	***O-Probit***	***HO-Probit***	***O-Probit***	***HO-Probit***	***O-Probit***	***HO-Probit***
VARIANCE:								
Log Family PC Income	---	-0.0651*** (-4.06)	---	---	---	---	---	---
Middle SES	---	-0.0733*** (-2.70)	---	-0.1091*** (-3.21)	---	---	---	---
Unmarried	---	0.1422*** (2.78)	---	---	---	---	---	---
Widowed	---	---	---	-0.1568** (-2.19)	---	---	---	---
Primary Education	---	---	---	---	---	0.0892** (2.25)	---	-0.0800* (-1.77)
Secondary Education	---	---	---	---	---	---	---	-0.0908* (-1.82)
County Gini	---	0.5956*** (3.45)	---	---	---	-0.4480*** (-2.86)	---	---
Observations	6015	6015	4171	4171	4611	4611	3935	3935
Log Pseudo Likelihood	-9081.04	-9040.94	-6556.24	-6546.18	-4463.80	-4455.05	-3758.48	-3755.74
HYPOTHESIS TESTS:								
H_0: SES Variables = 0[a]	59.34*** (p=0.000)	34.07*** (p=0.000)	21.07*** (p=0.000)	38.89*** (p=0.000)	10.91*** (p=0.004)	11.32*** (p=0.003)	27.02*** (p=0.000)	25.30*** (p=0.000)

	2005 URBAN		2005 RURAL		2006 URBAN		2006 RURAL	
	O-Probit	***HO-Probit***	***O-Probit***	***HO-Probit***	***O-Probit***	***HO-Probit***	***O-Probit***	***HO-Probit***
H_0: Marital Variables = 0[b]	5.65 (*p*=0.130)	12.47** (*p*=0.014)	0.98 (*p*=0.805)	5.71 (*p*=0.222)	4.90 (*p*=0.179)	4.69 (*p*=0.196)	4.02 (*p*=0.259)	3.84 (*p*=0.279)
H_0: Educ. Variables = 0[c]	4.68 (*p*=0.196)	5.67 (*p*=0.129)	11.86*** (*p*=0.008)	12.04*** (*p*=0.007)	5.16 (*p*=0.161)	12.88** (*p*=0.012)	12.22*** (*p*=0.007)	23.83*** (*p*=0.000)

NOTES: TABLE 2 consists of four sections. The top section reports coefficient estimates associated with the mean component of the likelihood function for the ordered probit/heteroskedastic ordered probit procedure. z-statistics are reported in parentheses below the coefficients. The second section reports coefficient estimates associated with the variance component of the heteroskedastic ordered logit estimation, with z-statistics in parentheses. The third section reports number of observations for each sample and a goodness-of-fit measure. The last section reports results of various joint hypothesis tests (described below). This section reports the Wald statistic associated with the null hypothesis and the corresponding *p*-value. Standard errors are calculated using a cluster-robust estimator of the error variance-covariance matrix.

*,**,*** Indicates that a parameter is significant at the 10-, 5-, and 1-percent level.

[a] This hypothesis tests whether the coefficients of the Socio-Economic Status variables (*Middle SES, High SES*) are each equal to zero. The omitted category is *Low SES*.

[b] This hypothesis tests whether the coefficients of the Marital Status variables (*Unmarried, Divorced, Widowed*) are each equal to zero. The omitted category is *Married*.

[c] This hypothesis tests whether the coefficients of the Education variables (*Primary Education, Secondary Education, University Education*) are each equal to zero. The omitted catego ry is *No Formal Education.*

TABLE 3
Average Marginal Effects on Self-Reported Health of Selected Variables

	2005 Urban		***2005 Rural***		***2006 Urban***		***2006 Rural***	
	HetProbit	***LPM***	***HetProbit***	***LPM***	***HetProbit***	***LPM***	***HetProbit***	***LPM***
Social Trust (ST)	0.0453*** (5.63)	0.0434*** (5.53)	0.0370*** (4.10)	0.0372*** (4.11)	---	---	---	
Social Relationships (SR)	0.0232*** (3.50)	0.0226*** (3.34)	0.0382*** (4.81)	0.0372*** (4.67)	---	---	---	
Social Participation (SP)	-0.0027 (-0.36)	-0.0038 (-0.53)	-0.0275* (-1.74)	-0.0261* (-1.73)	---	---	---	
Social Network (SN)	---	---	---	---	0.0237*** (3.14)	0.0229*** (3.10)	0.0271*** (2.61)	0.0229*** (2.45)
Age	-0.0096*** (-18.38)	-0.0101*** (-17.57)	-0.0085*** (-11.35)	-0.0088*** (-11.57)	-0.0067*** (-12.08)	-0.0070*** (-12.42)	-0.0061*** (-8.64)	-0.0063*** (-8.35)
Log Family PC Income	0.0170* (1.82)	0.0156* (1.66)	0.0488*** (4.75)	0.0486*** (4.89)	0.0087 (0.97)	0.0067 (0.80)	0.0205** (2.25)	0.0221** (2.29)
Female	-0.0768*** (-6.60)	-0.0794*** (-7.07)	-0.0649*** (-4.56)	-0.0665*** (-4.61)	-0.0402*** (-3.30)	-0.0430*** (-3.62)	-0.0267 (-1.64)	-0.0246 (-1.54)

NOTES: TABLE 3 reports "Average Marginal Effects" associated with a one-unit increase in the respective variable. The *HetProbit* estimates are derived from a heteroskedastic ordered probit model that has the same specification as the *HO-Probit* models reported in TABLE 2 with one major difference: The dependent variables for "self-reported health" were recoded to 0-1 variables, where 1 indicated "good health" (as described in the text). The *LPM* are the associated estimates from a linear probability model. The interpretation of the values in the table is the effect on the probability of reporting "good health" associated with a one-unit increase in the respective variable. As the social capital variables are each standardized, this corresponds to a one-standard deviation increase for the first four variables. For the age and income variables, a one-unit change can be interpreted as the effect of a one-year increase in age, and a 272-percent increase in income. Standard errors are calculated using a cluster-robust estimator of the error variance-covariance matrix.

*,**,*** Indicates that a parameter is significant at the 10-, 5-, and 1-percent level.

TABLE 4
Description of Instrumental Variables

VARIABLE	*DESCRIPTION*
TABLE 5: 2005 URBAN - 2SLS	
Endogenous variables: *ST, SR, SP*	
Instruments: *ST_CountyMean, SR_CountyMean, SP_CountyMean, Phone_CountyMean, Caring*	
ST_CountyMean	County mean of the level of social trust
SR_CountyMean	County mean of the level of social relation
SP_CountyMean	County mean of the level of social participation
Phone_CountyMean	County mean of the number of phones in a household
Caring	An index that sums how often the respondent engages in "mutual assistance" behaviors across various group activities[a]
TABLE 5: 2005 RURAL - 2SLS	
Endogenous variables: *ST, SR, SP*	
Instruments: *ST_CountyMean, SR_CountyMean, SP_County_Mean, Phone_CountyMean, Pub, Kin, Judge*	
ST_CountyMean	County mean of the level of social trust
SR_CountyMean	County mean of the level of social relation
SP_CountyMean	County mean of the level of social participation
Phone_CountyMean	County mean of the number of phones in a household
Public	An index of public decision-making institutions (yi shi yi yi), in which residents get together to discuss public affairs[b]
Kinship	An index of the effectiveness of the local kinship network to organize public affairs and public good provision[c]
Table 5: 2006 URBAN -2SLS	
Endogenous variables: *SN*	
Instruments: *SN_CountyMean, Position*	
SN_CountyMean	County mean of the level of social network
Position	A variable based on the extent to which the interviewee's year-end bonus was determined by his position in workplace[d]
Table 5: 2006 RURAL - 2SLS	
Endogenous variables: *SN*	
Instruments: *SN_CountyMean, Discretion*	
SN_CountyMean	County mean of the level of social network
Discretion	An index of the subject's freedom in his/her workplace[e]

VARIABLE	*DESCRIPTION*
TABLE 6: 2005 URBAN - 2SLS **Endogenous variables:** *ST, SR, SP, STxFemale, SRxFemale, SPxFemale* **Instruments:** *ST_CountyMean, SR_CountyMean, SP_County_Mean, Phone_CountyMean, Caring, ST_CountyMeanxFemale, SR_CountyMeanxFemale, SP_CountyMeanxFemale, Phone_CountyMeanxFemale, CaringxFemale*	
TABLE 6: 2005 RURAL - 2SLS **Endogenous variables:** *ST, SR, SP, STxFemale, SRxFemale, SPxFemale* **Instruments:** *ST_CountyMean, SR_CountyMean, SP_County_Mean, Phone_CountyMean, Pub, Kin, ST_CountyMeanxFemale, SR_CountyMeanxFemale, SP_CountyMeanxFemale, Phone_CountyMeanxFemale, PubxFemale, KinxFemale*	
TABLE 6: 2006 URBAN - 2SLS **Endogenous variables:** *SN, SNxFemale* **Instruments:** *SN_CountyMean, Position, SN_CountyMeanxFemale, PositionxFemale*	
TABLE 6: 2006 RURAL - 2SLS **Endogenous variables:** *SN, SNxFemale* **Instruments:** *SN_CountyMean, Discretion, SN_CountyMeanxFemale, DiscretionxFemale*	

[a] *Caring* is an index variable created by summing respondents' responses to the question: "How often do you have mutual assistance behaviors when you are in the following group activities?" These ranged from sports/gym groups; recreation groups; alumni/fellow villagers (townsmen) professional associations; religious groups; educational groups for children; educational groups for the respondent; and public service organizations.

[b] *Public* is an index variable created by summing respondents' responses from being asked how many public decisions, such as funding public education, building roads, and etc., were discussed and decided by the public decision-making procedure known as *yi shi yi yi* in Chinese, translated as One Project One Discussion.

[c] *Kinship* is constructed by summing two series of questions: "If your community has kinship networks, do they have public family trees, grave yards, common lands, and etc.?" and "How effective are they in the following activities, including organizing public services, coordinating between governments and villagers, sharing information, and etc.?"

[d] *Position* is based on a question that asks respondents to what extent the respondent's end-year bonus and rewards are determined by "their rank in the workplace."

[e] *Discretion* is an index of freedom in the workplace and is constructed by summing up a series of questions: “Can you freely speak of different opinions to your leader?” “If your leader want you to do something, he/she will discuss with you, or order you, or both?” “Can you make personal calls during working time without the permission of your leader?” and etc.

TABLE 5A
Average Marginal Effects on Self-Reported Health of Selected Variables – 2SLS Estimates: 2005 CGSS

	2005 URBAN			*2005 RURAL*		
	LPM	***2SLS Just-Identified***	***2SLS Over-Identified***	***LPM***	***2SLS Just-Identified***	***2SLS Over-Identified***
Estimated Marginal Effects:						
Social Trust (ST)	0.0434*** (5.53)	0.1184*** (4.64)	0.1176*** (4.65)	0.0372*** (4.11)	0.0775*** (2.94)	0.0781*** (2.98)
Social Relationships (SR)	0.0226*** (3.34)	-0.0112 (-0.30)	-0.0185 (-0.51)	0.0372*** (4.67)	0.1546*** (3.69)	0.1589*** (3.79)
Social Participation (SP)	-0.0038 (-0.53)	0.0035 (0.15)	-0.0034 (-0.36)	-0.0261 (-1.73)	0.0475 (0.64)	0.0559 (0.81)
Observations	6015	6015	6015	4171	4171	4171
First-stage tests of significance of excluded instruments						
ST: F-test	---	3209.88 (*p = 0.0000)*	2716.35 (*p = 0.0000)*	---	1406.49 (*p = 0.0000)*	720.55 (*p = 0.0000)*
SR: F-test	---	837.47 (*p = 0.0000)*	585.09 (*p = 0.0000)*	---	720.83 (*p = 0.0000)*	355.39 (*p = 0.0000)*
SP: F-test	---	936.09 (*p = 0.0000)*	903.05 (*p = 0.0000)*	---	498.99 (*p = 0.0000)*	289.61 (*p = 0.0000)*
First-stage Tests – Underidentification:[a]						
ST: Angrist-Pischke χ^2 *Test*	---	9690.05 (*p = 0.0000*)	13713.95 (*p = 0.0000*)	---	3876.59 (*p = 0.0000*)	3828.94 (*p = 0.0000*)

	2005 URBAN			2005 RURAL		
	LPM	***2SLS Just-Identified***	***2SLS Over-Identified***	***LPM***	***2SLS Just-Identified***	***2SLS Over-Identified***
SR: Angrist-Pischke χ^2 Test	---	2505.76 (*p = 0.0000*)	2937.82 (*p = 0.0000*)	---	2017.03 (*p = 0.0000*)	2047.23 (*p = 0.0000*)
SP: Angrist-Pischke χ^2 Test	---	2787.03 (*p = 0.0000*)	4442.70 (*p = 0.0000*)	---	1350.10 (*p = 0.0000*)	1474.36 (*p = 0.0000*)
ALL: Kleibergen-Paap rk LM Test	---	29.09 (*p = 0.0000*)	30.56 (*p = 0.0000*)	---	15.485 (*p = 0.0001*)	15.759 (*p = 0.0034*)
First-stage Tests - Weak Instruments:[b]						
ST: Angrist-Pischke F Test	---	9568.15[e]	4512.30[f]	---	3809.07[e]	939.88[h]
SR: Angrist-Pischke F Test	---	2471.27[e]	966.63[f]	---	1981.90[e]	502.53[h]
SP: Angrist-Pischke F Test	---	2751.97[e]	1461.78[f]	---	1326.58[e]	361.91[h]
ALL: Kleibergen-Paap rk F Test	---	n/a	732.91[g]	---	n/a	254.20[i]
Hansen's J-test for overidentifying restrictions[c]		n/a	2.072 (*p = 0.3548*)		n/a	0.668 (*p = 0.8807*)
χ^2 Test for exogeneity[d]	---	11.625 (*p = 0.0088*)	10.910 (*p = 0.0122*)	---	10.539 (*p = 0.0145*)	11.889 (*p = 0.0078*)

NOTES: This table is comparable to TABLE 3 in that it reports marginal effects associated with the same specifications. The *LPM* estimates are identical to those reported in TABLE 3 and are repeated here to facilitate comparison with the 2SLS estimates. The *2SLS/Just-Identified* (*Over-Identified*) specifications include one (more than one) instrument for each endogenous variable. The respective instruments are reported in TABLE 4. Values in parentheses are *z*-statistics unless otherwise indicated. Standard errors are calculated using a cluster-robust estimator of the error variance-covariance matrix.

*,**,*** Indicates that a parameter is significant at the 10-, 5-, and 1-percent level.

[a] The null hypothesis for the underidentification tests is that the respective variable/set of variables are not identified. Rejection indicates that the respective endogenous variable(s) are identified.

[b] The respective *F* values should be compared to Stock-Yogo (2005) critical values to determine the maximal relative bias (RB) and size (S) for the estimates of the instrumented endogenous variable(s). The respective critical values are reported below. *F* values larger than the critical values indicate that the respective bias and size are less than the maximal value. Note that the critical values assume iid error terms. Critical values for nonspherical errors have not been calculated.

[c] The null hypothesis is that the instruments are uncorrelated with the error term. Failure to reject is a necessary condition for an instrument to be valid.

[d] The null hypothesis is that the respective social capital variables are exogenous. Rejection indicates that they are endogenous. The test is calculated as the difference of two Sargan-Hansen test statistics and is robust to within-county error correlations. Details are given in Baum et al. (2015).

[e] Stock and Yogo critical *F* values for 5% RB and 10% S are 13.91 and 16.38, respectively.

[f] Stock and Yogo critical *F* values for 5% RB and 10% S are 18.37 and 22.30, respectively.

[g] Stock and Yogo critical *F* value for 5% RB is 9.53. There is no critical value reported for S.

[h] Stock and Yogo critical *F* values for 5% RB and 10% S are 19.28 and 24.58, respectively.

[i] Stock and Yogo critical *F* value for 5% RB is 12.20. There is no critical value reported for S.

TABLE 5B
Average Marginal Effects on Self-Reported Health of Selected Variables – 2SLS Estimates: 2006 CGSS

	2006 URBAN			*2006 RURAL*		
	LPM	***2SLS Just-Identified***	***2SLS Over-Identified***	***LPM***	***2SLS Just-Identified***	***2SLS Over-Identified***
Estimated Marginal Effects:						
Social Network (SN)	0.0229*** (3.10)	-0.0061 (-0.23)	-0.0082 (-0.33)	0.0229** (2.45)	0.0482** (2.09)	0.0488** (2.19)
Observations	4611	4611	4611	3935	3935	3935
First-stage F-tests of significance of excluded instruments	---	848.85 (*p = 0.0000*)	401.92 (*p = 0.0000*)	---	1876.66 (*p = 0.0000*)	968.15 (*p = 0.0000*)
First-stage Tests – Underidentification:[a]						
Angrist-Pischke χ^2 *Test*	---	860.08 (*p = 0.0000*)	814.65 (*p = 0.0000*)	---	1909.45 (*p = 0.0000*)	1970.63 (*p = 0.0000*)
Kleibergen-Paap rk LM Test	---	34.37 (*p = 0.0000*)	40.25 (*p = 0.0000*)	---	31.35 (*p = 0.0000*)	34.16 (*p = 0.0000*)
First-stage Tests - Weak Instruments:[b]						
Kleibergen-Paap rk F Test	---	848.85[e]	401.92	---	1876.66[e]	968.15[f]
Hansen's J-test for overidentifying restrictions[c]		n/a	0.127 (*p = 0.7216*)		n/a	0.045 (*p = 0.8320*)
χ^2 ***Test for exogeneity***[d]	---	1.119 (*p = 0.2736*)	1.597 (*p = 0.2064*)	---	1.389 (*p = 0.2385*)	1.765 (*p = 0.1840*)

NOTES: This table is comparable to TABLE 3 in that it reports marginal effects associated with the same specifications. The *LPM* estimates are identical to those reported in TABLE 3 and are repeated here to facilitate comparison with the 2SLS estimates. The *2SLS/Just-Identified* (*Over-Identified*) specifications include one (more than one) instrument for each endogenous variable. The respective instruments are reported in TABLE 4. Values in parentheses are *z*-statistics unless otherwise indicated. Standard errors are calculated using a cluster-robust estimator of the error variance-covariance matrix.

*,**,*** Indicates that a parameter is significant at the 10-, 5-, and 1-percent level.

[a] The null hypothesis for the underidentification tests is that the respective variable/set of variables are not identified. Rejection indicates that the respective endogenous variable(s) are identified.

[b] The respective *F* values should be compared to Stock-Yogo (2005) critical values to determine the maximal relative bias (RB) and size (S) for the estimates of the instrumented endogenous variable(s). The respective critical values are reported below. *F* values larger than the critical values indicate that the respective bias and size are less than the maximal value. Note that the critical values assume iid error terms. Critical values for nonspherical errors have not been calculated.

[c] The null hypothesis is that the instruments are uncorrelated with the error term. Failure to reject is a necessary condition for an instrument to be valid.

[d] The null hypothesis is that the respective social capital variables are exogenous. Rejection indicates that they are endogenous. The test is calculated as the difference of two Sargan-Hansen test statistics and is robust to within-county error correlations. Details are given in Baum et al. (2015).

[e] Stock and Yogo critical *F* value for 10% S is 16.38. There are no critical values reported for RB.

[f] Stock and Yogo critical *F* value for 10% S is 19.93. There are no critical values reported for RB.

TABLE 6
Estimation and Significance Testing of Female Interaction Terms

	2005 Urban		*2005 Rural*		*2006 Urban*		*2006 Rural*	
	LPM	***2SLS***	***LPM***	***2SLS***	***LPM***	***2SLS***	***LPM***	***2SLS***
STxFemale	0.0047 (0.40)	-0.0066 (-0.28)	0.0019 (0.12)	0.0222 (0.67)	---	---	---	---
SRxFemale	-0.0195 (-1.46)	-0.0046 (-0.13)	-0.0043 (-0.28)	-0.0321 (-0.88)	---	---	---	---
SPxFemale	-0.0029 (-0.28)	-0.0024 (-0.21)	0.0698** (2.53)	-0.0393 (-0.60)	---	---	---	---
SNxFemale	---	---	---	---	-0.0036 (-0.29)	0. 0117 (0.37)	-0.0166 (-1.14)	-0.0655* (-1.88)
Test of significance of interaction term(s)	F = 0.77 (*p=0.5128)*	χ^2 = 0.24 (*p=0.9705*)	F = 2.17 (*p=0.0989)*	χ^2 = 1.38 (*p=0.7114*)	F = 0.08 (*p=0.7717)*	χ^2 = 0.14 (*p=0.7094*)	F = 1.29 (*p=0.2589)*	χ^2 = 3.55 (*p=0.0595*)
χ^2 ***Test for exogeneity***[a]	---	13.337 (p=0.0380	---	17.569 (p=0.0074)	---	1.644 (p=0.4395)	---	4.976 (p=0.0831)

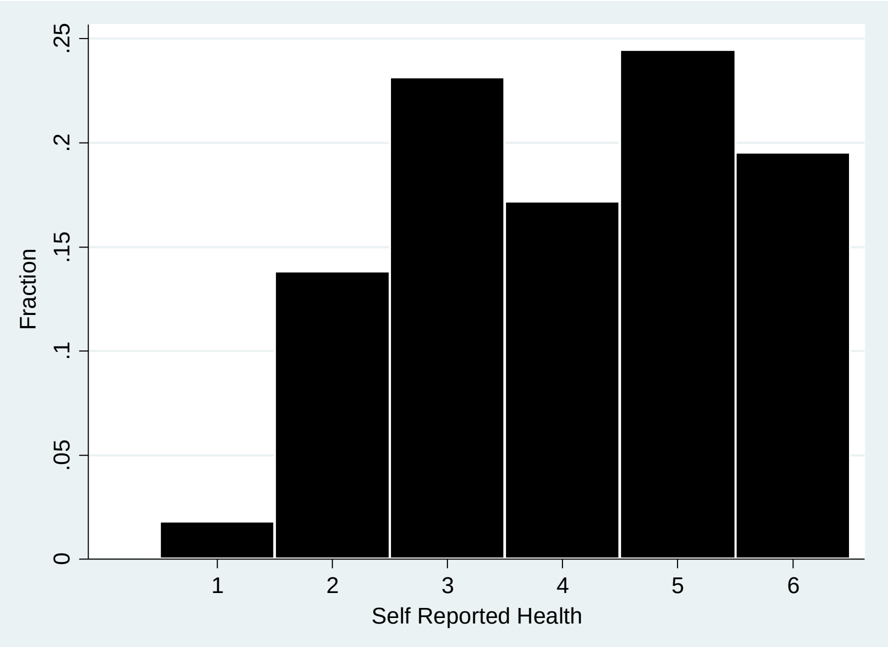
NOTES: The *LPM* and *2SLS* specifications are identical to those in TABLE 5 except that they add female interaction terms. The respective endogenous variables, and corresponding excluded instruments, are reported in TABLE 4. Values in parentheses are *z*-statistics unless otherwise indicated. Standard errors are calculated using a cluster-robust estimator of the error variance-covariance matrix.

*,**,*** Indicates that a parameter is significant at the 10-, 5-, and 1-percent level.

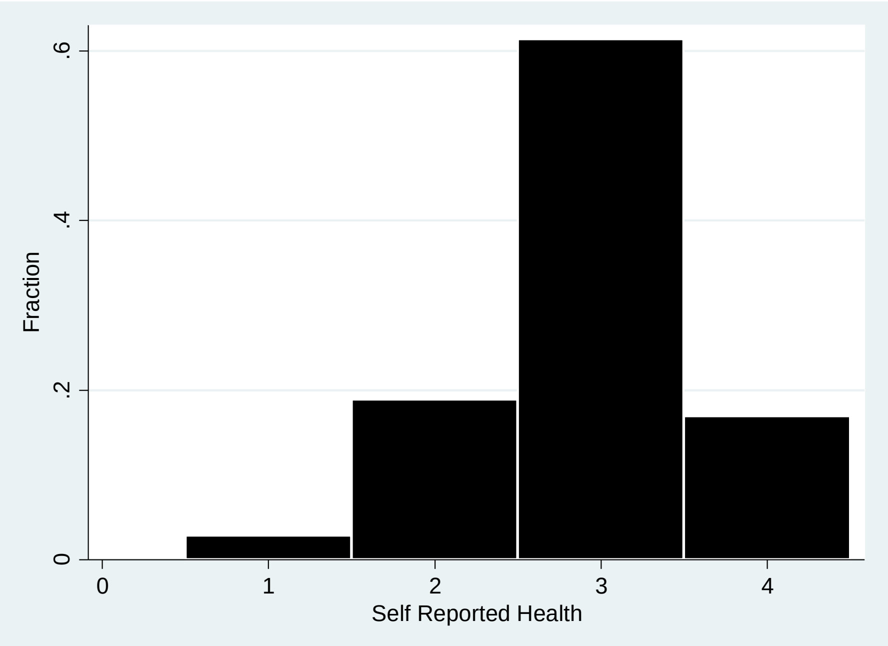
[a] The null hypothesis is that the respective social capital variables are exogenous. Rejection indicates that they are endogenous. The test is calculated as the difference of two Sargan-Hansen test statistics and is robust to within-county error correlations. Details are given in Baum et al. (2015).

FIGURE 1
Distribution of Self-Reported Health Values in the 2005 and 2006 CGSS Samples

A. 2005 CGSS



B. 2006 CGSS



APPENDIX A
Descriptive Statistics by Sample

	2005 URBAN			*2005 RURAL*			*2006 URBAN*			*2006 RURAL*		
	Mean	*Min*	*Max*	*Mean*	*Min*	*Max*	*Mean*	*Min*	*Max*	*Mean*	*Min*	*Max*
Self-Reported Health (SRH)	4.11	1	6	4.02	1	6	2.92	1	4	2.92	1	4
Social Trust (ST)	0.00	-4.11	2.76	0.02	-4.22	2.45	---	---	---	---	---	---
Social Relationships (SR)	-0.08	-3.51	1.77	0.13	-3.51	1.77	---	---	---	---	---	---
Social Participation (SP)	0.32	-0.63	5.83	-0.46	-0.63	5.02	---	---	---	---	---	---
Social Network (SN)	---	---	---	---	---	---	0.04	-1.93	2.75	-0.19	-2.36	4.10
Age	44.7	18	94	44.68	18	93	44.6	18	70	43.2	18	69
Female	0.534	0	1	0.510	0	1	0.528	0	1	0.517	0	1
Han	0.952	0	1	0.922	0	1	0.954	0	1	0.915	0	1
CPC Membership	0.137	0	1	0.068	0	1	0.281	0	2	0.172	0	2
Log Family PC Income	9.78	5.71	14.22	8.81	4.62	12.21	9.92	0	16.12	8.97	0	14.51
Low SES	0.572	0	1	0.457	0	1	0.664	0	1	0.690	0	1
Middle SES	0.369	0	1	0.449	0	1	0.286	0	1	0.259	0	1
High SES	0.059	0	1	0.094	0	1	0.040	0	1	0.033	0	1
Unmarried	0.121	0	1	0.051	0	1	0.091	0	1	0.069	0	1
Married	0.803	0	1	0.898	0	1	0.846	0	1	0.884	0	1
Divorced	0.023	0	1	0.009	0	1	0.028	0	1	0.012	0	1
Widowed	0.053	0	1	0.042	0	1	0.035	0	1	0.036	0	1
No Education	0.060	0	1	0.190	0	1	0.028	0	1	0.160	0	1
Primary Education	0.153	0	1	0.404	0	1	0.137	0	1	0.376	0	1
Secondary Education	0.621	0	1	0.399	0	1	0.669	0	1	0.451	0	1
University Education	0.166	0	1	0.007	0	1	0.165	0	1	0.013	0	1
Log County PC Income	8.75	7.15	9.96	7.87	6.79	9.57	8.97	7.60	10.56	8.18	7.16	10.56
County Gini	0.442	0.239	0.713	0.437	0.289	0.713	0.465	0.301	0.952	0.482	0.300	0.952

APPENDIX B
Summary of Studies that Corrected for Endogeneity

Study	***Country***	***Dependent Variable***	***Social Capital Variables***	***Instrumental Variables***	***Correcting for Endogeneity Bias:***
Schultz et al. (2008)	USA	Self-Rated Health	(i) Social trust	(i) Length of residence in the community; and (ii) attendance at religious services	Produces similar estimates[a]
d'Hombres et al. (2010)	8 countries from the Commonwealth of Independent States	Self-Rated Health	(i) Trust; (ii) participation in local organisations; and (iii) social isolation	Heterogeneity in (i) religious beliefs; (ii) education; (iii) income; and (iv-vi) community-level averages of the social capital variables	Produces similar estimates or increases the magnitude of the estimated effects, depending on the procedure for correcting endogeneity
Kim et al. (2011)	64 countries	Self-Rated Health	(i) Country-level social trust	(i) Corruption; (ii) population density; and (iii) religious heterogeneity	Increases the magnitude of the estimated effects
Yamamura (2011)	Japan	Self-Rated Health	(i) Participation in neighborhood association	(i) Homeownership; (ii) have young children; (iii)-(v) length of residence in the community	Produces similar estimates or increases the magnitude of the estimated effects, depending on whether respondent had a job.

Study	*Country*	*Dependent Variable*	*Social Capital Variables*	*Instrumental Variables*	*Correcting for Endogeneity Bias:*
Ronconi et al. (2012)	Argentina	Self-Rated Health	(i) Informal social interactions	(i)-(ii) Measures of the availability of public transportation	Increases the magnitude of the estimated effects
Goryakin et al. (2013)	9 Former Soviet Union countries	(i) Self-Rated Health; and (ii) Self-Rated Mental Health	(i) Trust; (ii) membership; and (iii) being lonely	3 different sets of IVs, all of which include community averages of the three social capital variables	Produces similar estimates or increases the magnitude of the estimated effects in 17 out of 22 cases
Kawachi et al. eds. (2013)[b]	Japan	Self-Rated Health	(i) Participation in salon activities	(i) Distance from salon	Increases the magnitude of the estimated effects
Habibov and Weaver (2014)	Canada	Self-Rated Health	(i) Social networks and social support; (ii) civic participation; and (iii) social participation	(i) Attendance at religious services	Increases the magnitude of the estimated effects
Rocco et al. (2014)	25 European countries (Europe Social Survey)	Self-Rated Health	Individual degree of generalized trust	(i) crime victimization in the past 5 years (ii) physician density	(i) Increases the magnitude of the estimated effects (ii) Community-level social capital has a smaller effect

Study	***Country***	***Dependent Variable***	***Social Capital Variables***	***Instrumental Variables***	***Correcting for Endogeneity Bias:***
Ljunge (2014)	30 European countries (Europe Social Survey)	Self-Rated Health	Individual degree of generalized trust	The ancestral trust of immigrants	Increases the magnitude of the estimated effects
Howley (2015)	Ireland	Self-Rated Psychological Health	(i) Social trust; and (ii) support from friends	(i) Attitude towards European Union; and (ii) neighbours look out for each other	Increases the magnitude of the estimated effects
Fiorillo and Sabatini, (2015)	Italy	Self-Rated health	(i) Frequently meets with friends	(i) Mass attendance (ii) Average frequency of meeting friends at the community level	Increase the magnitude of the estimated effects

[a] Conclusion is based on the following statement (page 613): "For the ordered probit estimation, we report results from models using the actual values of social trust rather than predicted values *as the results are similar for both specifications* [italics added]."

[b] Source: Chapter 4 in Kawachi et al. eds. (2013), "Case Example of IV Estimation: The Taketoyo Intervention Study".

APPENDIX C
Expanded Results from TABLE 6

	2005 Urban		*2005 Rural*		*2006 Urban*		*2006 Rural*	
	LPM	***2SLS***	***LPM***	***2SLS***	***LPM***	***2SLS***	***LPM***	***2SLS***
STxFemale	0.0047 (0.40)	-0.0066 (-0.28)	0.0019 (0.12)	0.0222 (0.67)	---	---	---	---
SRxFemale	-0.0195 (-1.46)	-0.0046 (-0.13)	-0.0043 (-0.28)	-0.0321 (-0.88)	---	---	---	---
SPxFemale	-0.0029 (-0.28)	-0.0024 (-0.21)	0.0698** (2.53)	-0.0393 (-0.60)	---	---	---	---
SNxFemale	---	---	---	---	-0.0036 (-0.29)	0. 0117 (0.37)	-0.0166 (-1.14)	-0.0655* (-1.88)
Test of significance of interaction term(s)	F = 0.77 (*p=0.5128)*	χ^2 = 0.24 (*p=0.9705*)	F = 2.17 (*p=0.0989)*	χ^2 = 1.38 (*p=0.7114*)	F = 0.08 (*p=0.7717)*	χ^2 = 0.14 (*p=0.7094*)	F = 1.29 (*p=0.2589)*	χ^2 = 3.55 (*p=0.0595*)
First-stage tests of significance of excluded instruments								
ST: F-test	---	1544.06 (p=0.0000)	---	335.93 (p=0.0000)	---	---	---	---
SR: F-test	---	310.47 (p=0.0000)	---	226.53 (p=0.0000)	---	---	---	---
SP: F-test	---	528.14 (p=0.0000)	---	171.63 (p=0.0000)	---	---	---	---
STxFEM: F-test	---	141.44 (p=0.0000)	---	156.45 (p=0.0000)	---	---	---	---
SRxFEM: F-test	---	97.12 (p=0.0000)	---	84.28 (p=0.0000)	---	---	---	---

	2005 Urban		*2005 Rural*		*2006 Urban*		*2006 Rural*	
	LPM	***2SLS***	***LPM***	***2SLS***	***LPM***	***2SLS***	***LPM***	***2SLS***
SPxFEM: F-test	---	276.64 (p=0.0000)	---	25.01 (p=0.0000)	---	---	---	---
SN: F-test	---	---	---	---	---	204.37 (p=0.0000)	---	517.48 (p=0.0000)
SNxFEM: F-test	---	---	---	---	---	169.05 (p=0.0000)	---	234.90 (p=0.0000)
First-stage Tests – Underidentification:[a]								
ST: A-P χ^2 *Test*	---	584.38 (p=0.0000)	---	631.89 (p=0.0000)	---	---	---	---
SR: A-P χ^2 *Test*	---	536.16 (p=0.0000)	---	945.36 (p=0.0000)	---	---	---	---
SP: A-P χ^2 *Test*	---	3611.57 (p=0.0000)	---	471.81 (p=0.0000)	---	---	---	---
STxFEM: A-P χ^2 *Test*	---	1254.08 (p=0.0000)	---	1187.40 (p=0.0000)	---	---	---	---
SRxFEM: A-P χ^2 *Test*	---	947.04 (p=0.0000)	---	917.89 (p=0.0000)	---	---	---	---
SPxFEM: A-P χ^2 *Test*	---	2668.45 (p=0.0000)	---	248.59 (p=0.0000)	---	---	---	---
SN: A-P χ^2 *Test*	---	---	---	---	---	379.72 (p=0.0000)	---	560.70 (p=0.0000)
SNxFEM: A-P χ^2 *Test*	---	---	---	---	---	685.58 (p=0.0000)	---	937.64 (p=0.0000)

	2005 Urban		*2005 Rural*		*2006 Urban*		*2006 Rural*	
	LPM	***2SLS***	***LPM***	***2SLS***	***LPM***	***2SLS***	***LPM***	***2SLS***
ALL: K-P rk LM Test	---	33.17 (p=0.0000)	---	18.597 (p=0.0095)	---	43.47 (p=0.0000)	---	33.51 (p=0.0000)
First-stage Tests - Weak Instruments:[b]								
ST: A-P F Test	---	115.27[e]	---	88.50[f]	---	---	---	---
SR: A-P F Test	---	105.76[e]	---	132.41[f]	---	---	---	---
SP: A-P F Test	---	712.39[e]	---	66.08[f]	---	---	---	---
STxFEM: A-P F Test	---	247.37[e]	---	166.31[f]	---	---	---	---
SRxFEM: A-P F Test	---	186.81[e]	---	128.56[f]	---	---	---	---
SPxFEM: A-P F Test	---	526.36[e]	---	34.82[f]	---	---	---	---
SN: A-P F Test	---	---	---	---	---	124.84[g]	---	183.55[i]
SNxFEM: A-P F Test	---	---	---	---	---	225.39[g]	---	306.95[i]
ALL: K-P rk F Test	---	n/a	---	n/a	---	199.58[h]	---	190.22[j]
Hansen's J-test for overidentifying restrictions[c]	---	3.383 (*p=0.4960)*	---	2.846 (*p=0.8279*)	---	0.906 (*p=0.6356*)	---	0.228 (*p=0.8922*)
χ^2 ***Test for exogeneity***[d]	---	13.337 (p=0.0380	---	17.569 (p=0.0074)	---	1.644 (p=0.4395)	---	4.976 (p=0.0831)

NOTES: The *LPM* and *2SLS* specifications are identical to those in TABLE 5 except that they add female interaction terms. The respective endogenous variables, and corresponding excluded instruments, are reported in TABLE 4. Values in parentheses are *z*-statistics unless otherwise indicated. Standard errors are calculated using a cluster-robust estimator of the error variance-covariance matrix.

*,**,*** Indicates that a parameter is significant at the 10-, 5-, and 1-percent level.

[a] The null hypothesis for the underidentification tests is that the respective variable/set of variables are not identified. Rejection indicates that the respective endogenous variable(s) are identified. *A-P* stands for Angrist-Pischke. *K-P* stands for Kleibergen-Paap.

[b] The respective *F* values should be compared to Stock-Yogo (2005) critical values to determine the maximal relative bias (RB) and size (S) for the estimates of the instrumented endogenous variable(s). The respective critical values are reported below. *F* values larger than the critical values indicate that the respective bias and size are less than the maximal value. Note that the critical values assume iid error terms. Critical values for nonspherical errors have not been calculated. *A-P* stands for Angrist-Pischke. *K-P* stands for Kleibergen-Paap.

[c] The null hypothesis is that the instruments are uncorrelated with the error term. Failure to reject is a necessary condition for an instrument to be valid.

[d] The null hypothesis is that the respective social capital variables are exogenous. Rejection indicates that they are endogenous. The test is calculated as the difference of two Sargan-Hansen test statistics and is robust to within-county error correlations. Details are given in Baum et al. (2015).

[e] Stock and Yogo critical *F* values for 5% RB and 10% S are 20.74 and 26.87, respectively.

[f] Stock and Yogo critical *F* values for 5% RB and 10% S are 21.01 and 31.50, respectively.

[g] Stock and Yogo critical *F* values for 5% RB and 10% S are 16.85 and 22.30, respectively.

[h] Stock and Yogo critical *F* values for 5% RB and 10% S are 11.04 and 16.87, respectively.

[i] Stock and Yogo critical *F* values for 5% RB and 10% S are 16.85 and 22.30, respectively.

[j] Stock and Yogo critical *F* values for 5% RB and 10% S are 11.04 and 16.87, respectively.