

# Schooling's contribution to social capital: study from a native Amazonian society in Bolivia

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Understanding why traditional cultures weaken matters because they embody humanity's heritage. Schooling has been singled out as an abrader of traditional culture. We assess whether schooling erodes one aspect of traditional culture: social capital as shown by generosity to people outside the household. In industrial nations researchers find positive associations between social capital and schooling. We hypothesize that in pre-industrial societies schooling will produce ambiguous effects on social capital: it will reduce social capital expressed through labour help but increase social capital expressed through gifts given. Furthermore, we hypothesize that schooling will lower the likelihood of displaying social capital to kin. To test the hypotheses we use 2004 data from a highly autarkic society of farmers and foragers in the Bolivian Amazon, the Tsimane'. To strengthen the inferences we make about causality we use instrumental variables. Participants in the study included all people of 16+ years of age (n=574) in 13 villages. Social capital included (a) gifts given to people of other households and (b) labour help offered to people of other households and participation in communal work during the week before the day of the interview. Instrumental variables included childhood village of residence and father's writing ability. Contrary to expectations, schooling weakened all forms of social capital, including expressions of generosity toward kin, but results were statistically insignificant. Parameters estimated with standard techniques and with instrumental variables differed in sign and magnitude, suggesting that researchers should correct for the endogeneity of schooling when assessing schooling's effect on social capital. We end by discussing reasons for the weak statistical results.

## Introduction

At the core of cultural anthropology lies the belief that culture—norms, technology, and social organization—evolved through generations to help people adapt to their

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environment (Steward, 1955; Alland, 1973; Durham, 1992; Richerson & Boyd, 2004). Throughout our evolutionary history, humans have survived by relying on non-biological cultural means, such as local knowledge of the environment (Reyes-García *et al.*, 2005) and local forms of social capital or generosity, including gift giving, sharing, and reciprocity (Sahlins, 1972; Mauss, 1990). Besides helping people adapt to their environment, culture bestows a sense of time, place, and belonging that contributes to the well-being of individuals (Brumann, 1999; Kuper, 1999; Steedly, 1999).

Understanding why traditional cultures weaken matters because cultures have allowed humans to adapt to their environment and because they embody humanity's heritage (Sutherland, 2003). By traditional culture we mean a culture with only recent continuous exposure to the market economy or westerners. Among abraders of traditional cultures, schooling has received much attention. Researchers have noted that schooling and academic skills learned in school undermine aspects of traditional culture, such as knowledge of the local environment (Sternberg, 1997; Benz *et al.*, 2000; Sternberg *et al.*, 2001; Zent, 2001), social organization (Chavajay & Rogoff, 2002), ethos (Middleton, 2005), and the local language (Akinnaso, 1992).

Clearly the effect of formal schooling on traditional cultures will depend on the type of schooling and on the number of years of school exposure. Schooling may not help people in all communities in the same ways. Schooling that infuses traditional knowledge with the acquisition of academic skills likely enhances learning outcomes (Lipka *et al.*, 2001; Grigorenko *et al.*, 2002), but others argue that simple school exposure, independent of its content or quality, influences outcomes such as health and fertility, particularly among females (LeVine *et al.*, 2001), and behaviours valued in the market, such as obedience and punctuality (Bowles & Gintis, 1975).

Here we assess whether schooling weakens a core dimension of traditional culture: social capital. Social capital stands for norms and behaviours that enable people to act collectively. In industrial nations, proxy variables for social capital have included trust, safety nets, social networks, membership of local organizations, and political and civic engagement (Portes, 1998; Ostrom, 2000; Durlauf & Fafchamps, 2005). In pre-industrial societies, proxy variables for social capital have included expressions of generosity, such as gifts (Hill, 2002) or labour help given to other households, or participation in communal chores (Erasmus, 1956; Leatherman, 2005). In pre-industrial societies social capital matters because it contributes to group cohesion and because it helps protect household consumption against mishaps (Godoy, 2001; Carter & Maluccio, 2003).

Table 1 contains a summary of 14 quantitative studies about the effect of schooling on social capital in industrial and developing nations, and in small-scale, pre-industrial rural societies. Six findings stand out.

First, except for two studies, researchers have found positive associations between schooling and social capital. The finding held up across studies that varied in sample size, from a low of only 470–716 people to a high of 76,156 people. Glaeser *et al.*, (2002) note that the relation between social capital and schooling is 'one of the most robust empirical regularities in the social capital literature' (p. 455) and Putnam

Table 1. Review of quantitative studies of the effects of schooling on social capital

Author and year of publication	Name, country and year(s) of survey	Sample population and age	Method	Definition of social capital (in italics) and controls	Question and social capital outcome	Statistically significant support
A	B	C	D	E	F	G
1. (Brehm & Rahn, 1997)	General Social Survey USA 1972-1994	9118 residents of the continental USA 18 years of age and over	IVs for social capital=early childhood experiences, divorce, being a victim of crime, ethnic membership	<p><i>I. INDUSTRIAL NATIONS:</i></p> <ul style="list-style-type: none"> <li>- <i>Interpersonal, trust</i></li> <li>- <i>Confidence in government</i></li> <li>- <i>Partisanship</i></li> <li>- <i>Days reading newspaper</i></li> <li>- Income</li> <li>- TV hours</li> <li>- Size of city</li> <li>- Race</li> <li>- Gender</li> <li>- Divorce</li> <li>- Life satisfaction</li> </ul>	Does education affect civic engagement?	Each additional year of schooling increases civic engagement by .11 ( $t=27.5$ )
2. (Bynner & Ashford, 1994)	UK Economic and Social Research Council's 16-19 Initiative 1987-1989	5000 British citizens from Swindon, Sheffield, Liverpool and Kirkcaldy 16-19 years of age	Multiple regressions	<ul style="list-style-type: none"> <li>- <i>Voting</i></li> <li>- Mother/father's social class</li> <li>- Age at which father left school</li> <li>- Age at which mother left school</li> <li>- City of residency</li> <li>- Income</li> </ul>	Does education affect the likelihood of a person voting?	Not being enrolled in school decreased the likelihood of an individual voting by .14 R=.47 ( $t$ cannot be determined from data provided)
3. (Egerton, 2002)	British Household Panel Study UK 1991-1999	470 British citizens 17-23 years of age from a study of 5,000 British households	Logistic regression	<ul style="list-style-type: none"> <li>- <i>Social groups</i></li> <li>- Gender</li> <li>- SES</li> <li>- Father's occupation</li> <li>- Level of education</li> </ul>	Does a college education make a citizen more likely to join social groups?	The odds ratio for between membership in civic groups and completing a 4-year degree programme is 3.21 ( $p<.05$ )
4. (Glaeser <i>et al.</i> , 2002)	General Social Survey USA 1972-1998	19, 245 Americans in the continental USA 18-59 years of age	OLS	<ul style="list-style-type: none"> <li>- <i>Average sociability of occupation</i></li> <li>- <i>Average membership in peer groups</i></li> <li>- Age</li> <li>- Gender</li> <li>- Race</li> <li>- Education</li> <li>- Income</li> </ul>	Does education make people more likely to join groups?	An additional year of school raises the total number of membership in groups by .21 ( $r=42.4$ )

Table 1. (continued)

Author and year of publication	Name, country and year(s) of survey	Sample population and age	Method	Definition of social capital (in italics) and controls	Question and social capital outcome	Statistically significant support
<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>	<i>E</i>	<i>F</i>	<i>G</i>
5. (Mertler & Welch, 2004)	World War II Veterans Survey USA 1950–1998	716 members of WW II military units	OLS	<ul style="list-style-type: none"> <li>- <i>Political participation</i> defined by                             <ul style="list-style-type: none"> <li>* <i>contacting political officials</i></li> <li>* <i>working on campaigns</i></li> <li>* <i>servng on government boards/ council</i></li> <li>* <i>contributing money to an individual or party</i></li> <li>* <i>participating in a protest, march or demonstration</i></li> </ul> </li> <li>- Standard of living</li> <li>- Parents' political activity</li> <li>- Use of GI Bill</li> <li>- High school diploma</li> <li>- 2-year college degree</li> <li>- 4-year college degree</li> <li>- Unfinished college experience</li> </ul>	What is schooling's effect on political participation?	Being a graduate of a 4-year college programme increased the likelihood of political participation by .37 ( $p < .001$ )
6. (McVeigh & Smith, 1999)	Evangelical Influence Survey USA 1996	2591 American citizens Over 17 years of age	Multinomial logistic regression	<ul style="list-style-type: none"> <li>- <i>Participation in institutional politics and political protests</i></li> <li>- Income</li> <li>- Education</li> <li>- Financial situation</li> <li>- Ascriptive identities</li> <li>- Organizational activities</li> <li>- Religious affiliation</li> </ul>	Does completion of 4-year degree programme encourage participation in : a) institutional politics b) political protests	Having a 4-year degree increases: a) participation in institutional politics by .582 ( $p < .01$ ) b) participation in political protests by .559 ( $p < .05$ )
7. (Nie, Junn, & Stehlik-Barry, 1996)	General Social Survey 1976–1994 National Election Study	15,887 USA citizens, 25 and older, residing in the continental USA	OLS	<ul style="list-style-type: none"> <li>- <i>Political engagement and tolerance</i></li> <li>- Age</li> <li>- Education</li> <li>- Race</li> <li>- Gender</li> </ul>	Does individual educational achievement correlate with	Each additional year of school increases an individual's Knowledge of principles of democracy by .17 ( $r = 5.53$ ) Tolerance by .23 ( $t = 7.04$ )

Table 1. (continued)

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	1972-1994; USA			<ul style="list-style-type: none"> <li>- Family income</li> <li>- Occupational prominence</li> </ul>	<p>higher levels of political engagement?</p> <p>Does a higher level of average education reduce a community's level of political engagement?</p>	<p>Knowledge of political leaders by .09 (t=2.92)</p> <p>Participation in difficult political activities by .08 (t=2.95)</p> <p>Voting by .07 (t= 2.28)</p> <p>Political attentiveness by .20 (t=6.39)</p> <p>Knowledge of other current political facts by .26 (t=7.69)</p> <p>Each additional year added to a community's average years of schooling reduces political engagement by -3.69 (t=-16.4)</p>
8. (Helliwell & Putnam, 1999)	US General Social Survey (GSS) USA (1974-1994)	19,214 participants throughout USA (24 years and older)	OLS	<ul style="list-style-type: none"> <li>- <i>Social trust, political engagement</i></li> <li>- TV Generation</li> <li>- TV Era</li> <li>- Lifecycle</li> <li>- Gender</li> <li>- Average education in region</li> <li>- Divorce</li> <li>- Geographic region</li> </ul>	<p>Does individual education encourage social trust and engagement?</p> <p>Does average education encourage social trust and engagement?</p>	<p>Each additional year of schooling increased:</p> <p>GSS social trust by .04 (t=40.3)</p> <p>DDB social trust by .02 (t=3.2)</p> <p>Each additional year of schooling increased:</p> <p>the GSS number of social engagements by .22 (t=51.7)</p> <p>The results for average education on both social trust and social engagement are statistically insignificant, except for GSS social trust, where the region's average years of schooling raises social trust by .02 (t=3.2)</p>

Table 1. (continued)

A	B	C	D	E	F	G
Author and year of publication	Name, country and year(s) of survey	Sample population and age	Method	Definition of social capital (in italics) and controls	Question and social capital outcome	Statistically significant support
<b>II. DEVELOPING NATIONS:</b>						
9. (Seligson, 1999)	Survey of metropolitan areas in capital cities of six Central American countries in 1991, 1995 for Costa Rica	4181 residents of San José Guatemala City Managua Tegucigalpa Panama City San Salvador (age not given)	OLS	<ul style="list-style-type: none"> <li>- <i>Citizen's demand on government [not defined]</i></li> <li>- Age</li> <li>- Gender</li> <li>- Education [not defined]</li> <li>- Democratic values</li> <li>- Trust</li> <li>- Wealth</li> </ul>	Does education increase the likelihood that citizens will make demands of government officials?	Each year of school schooling increases the number of political demands made by: Costa Rica .0037 (t=-.37) El Salvador .0099 (t=-.99) Guatemala .016 (t=1.6) Honduras .034 (t=3.4) Nicaragua .0019 (t=-.19) Panama .0009 (t=-.09)
10. (Henrich et al., 2004)	Experimental games played in 6 pre-industrial societies 1996–2004	Mapuche: 62 participants Tsimane': 134 participants Orma: 262 participants Sangu: 80 participants Au: 60 participants Gnau: 50 participants Age not given	Ultimatum game and Public goods game. OLS, bivariate, multivariate Analysis	<ul style="list-style-type: none"> <li>- Results of experimental games</li> <li>- Age, sex, village, language, trips to town, wage labour</li> </ul>	Does formal schooling affect pro-social behaviour as revealed through experimental games?	Generally no effect, except among Tsimane' (more schooling, less offer in Ultimatum game, but no effect in Public goods game)
11. (Gregson et al., 2003)	People in Manicaland, a rural province in eastern Zimbabwe 1998–2000	9843 participants 15–54 years of age	Logit	<ul style="list-style-type: none"> <li>- <i>Social groups</i></li> <li>- Groups that meet during school hours</li> <li>- Age</li> <li>- SES</li> </ul>	Does education affect an individual's participation in community and social groups that meet outside of school hours	Women with secondary education more likely to report membership in a community group (OR=1.34, p=.023)

Table 1. (continued)

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12. (Grootaert & Narayan, 2004)	Local Level Institutions Study Bolivia; study in following provinces: Tiahuanacu Mizque Charagua, Villa Serrano. 1996	A study of 1432 families, conducted by asking only the leader of the household over the age of 15	Bivariate associations	- <i>Social groups</i> - Province - Head of household - Religion - Income (divided into quintiles)	Does education increase a household's number of group memberships?	No clear pattern; education associated with increasing participation in some groups and decreased participation in other groups
13. (Krishna, 2002)	Study of 69 Rajasthan villages India 1998–2000	2232 Indians from rural villages Over 18 years of age	OLS	- <i>Political activity measured in 100-point index</i> - Gender - Age - Religion - Education - Independent political education - Wealth - Caste - Distance to nearest town - Infrastructure	Does an individual's years of schooling influence his or her decision to become politically active?	An additional year of schooling increases an individual's score of political activity by .61 ( $t=2.77$ )
14. (Maluccio, Haddad, & May, 2000)	KwaZulu-Natal Income Dynamics Survey and individual survey to check against the KNID survey South Africa 1993–1998	The heads of 1,393 households in KwaZulu-Natal Ages 20 and over	OLS	- <i>Social groups</i> - Location - Race - Household size - Gender - Age	Does education increase the number of group memberships in a household?	Each additional year of schooling increases the number of group memberships by .08 ( $t=10.6$ )

Notes. IV: Instrumental variable  
 OLS: Ordinary least square  
 OR: Odds ratio

(2000) echoes the observation by noting that schooling is ‘the most powerful predictor of virtually all forms of altruistic behaviour’ (p. 18).

Only Seligson (1999), in her study of six Central American cities, and Henrich *et al.* (2004) in his study of 15 pre-industrial societies using field laboratory experiments found no strong association between schooling and social capital. An example of a field laboratory experiment is a game with two participants who cannot see each other in which one participant makes an offer (often of money) to the other participant, who can either refuse or accept. If the second participant refuses, neither player receives a reward, but if the second participant agrees to the amount, then the sum is split along the lines indicated by the first participant. Seligson found strong relations in Guatemala and Honduras, but her studies in Panama, Nicaragua, Costa Rica, and El Salvador failed to demonstrate such a relation. Of the six pre-industrial societies studied by Henrich *et al.* for which they had information on schooling and social capital, only among the Tsimane’ of Bolivia did researchers find evidence of an association between schooling and pro-social behaviour. Tsimane’ with more schooling offered less in some types of field laboratory experiments than Tsimane’ with less schooling, but schooling bore no association with the amount offered in other studies. The weak results among the Tsimane’ might reflect both a small sample size of observations ( $n=134$ ) and participants’ lack of understanding of the task in the field experiment.

Second, except for the study by Brehm and Rahn (1997), none of the other studies listed in Table 1 corrects for the endogeneity of schooling. An endogenous variable is an explanatory variable whose use produces a biased estimate owing to the role of omitted variables in the model, random error in the measure of the endogenous variable, or two-way causality between the endogenous variable and another explanatory variable. For example, the studies of Table 1 suggest that schooling contributes to social capital, but studies from industrial nations also suggest that social capital expressed through such things as participation in parent-teacher associations lowers the likelihood that children will drop out of school, thereby improving children’s school performance (Coleman, 1988; Furstenberg & Hughes, 1995; Teachman *et al.*, 1997; McNeal, 1999; Morgan & Sorenson, 1999). Furthermore, social capital and schooling might both reflect the role of third, unmeasured variables. For instance, people of some ethnic groups might invest more in schooling and also engage in more pro-social behaviour than people of other ethnic groups. The possible two-way causality between social capital and schooling and the role of unmeasured variables (e.g., ethnicity) suggests that the estimates of schooling’s effect on social capital in Table 1 may contain biases of an unknown direction and magnitude.

Third, the association between schooling and social capital is stronger in industrial nations than in developing nations, or than in small-scale, pre-industrial societies. All the studies from industrial nations in Table 1 found strong positive associations between schooling and social capital, but only four of the six studies from developing nations found such an association. This may result from higher schooling levels in industrial nations, but may also suggest that social capital is stronger in some societies than in others.

Fourth, all but two of the studies in industrial nations used some form of political participation to measure social capital. Political participation can benefit an entire society because it increases one's trust in one's society. While a person's political goals may not be reached, political participation promises that an individual's opinions can be heard. This is why researchers have chosen to quantify political participation to measure the kind of social capital that produces more democratic and tolerant societies. Therefore, in societies where the measurement is applicable researchers have used various forms of political participation to measure social capital.

Fifth, the studies from industrial nations summarized in Table 1 may contain a bias from self-selection into the sample used in the study. In those studies researchers used surveys to identify levels of participation, but completion of the survey itself requires civic mindedness (Hauser, 2005). Therefore, there may be an upward bias in some of the estimates shown in Table 1 because people who valued participation may have been more likely to answer the survey. As a result, people with low levels of social capital may be underrepresented in the studies.

With the exception of the study by Bynner and Ashford (1994), all the other studies listed in Table 1 examined data from nationwide surveys. As a result, the findings imply that the relation between schooling and social capital applies to the entire nation. In fact, the finding may gloss over diversity within a nation. For example, studies in the USA suggest higher levels of social capital in the mid-west and lower levels in most urban areas (Goldin & Katz, 1999).

Sixth, except for the study by Henrich *et al.* (2004) none of the other studies has focused on pre-industrial societies. Many quantitative studies in anthropology focus on gift giving in pre-industrial societies (Reyes-García *et al.*, 2006), but few of them contain estimates of schooling's effect on social capital.

In this paper we have three aims. *First*, we want to improve on previous estimates of the effects of schooling on social capital by correcting for the endogeneity of schooling, and do so by using instrumental variables for schooling (Durlauf, 2002; Durlauf & Fafchamps, 2005). An instrumental variable is a variable that correlates highly with the endogenous explanatory variable but does not correlate with the outcome, except through the endogenous variable. For example, in estimating the effects of schooling on earnings, researchers are faced with the endogeneity of schooling; schooling could increase earnings, but earnings could affect schooling, and both could reflect the role of a third variable (e.g., motivation). Researchers have used variables such as parental schooling as an instrumental variable for own schooling because parental schooling is likely highly correlated with own schooling, but uncorrelated with earnings (except through own schooling) (Wooldridge, 2003). Valid instrumental variables allow one to reduce biases from endogeneity (Angrist & Krueger, 2001).

*Second*, we want to test whether the positive association between schooling and social capital found in industrial nations holds in a small-scale pre-industrial society. Unlike industrial societies, in pre-industrial societies we expect schooling to have ambiguous effects on social capital.

*Third*, we want to test three hypotheses about the effects of a person's own schooling on social capital. We focus on a person's own schooling rather than on parental

schooling or on the average level of schooling of the household because we use parental schooling as an instrumental variable to reduce endogeneity biases. The studies summarized in Table 1 focus on a person's own schooling, so our use of own schooling facilitates comparison with other studies. The three hypotheses are detailed below.

### *Hypothesis #1*

Own schooling will lower a person's social capital expressed through labour help offered to people of other households or through participation in communal work. Research in developing nations suggests that schooling contributes to higher earnings if people acquire more than 4–6 years of schooling (Mingat & Bruns, 2002). Beyond a minimum threshold of schooling, schooling opens employment opportunities outside the village economy. As the economic value of their time rises, more schooled people will reduce the amount of labour they allocate to help others or to do communal work because it will become more expensive to show generosity in this way.

### *Hypothesis #2*

Own schooling will increase individual social capital expressed through gifts given to people of other households. Greater income from more schooling should induce the better off to flaunt their riches by giving it to the rest of the community. As long as the social capital of a community does not collapse, the rest of the community should be able to pressure the better off to give away some of their resources. Anthropologists have shown how the fear of envy, gossip, mistrust, and false reports bruited through a community can end in accusations of witchcraft, sickness, and death (Briggs, 1970; Haviland, 1977). The fear of odium should push those with more resources to share their riches.

### *Hypothesis #3*

Own schooling will increase the probability of displaying generosity to people unrelated by blood or marriage. Schooling should change not only how people express social capital, but also whom they give it to. People in traditional societies rely on kin to organize production and social relations. When one's village of residence contains a wide network of kin related to one by marriage and by blood, generosity to what at first sight may appear a stranger is, in actuality, generosity to one's relative. If we take our cues from research findings based on observational studies of industrial nations (Abramson & Inglehart, 1995; Inglehart & Norris, 2003) we would expect schooling to increase the likelihood of displaying social capital to strangers. For example, Abramson and Inglehart (1995) used a nationally-representative panel (or longitudinal) and repeated cross-sectional surveys from industrial nations and found that schooling helped internalize concerns with equity, quality of life, and the environment rather than with survival and immediate kin.

## **Methodology**

To test the three hypotheses we use data from a highly autarkic society of farmers and foragers in the Bolivian Amazon, the Tsimane', who are in the early stages of continuous exposure to the market economy and the western world.

### *Sample, data, and measure of variables*

(see also, Appendix 1 for further technical details). Information comes from a survey undertaken in 2004 in 13 Tsimane' villages straddling the Maniqui river, province of Beni. Participants in the study included people in all 236 households of the 13 villages, but we only use information from people over 16 years of age ( $n = 574$ ) because we did not collect information on social capital for people under 16 years of age. Sixteen years is a cut-off age for adulthood; after that age, people start to clear their own plots for farming and set up unions. The 2004 survey formed part of a panel study in progress that started in 1999 (Godoy *et al.*, 2005a, b). A panel study is a longitudinal study in which researchers track the same people and households over time. Experienced translators and interviewers who had been part of the panel study from the start carried out the 2004 survey. Translators included Tsimane' whom we had trained in the implementation of the survey. They have deep knowledge of the questions since they have pilot tested the questions, used them on themselves in practice runs, and applied them to other Tsimane' in different survey waves. The surveyors included people who wrote down answers and included several researchers who had done their Ph.D. with the Tsimane', understood the local language (though they still needed a translator to understand answers to some of the more complex questions), and had helped develop the survey instrument.

*Social capital.* For reasons discussed earlier, we equate social capital with gifts given to people of other households, work done for people of other households, and with participation in communal work. We constructed three dependent variables for social capital for each adult. The dependent variables captured different expressions of social capital, but only during the seven days before the day of the interview. We did not increase the recall period farther back into the past to avoid measurement errors from faulty recall.

We followed three steps to collect information on social capital and create the variables for social capital used in the statistical analysis. First, we asked people to list all the gifts they had given. Gifts included items such as fish, game meat, rice, manioc, plantains, maize, cooked food, and medicines. Second, we asked people about unpaid work done for people of other households, and about participation in communal work. Unpaid work for others included things such as help in farm work, running errands, or helping ill people. Third, we added answers to the two questions to arrive at a measure of total expressions of social capital. We also asked who received the gift or help. We grouped recipients of generous acts into the following categories: immediate family, Tsimane' of other households in the village, Tsimane' of other villages,

and *napos*, or Bolivians who are not native Amazonians. To test hypotheses 1–2 we excluded expressions of social capital to immediate family and *napos*.

*Own schooling and instrumental variables for own schooling.* We asked people about the maximum school grade they had attained. We did not ask about the quality of schooling received, though later we comment on changes in school quality.

To obtain information about instrumental variables for own schooling, we asked them about the maximum school grade attained by their mother and by their father, the ability of their mother and their father to write and speak Spanish, and whether their same-sex parent was taller, of the same physical stature, or shorter than they. We coded answers to questions about parental ability to speak Spanish as follows: 0 = unable, 1 = with difficulty, and 2 = fluent. We coded answers to questions about parental writing ability as follows: 0 = cannot, 1 = some, and 2 = well. We coded people’s answers to questions about physical stature relative to their same-sex parent as follows: –1= taller than parent, 0 = same physical stature as parent, and +1= shorter than parent. We asked about parental physical stature as a possible instrumental variable for own schooling because studies have shown positive associations between adult physical stature and indicators of individual well-being, such as income, longevity, and occupation (Fogel, 2005).

Besides the variables just described, we coded for the respondent’s sex (female=0; male=1) and asked participants to report their age. Table 2 contains definition and summary statistics of the dependent, explanatory, and instrumental variables used in the regression analyses.

Table 2. Definition and summary statistics of variables for Tsimane’ over 16 years of age used in regression analysis

Variable	Definition	N	Mean	Std Dev
<i>Dependent variables (social capital expressed during 7 days before interview):</i>				
Gifts	Number of gifts given to people of other households	574	0.109	0.602
Labour	Number of times person helped people of other households with labour or did communal work	574	0.207	0.808
Total	Sum of the two variables: Gifts and Labour	574	0.317	1.202
<i>Explanatory variables:</i>				
Schooling	Maximum school grade achieved by respondent	574	1.993	2.411
Age	Age of respondent in years	574	36.538	17.602
Male	Sex of respondent; male=1; female=0	574	0.49	0.50
<i>Instrumental variables:</i>				
Father writing	Respondent’s father’s writing ability (0 = cannot; 1 = some; 2 = well)	565	0.152	0.401
Village	Respondent’s childhood village of residence	569	48.311	42.751

*The people*

In recent publications we discuss general aspects of Tsimane' ethnography and history (Godoy *et al.*, 2005b, c), so below we provide a synopsis of the Tsimane' and a description of the dependent variable, social capital, and schooling, the explanatory variable of main interest.

*Ethnographic synopsis.* The Tsimane' number 8,000 people and live in 100+ villages scattered along river banks and logging roads, mostly in the department of Beni at the foothills of the Andes, in the Bolivian Amazon. Villages in our sample are small and contain an average of 24 households (S.D. = 10.8); each household has 7.3 people (S.D. = 2.6) made up of 1.1 adult females (S.D. = 0.4) and 1.1 adult males (S.D. = 0.4).

The Tsimane' practise hunting, gathering, fishing, and slash-and-burn farming. Though they had sporadically taken part in the market in the past during the boom of selected forest goods (e.g., pelts), they started to take part in the market economy more continuously only since the 1970s. It is still not clear whether increasing participation in the market economy and the western world reflects a shortage of natural resources, a desire to acquire western goods, or both (Godoy *et al.*, 2005c). The opening of a motorized dirt road that linked much of the Tsimane' territory with the highlands brought an onslaught of highland colonist farmers, cattle ranchers, and logging and oil firms. The Tsimane' take part in the market economy by selling farm crops (principally rice) and forest goods (principally logs and thatch palm), and by working as unskilled labourers in cattle ranches, logging firms, or in the farms of colonist farmers.

Like other native Amazonian societies, Tsimane' practise cross-cousin marriage (Daillant, 1994); a man marries his mother's brother's daughter. Residence is with the wife's kin group shortly after marriage, followed by a neolocal or independent post-marital living arrangement, neither with the husband's nor with the wife's relatives. Polygamous in the past, the Tsimane' today practise monogamy and live in nuclear households, run jointly by a wife and a husband. Only 10% of the households were run by a single parent (8% headed by a single female and 2% headed by a single male).

Neolocal or independent residence after marriage, plus preferential cross-cousin marriage creates a wide and thick web of relatives linked by blood and marriage potentially available for social support. Thirty-six percent of wives and 39% of husbands lived in their village of birth, suggesting that wives and husbands each likely benefit from the social support of people known since childhood. Village composition is fluid because people move constantly in and out of settlements in search of better places to farm, hunt, and fish (Ellis, 1996).

*Social capital.* The Tsimane' share goods, give gifts, help each other, and do communal work, but also have a stingy side. The Tsimane' routinely share the ubiquitous *chicha*, a beverage made by fermenting crops such as manioc or plantains. The alcoholic content of *chicha* varies by the duration of fermentation. *Chicha* generally

has less than 5% alcoholic content by volume (1%–12%) (Jennings *et al.*, 2005). Tsimane' give freshly made *chicha* to children and infants because it does not contain alcohol, sufficient time not having elapsed for fermentation to take place, but *chicha* several days old is strong and is reserved for adults. Any Tsimane' can walk into a household serving *chicha* and expect to be served. Tsimane' stigmatize as misers and hold in contempt people who do not prepare and share *chicha*. People drink *chicha* sitting in a circle with people of the same sex. They take a few sips from a gourd, then pass it to the person next to them until all is consumed, at which point the host refills the gourd, and the drinking round starts again. As they pass time drinking *chicha*, they tell stories and make commentaries about a wide range of subjects. Unlike the drinking of commercial alcohol, which is done alone or in small groups, mostly by men, the drinking of *chicha* takes place in groups with the participation of all adult Tsimane' present. Many legends and myths of the Tsimane' centre on the drinking of *chicha* (Huanca, 2005). In part because the drinking of *chicha* links with the religious beliefs of Tsimane', Protestant missionaries and Tsimane' who have converted to the Protestant faith abjure and inveigh against drinking *chicha*.

Besides sharing *chicha*, Tsimane' also share food. In the smaller villages, people cook in open courtyards and shout when the meal is ready so all can join in communal eating. In those villages people literally eat from a common pot. Successful hunters share game with others. In an earlier panel study undertaken during five consecutive quarters in 1999–2000 in two villages, we found that 11% of all goods entering households from morning until dusk came as gifts from friends or relatives.

Communal work prevails in the construction and in the maintenance of schools, in hunting expeditions far from villages, in the cleaning of public places, in preparations for village festivities, and in some types of fishing. In remote villages, people work together in the more arduous farm tasks, such as felling large trees before planting. During the dry season, Tsimane' work in groups to set up fish traps and prepare plant poison (Pérez, 2001). In the 1999–2000 study we found that group fishing accounted for a quarter of all fishing events.

Nevertheless, offsetting public displays of generosity one also finds evidence of stinginess. The presence or lure of public schools, the territorial circumscription from the expansion into the Tsimane' territory of loggers, cattle ranchers, and migrant farmers, and the indebtedness into which some Tsimane' have fallen with outside merchants—all create incentives to accumulate more material possessions and to share less.

Even without the presence of markets, one finds a strong ethos of economic independence among households because most food comes from farm and forest goods procured by each household, rather than from goods produced by the village working in unison. For example, during communal fishing people cooperate to set up the traps and to prepare the plant poison, but they keep the fish they catch with their own nets; they do not redistribute the catch among all the people who fished, or among all the people in the village. People in villages closer to towns build walls to enclose their homes and put fences around their courtyards. To guard their material possessions, some Tsimane' put locks on their doors when they leave the village (Byron, 2003). People even hold back on food. People in larger villages do not go out of their way to

invite others to share meals, and prefer to eat from dishes rather than from a common pot. Tsimane' often turn their backs to others when they eat (Ellis, 1996). Social capital might permeate daily life, but it does not get activated after a neighbour suffers a misfortune. In the study of 1999–2000 we probed into how households had coped with unforeseen misfortunes (e.g., crop loss), and found that only 5% of the sample received help from kin or neighbours after a misfortune.

*Schooling.* The first recorded contact of Tsimane' with westerners dates back to the seventeenth century, but continual exposure to westerners dates back only to the 1940s when Protestant missionaries from the USA entered the department of Beni for the first time (Chicchón, 1992). The work of missionaries took off during the 1950s when the Bolivian Government gave them the responsibility for schooling remote lowland native Amazonian populations such as the Tsimane' (Castro Mantilla, 1997). The agreement lasted from 1954 until 1985. As part of the agreement, missionaries in 1955 set up a centre in the town of Tumichuco, several days away from the Tsimane' territory, with the purpose of training Tsimane' to become bilingual school teachers and to translate the Bible into the Tsimane' language. Protestant missionaries offered scholarships to promising Tsimane' young men so they could attend Tumichuco for three months a year to work as informants for missionary linguists. In Tumichuco missionaries taught Tsimane' academic and practical skills (e.g., modern hygiene) and the Scriptures so Tsimane' could proselytize in the Tsimane' language when they returned to their villages. After 27 years of operating in Tumichuco, missionaries transferred their training centre to the town of San Borja (population ~19,000), closer to the Tsimane' territory. After receiving training, schooled Tsimane' returned to their villages, where they worked as lay missionaries and teachers using instructional materials in the Tsimane' language prepared by missionaries. In 1985, when the agreement with the Government of Bolivia ended, the State took over the responsibility for educating the Tsimane', which meant keeping Tsimane' as school teachers and paying their salaries. To this day, missionaries produce the textbooks used in Tsimane' classrooms, run training seminars for Tsimane' teachers, and offer courses in reading and writing twice a year for Tsimane' adults. Most of today's top Tsimane' political leaders received their training from Protestant missionaries.

At present about 40% of Tsimane' villages have a primary school covering the first five grades. No village has a middle school or a high school. Four villages close to the town of San Borja have an education programme for adults where Tsimane' with primary schooling can earn a high-school diploma by attending classes one week a month.

Despite nearly five decades of exposure to schools, Tsimane' adults have little modern human capital, with males having more than females. The average adult had completed only 1.99 years of schooling (S.D. = 2.41) (Table 2). The average female had completed 1.25 years of schooling (S.D. = 1.51), but 44.14% of females had no schooling. In contrast, the average male had more than twice as many years of schooling (2.72 years; S.D. = 2.88) as the average female. Only 28.52% of males had no

schooling. Ninety-one percent of males but only 51% of females knew some Spanish, and 49.82% of males but only 12.11% of females spoke fluent Spanish.

A striking feature of Tsimane' schooling is that it was developed *in situ* by missionaries using the Tsimane' language to prepare instructional material. Instruction has always taken place in village schools with Tsimane' teachers, who receive refresher courses in the Tsimane' language. We say 'striking' because indigenous children in the rest of Bolivia have generally been taught in Spanish. Only with the advent of Bolivia's educational reform during the mid-1980s has the school curriculum for some of the largest indigenous groups, such as the Quechua, Aymara, and Guaraní, started to change so teachers at present instruct using the local language. To support this work, instructional materials in the local language are prepared by Bolivia's Ministry of Education (Contreras & Talavera, 2003). We have been unable to assess the current quality of Tsimane' schooling, but Tsimane' often refer to the years when Tumichuco operated as the golden age of schooling, perhaps because missionaries had direct oversight over the curriculum and its implementation.

## Results

### *Selection of instrumental variables*

We followed two steps to select instrumental variables for the maximum school level achieved by the person interviewed. First, we ran a regression with own schooling as a dependent variable and the following explanatory variables: village of residence during childhood, age, sex, and mother's and father's maximum school grade attained, mother's and father's writing ability, and the perceived physical stature of the same-sex parent relative to physical stature of the respondent. In column [a], Table 3, we show the results of the regression. Second, we regressed each of the three measures of social capital (dependent variables) against the instrumental variables that had borne a statistically significant relation with own schooling in column [a], Table 3. We show those results in columns [b]–[d] of Table 3.

The results of column [a], Table 3, suggest that two instrumental variables—village of residence during childhood and father's writing ability—bore a strong statistical association with measures of own schooling, but not with the three measures of social capital. Each of the two instrumental variables was associated with own schooling at the 95% confidence level or higher in the regression of column [a]; combined, the two instrumental variables also bore a statistically significant association with own schooling ( $F=5.36$ ,  $p=0.005$ ). The last three columns ([b]–[d]) of Table 3 contain regression results with the three measures of social capital as separate dependent variables; as explanatory variables we include own schooling, the significant instrumental variables of own schooling from column [a] of Table 3, and the two control variables, age and sex. Those results suggest that neither of the two instrumental variables alone or together bore a statistically significant relation with social capital. The results suggest that the writing ability of the respondent's father and the respondent's village of residence during childhood provide reasonable, valid instrumental variables when using

Table 3. Testing the adequacy of instrumental variables for own schooling for Tsimane' adults (16+ years of age) in Bolivia, 2004

<i>Explanatory Variables:</i>	<i>Dependent variables:</i>			
	<i>Schooling:</i>	<i>Social capital:</i>		
		<i>Gifts</i>	<i>Labour</i>	<i>Gifts + labour</i>
	<i>[a]</i>	<i>[b]</i>	<i>[c]</i>	<i>[d]</i>
Subject:				
Schooling	^	0.036 (0.151)	0.147 (0.91)*	0.187 (0.138)
Age	-0.108 (.009)***	0.008 (0.022)	0.006 (0.014)	0.008 (0.022)
Male	2.133 (0.275)***	3.768 (1.064)***	3.384 (0.651)***	5.150 (0.981)***
Instrumental variables:				
A. Subject's mother:				
Schooling	0.091 (0.203)	^	^	^
Writing	0.453 (0.979)	^	^	^
Spanish	0.087 (0.254)	^	^	^
B. Subject's father:				
Schooling	-0.010 (0.082)	^	^	^
Writing	1.048 (0.439)**	-1.083 (1.178)	-0.799 (0.705)	-1.335 (1.077)
Spanish	0.052 (0.223)	^	^	^
C. Same-sex parental height relative to subject's height	-0.137 (0.155)	^	^	^
D. Village	-0.007 (0.003)**	0.0005 (0.008)	-0.004 (0.005)	-0.006 (0.008)
Observations:				
Total	493	560	560	560
Left censored	192	527	491	491
Left censored as % of total	38	94	87	87
Pseudo R2	0.117	0.066	0.087	0.079
Joint: F and p>F	5.36 (0.005)	0.43 (0.653)	0.90 (0.407)	1.01 (0.365)

Notes. Regressions are left-censored Tobits with constant (not shown). In cells we show coefficients and, in parenthesis, standard errors. \*, \*\*, and \*\*\* significant at the 10%, 5%, and 1% level. Joint is F test of joint significance for father's writing ability and respondent's childhood village of residence. ^ = variable intentionally left out. Instrumental variables refer to the attributes of the respondent's parents and the respondent's childhood village of residence. Village = village of childhood residence. Schooling under instrumental variables = maximum school grade attained by parent. Spanish refers to parental ability to speak Spanish: 0 = unable, 1 = with difficulty, and 2 = fluent. Writing = parental writing ability: 0 = cannot, 1 = some, and 2 = well. Physical stature relative to their same-sex parent (row C): -1= taller than parent, 0 = same physical stature as parent, and +1= shorter than parent.

own schooling as an endogenous variable to explain variation in personal expressions of social capital.

*The effect of own schooling on own social capital*

Table 4 contains the main regression results. The first three columns contain the regression results without instrumental variables, and the next three columns contain the regression results with instrumental variables. Table 4 contains four noteworthy findings. First, the variable for own schooling did not bear a significant statistical

Table 4. Results of Tobit regressions: effect of schooling on social capital among Tsimane’ adults (16+ years of age) in Bolivia, 2004

<i>Explanatory variables:</i>	<i>Dependent variables – social capital expressed through:</i>					
	<i>Gifts</i>	<i>Labour</i>	<i>Total</i>	<i>Gifts</i>	<i>Labour</i>	<i>Total</i>
	<i>[a]</i>	<i>[b]</i>	<i>[c]</i>	<i>[d]</i>	<i>[e]</i>	<i>[f]</i>
Schooling	0.009 (0.150)	0.127 (0.089)	0.156 (0.136)	-1.494 (1.606)	-0.957 (1.268)	-1.677 (1.920)
Age	0.011 (0.022)	0.009 (0.014)	0.013 (0.022)	-0.068 (0.088)	-0.049 (0.068)	-0.084 (0.103)
Male	3.822** (1.067)	3.428*** (0.652)	5.225*** (0.983)	6.079** (2.720)	5.040** (2.025)	7.949*** (3.040)
Observations						
Total	574	574	574	560	560	560
Left censored	541	505	505	527	491	491
Left censored as % of total	94	88	88	94	88	88
Over-identification	Not applicable			0.939	0.938	0.939
Regression type:	Tobit			Tobit with instrumental variables		

Notes. Cells contain coefficients and, in parenthesis, standard errors. \*, \*\*, and \*\*\* significant at the 10%, 5%, and 1% level. Instrumental variables = respondent’s father’s ability to write and respondent’s childhood village of birth. Over-identification test is p-value from a chi2 distribution (Wooldridge, 2003).

association with any of the three measures of social capital. The conclusion applies whether or not we use instrumental variables.

Second, coefficients from the regressions with instrumental variables differed in size and in magnitude from the coefficients of the regressions without instrumental variables. The regression results of the first three columns without instrumental variables suggest that schooling contributes to social capital. For example, in column [a] an additional year of schooling was associated with 0.009 more gifts given and with 0.12 more episodes of helping and doing communal work in a week (column [b]). Since the average respondent in one week gave 0.10 gifts and helped others or did communal work 0.20 times (Table 2), an additional year of schooling would be associated with an 8.20% increase in gifts given and with a 61.30% increase in episodes of labour help and communal work in a week. Though not statistically significant at the 95% confidence level or higher, the amounts are large and have economic significance. Once we use instrumental variables for schooling, an additional year of schooling was associated with a decrease of 1.49 gifts given and with a decrease of 0.95 in the number of times a respondent helped people of other households or took part in communal work during a week. Using the mean values of gifts and labour help just mentioned, the estimates with instrumental variables imply that schooling would be associated with a 13-fold decrease in gifts given and with an almost five-fold decrease in the number of times a respondent helped people of other households or did communal work.

Third, the information in columns [d]–[e] of Table 4 do not confirm the first two hypotheses. We had hypothesized that schooling would reduce labour help offered and participation in communal work, and that it would be associated with an increase in the amount of gifts given to people of other households. Results in columns [d]–[e] suggest that schooling bore no significant statistical association with gifts given, labour help offered, or with participation in communal work. If we leave aside statistical significance and focus only on the sign and on the size of coefficients, then the information in columns [d]–[e] of Table 4 would support hypothesis 1 (more schooling, less labour help offered), but not hypothesis 2 (more schooling, more gifts given).

To test hypothesis 3 (more schooling, more generosity to non-kin) we restricted the analysis to people who had made gifts, offered help, or done communal work ( $n=66$ ) and ran a probit regression (not shown); we excluded people who had not displayed social capital. The dependent variable took the value of one if respondents had directed their social capital to people of their household, and zero if they had directed their social capital to people outside their household. Probit regressions are appropriate when the dependent variable only takes two values, as in this case. As an explanatory variable we used a binary variable that took the value of one if the person had any schooling and zero otherwise. We did not use instrumental variables nor did we control for other explanatory variables besides schooling because of the small sample size. As hypothesized, we found that schooling was associated with a 16.52% *lower* probability of directing one's generosity toward one's household, but results were statistically insignificant ( $z=1.22$ ;  $p=0.22$ ).

### *Robustness*

To test the robustness of the main results (columns [d]–[f], Table 4), we undertook further analysis, which included the following: (a) dropping the variable for schooling and replacing it with a summary variable for the modern human capital of the respondent, (b) using probit and ordinary least squares regressions instead of using Tobit regressions, and (c) using another definition of social capital.

During the survey we collected information on many dimensions of modern human capital besides the maximum school grade attained by the respondent. Other dimensions of modern human capital included academic skills (measured through objective tests) and competence speaking Spanish (assessed by the interviewer). We found that respondent's maximum school grade attained, fluency in spoken Spanish, and maths, reading, and writing skills correlated highly (Cronbach's  $\alpha = 0.92$ ), so we used principal component factor analysis to create a summary measure for modern human capital and re-estimated regressions [d]–[f] of Table 4 with the new measure of modern human capital instead of using the maximum school grade attained. For the new estimation we used Tobit regressions with instrumental variables and the controls of Table 4. The results of the analysis (not shown) confirmed the results discussed so far. The coefficients for the summary measure of modern human capital bore a negative sign but were statistically insignificant. The coefficients for modern human capital in the three regressions were as follow:  $-2.87$  ( $p=0.35$ ) for gifts given,

-1.42 ( $p=0.53$ ) for labour help offered and communal work, and -2.62 ( $p=0.45$ ) for total social capital (gifts plus labour).

Since dependent variables had a large share of zero values, we transformed them into binary variables and ran probit regressions. We also ran ordinary least squares regressions with the values of social capital used in Table 4. The use of probit regressions with instrumental variables or the use of two-stage ordinary least squares regressions did not alter the main findings of column [d]–[f] in Table 4.

Finally, we dropped the three variables of social capital and used a new variable for social capital. During the survey we asked peoples how often they had consumed *chicha* during the seven days before the day of the interview. This variable had many zero values; 65.26 % of respondents had not consumed *chicha* during the seven days before the day of the interview. We used a Tobit regression with instrumental variables and found that an additional year of schooling lowered by 0.80 the number of times a person drank *chicha* ( $p=0.15$ ) in a week, so the results mesh with the earlier results. That is, as own schooling increases, social capital expressed through *chicha* drinking declined.

## Discussion and conclusion

We end by discussing three topics: (a) the importance of correcting for the endogeneity of schooling when estimating the effects of schooling on traditional cultures, (b) comparison with the results of other studies, and (c) possible reasons for the weak statistical results.

Our results suggest that treating the endogeneity of schooling in a cavalier fashion might produce flawed conclusions about how schooling affects traditional cultures. We saw in columns [a]–[c] of Table 4 that parameter estimates of schooling uncorrected for endogeneity biases yield the impression that schooling contributes to the formation of social capital, consistent with most of the results of Table 1 that schooling and social capital move in the same direction. Nevertheless, parameter estimates corrected for the endogeneity of schooling lead one to the opposite conclusion; as schooling increases, personal expressions of social capital decrease.

How do our results compare with the results of previous studies? The answer depends on how one reads the coefficients of schooling in columns [d]–[e] of Table 4. If we rely chiefly on levels of statistical significance, then we would conclude that once we instrument schooling, schooling produces no significant effect on social capital, and our results would mesh with the results of Seligson (1999) and Henrich *et al.* (2004) in Table 1. If we focus instead on the magnitude and on the sign of the coefficients and leave aside levels of statistical significance, then our results would mesh with the writings of researchers discussed earlier who have found consistent evidence that schooling undermines traditional cultures.

Why did schooling bear such a weak effect on social capital? The answer likely has to do with methods and with substance. First, neither schooling nor social capital had much variance. Recall that the typical Tsimane' had only about two years of schooling and that all variables for social capital contained a large share of zero values. Furthermore, we had a small sample size of observations (574 and 560) for the

regressions of Table 4. In fact, our sample size falls toward the lower end of the sample size of studies in Table 1; only the study by Egerton (2002) had fewer observations than our study. The lack of variance in schooling and in social capital, and the small sample size of observations would weaken results. Second, possible random measurement errors in social capital from faulty recall about acts of generosity during the seven days before the day of the interview would have inflated standard errors and further weakened statistical results. Third, and in a more substantive note, Tsimane' are still in the early stages of continual exposure to the market economy so perhaps not enough time has elapsed for schooling to erode social capital if, in fact, schooling has such an effect. Fourth, unlike other rural areas of developing nations, in the Tsimane' territory all schooling takes place in the Tsimane' language, in traditional villages, by Tsimane' teachers, using a curriculum in the Tsimane' language developed by Protestant missionaries *in situ*. So far, Tsimane' have managed to adapt schooling to their needs and way of life.

What are the likely links between schooling and Tsimane' culture in the future? Tsimane' value schooling and many have started attending night courses in the region, joined the army as a way to gain more schooling and skills in Spanish, or sought further opportunities for education by moving to some of the larger towns in the department of Beni. The increasing demand for schooling by Tsimane' has been matched by an increase in the supply of schools. Several non-government organizations and institutions in the area have started to strengthen or expand schooling opportunities for the Tsimane'. But formal education is not equally accessible to all; people in more remote communities are likely to be worse served than people in communities closer to roads, so one should see increasing disparities in schooling levels and academic skills over the years.

When they return to their territory after studying outside the region, Tsimane' gravitate to the larger towns and seek to emulate the lifestyle of people in towns, or else take up employment with the logging firms. They dress, speak, and behave like townspeople. Until now, schooled Tsimane' have limited themselves to living and working around their territory, but over time they will likely start to migrate to other regions of Bolivia in search of better employment opportunities. We do not know what increasing disparity in school achievement and migration will do to Tsimane' society.

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## Appendix 1. Technical details

*Estimation strategy.* We use multivariate regressions to estimate the effect of schooling on social capital, but we cannot use a standard approach because of the endogeneity biases discussed earlier. We care about the bias from endogeneity because it can affect the sign and size of the coefficient of schooling, and its level of statistical significance. As a result, we proceed in two steps. First, we identify suitable instrumental variables for schooling and, second, we use the instrumental variables to obtain more accurate estimates of schooling’s effect on social capital.

For the first step we use the following expression:

$$[1] \hat{E}_{ihv} = \alpha' + \beta' FW_{ihv} + \pi CVR_{ihv} + \theta C_{ihv} + \varepsilon'_{ihv}$$

In expression [1]  $\hat{E}_{ihv}$  is the predicted schooling level of person *i*, in household *h*, and village (or community) *v*. *FW* and *CVR* are the two instrumental variables that enter directly into expression [1] but not into expression [2]. *FW* stands for father’s writing ability and *CVR* stands for childhood village of residence. *C* stands for two control variables, age and sex.  $\varepsilon'$  is an error term with standard properties.

For the second step, we use the predicted value of schooling,  $\hat{E}_{ihv}$ , from expression [1] to assess the effect of schooling on social capital, *SC*:

$$[2] SC_{jihv} = \alpha + \beta E_{ihv} + \theta C_{ihv} + \varepsilon_{jihv}$$

In expression [2] *SC* stands for social capital,  $\hat{E}$  stands for predicted own schooling from expression [1], and the subscripts *j*, *i*, and *v* stand for the type of social capital

( $j$  = labour help or participation in communal work, and gifts given to people of other households), person ( $i$ ), household ( $h$ ), and village ( $v$ ) or community.  $\varepsilon$  is an error term with standard properties.

We next explain the rationale for selecting the two instrumental variables. Researchers have used parental schooling as an instrumental variable for own schooling when estimating the effects of schooling on the earnings of workers in the USA (Wooldridge, 2003). As we can see, parental modern human capital (measured through the writing ability of the respondent's father) also works reasonably well as an instrumental variable in our sample because it overlaps with a respondent's schooling level, but not with the expressions of social capital of the respondent. The respondent's village of residence during childhood is not endogenous because children do not have much choice of where to live during their childhood when they attend school. Villages far from market towns would have been more likely to lack schools, so people growing up in those villages would have been less likely to attend school.

It is possible that the two instrumental variables might bear a strong association with a person's social capital; if so, one would question the validity of the instrumental variables because, by definition, instrumental variables should not be linked (or only weakly linked) to the outcome of substantive interest (in this case, social capital). For example, parents with more schooling might have discouraged their children from displaying traditional forms of social capital; thus, expressions of social capital of adults would reflect their parents' schooling. It is also possible that role models in the childhood village of residence influenced the displays of social capital of children as adults. Though possible, it is not likely; the associations between the instrumental variables and social capital were weak; and we later present regression results showing that the two instrumental variables bore significant statistical associations with a person's own maximum schooling level, but not with a person's display of social capital.

A large share (88–94%) of the observations for the dependent variable, social capital, had values of zero, as the row 'Left censored as % of total' in Table 4 shows. When the dependent variable has a large share of zero values we speak of censoring or left or lower censoring. Because the outcome variable had a large share of zero values, we used Tobit regressions to estimate expression [2]. Tobit regressions are more appropriate than Ordinary Least Squares regressions when the dependent variable is censored. Since own schooling is endogenous, we also use instrumental variables with the Tobit regressions.