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Can We Trust an Adult's Estimate of Parental School Attainment? Disentangling Social Desirability Bias and Random Measurement Error

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Researchers often need to know the parental school attainment of adult subjects. When researchers cannot ask parents about their school attainment, they must ask adult offspring about the school attainment of their parents. We assess the accuracy of answers provided by adults about the school attainment of their parents with data from a native Amazonian society in Bolivia (Tsimane'). Offspring overestimate the school attainment of their parents. They also report inaccurately other human capital attributes of their parents (e.g., writing skills, fluency speaking Spanish, practical indigenous knowledge of medicinal plants). Results mesh with findings from the United States about the lack of reliability of adults' self-reports about parental school attainment and with prior research among the Tsimane' suggesting significant misreporting of other outcomes (e.g., age, income, parental height).

Keywords: *Amazon; Bolivia; informant accuracy; Tsimane'; reliability coefficient; education; human capital; social desirability bias*

Researchers often need to know the parental school attainment of adult subjects to (1) control for unobserved attributes of subjects (Behrman 1997, 1998), (2) use as instrumental variables for subject's own schooling when

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assessing the payoffs of schooling (Rosenzweig and Wolpin 2000; Wooldridge 2003), (3) detect bias from selective migration or mortality of parents in relation to schooling when estimating secular (long-term) trends of schooling, or (4) assess the representativeness of samples in panel studies (Rosenzweig 2003). When researchers cannot ask the parent of the adult about the parent's school attainment or when they cannot obtain the parent's school record, they must rely on answers from adult offspring about their parents' school attainment.

Without factual verification, researchers cannot determine the accuracy of answers provided by offspring about parental school achievement, but they can estimate the agreement of answers between parent and offspring. High agreement does not imply accuracy because parent and offspring might both provide the same inaccurate information; nor does low agreement imply inaccuracy if the offspring provides accurate information but the parent does not.

Although high agreement does not imply accuracy, low agreement might affect parameter estimates when using parental schooling as an explanatory variable. This will depend on whether low agreement reflects social desirability bias or random measurement error.

SOCIAL DESIRABILITY BIAS

If schooling is a socially desirable trait, respondents might misrepresent themselves and overreport school attainment to project a favorable impression to the surveyor (Fisher 1993; Presser and Stinson 1998). Offspring would overestimate parental school attainment and parents would overestimate their own school attainment. These types of responses will produce inaccuracies in levels of parental school attainment in descriptive statistics but will not bias parameter estimates of parental school attainment when using parental school attainment as a covariate in regression analysis.

RANDOM MEASUREMENT ERROR

If low agreement reflects random measurement errors from, say, faulty recall—some offspring overestimate and others underestimate parental school

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attainment, whereas some parents overestimate and others underestimate their school attainment—then parameter estimates for parental school attainment will contain an attenuation bias. The severity of the attenuation bias will affect inferences we draw about the associations between parental schooling and outcomes.

Drawing on a survey done in 2005 among the Tsimane', a highly endogenous, native Amazonian society of foragers and farmers in Bolivia, we try to accomplish four aims in this article. First, we assess the agreement of answers about a parent's own school attainment given by parents themselves with answers given by their offspring. Second, we assess whether low agreement reflects random measurement error or systematic measurement error, as might happen if people respond to enhance their social desirability. Third, we estimate the consequences of low agreement for empirical research. Fourth, we assess whether offspring report inaccurately other dimensions of parental human capital (e.g., writing skills, ethnobotanical knowledge, language fluency).

Prior research yields unclear guidance about what to expect. More than two decades ago, Bernard et al. (1984) reviewed the anthropological literature on informant accuracy in reporting past events and concluded that informants provided inaccurate answers about half the time. Since the article by Bernard et al. (1984) first appeared, a large literature has emerged trying to explain the sources of informant errors. Errors stem from ambiguities in survey questions, guessing, faulty memory, and intentional over- or underestimation (Fowler 2001).

Research on the agreement of answers by adults of the school attainment of themselves or near kin suggests room for improvement. In a study of adult twins in the United States, Ashenfelter and Krueger (1994) estimated a correlation coefficient of .85 between identical twins in their answers about the school attainment of their parents (mothers = .84; fathers = .86). They found a lower correlation coefficient (.78) between nonidentical twins. Because twins share parents, deviations from a correlation of 1 represent a conservative estimate of measurement error. We say conservative because if parents misrepresent their school attainment to their twins, the true measurement error will exceed these figures (Angrist and Krueger 1999). Angrist and Krueger (1999) reviewed the literature from the United States on how well adult offspring reported the school attainment of themselves over time or how well they reported the school attainment of their near kin. They found that self-reported estimates of school attainment taken from the same adults at different times in their adult life and comparison of answers about the school attainment of adults from answers supplied by the adults themselves and by their adult siblings living elsewhere yielded correlation coefficients between .80 and .94. In Bangladesh, Rosenzweig (2003)

estimated the agreement in answers about the school attainment of adults who left a household, comparing answers by the person who split from the household with answers from adults who remained in the household. He found a correlation coefficient of .84.

In a rural setting of developing nations, there might be reasons to expect high agreement between answers about parental schooling given by parents about their own school attainment and by adult offspring about their parents' school attainment. If people in such societies have low levels of school attainment, they will have a greater likelihood of reporting accurately the school attainment of themselves or their parents because of a narrower range of possible correct choices. Furthermore, in a close-knit society in which people have known each other from childhood onward, respondents might find it difficult to misrepresent their school attainment to local interviewers. However, in such settings, schooling is a rare and valued commodity, serving as a status marker (Akinnsaso 1992; Middleton 2005; Godoy et al. 2007), so one might also expect some people to overestimate their own or their parents' school attainment.

In sum, if we use prior research to inform expectations, then we should expect correlation coefficients in the neighborhood of .80+ for measures of agreement of parental school attainment from answers supplied by parents about themselves with answers supplied by offspring about their parents' school attainment. In a small-scale, highly endogamous rural setting with low levels of schooling, people will likely report accurately their own and their parents' school attainment, particularly if surveyors and subjects know each other.

DATA AND METHODS

Data for the article come from a survey done during June–September 2005 among all households ($N = 252$) in thirteen Tsimane' villages along the Maniqui River, province of Beni, Bolivia. The survey formed part of a panel study in progress dating back to 1999 (Godoy et al. 2005). Three experienced interviewers from the highlands of Bolivia and three Tsimane' translators who had participated in the study from the beginning did the survey.

We first asked all women ($N = 322$) and men ($N = 328$) over the age of 16 to report the maximum school grade they had completed. We chose 16 as the cutoff age because Tsimane' typically set up an independent household by that age; we use the term *adult* to refer to people over 16 years of age. We coded the variable in integers so that it matched the maximum number of years of school completed (e.g., 0 = *no schooling*, 6 = *6 years of*

schooling). We then asked people to report separately the maximum school grade attained by their mother and father. We coded answers to the two questions about the parental school attainment of each parent in the same way we coded answers about own school attainment, except that we used the code 99 when respondents said they did not know the school attainment of a parent.

Because some adults had parents in the sample, we could compare answers provided by the offspring with answers provided by the parent. Slightly less than half of the adults in the study had a mother in the sample (women = 48.59%; men = 45.25%), and about 40% of the adults had a father in the sample (women = 41.12%; men = 40.49%). Of the parents who were not in the sample, ~57% had died, ~12% lived in communities that did not form part of the panel study, and the rest (~31%) had lost touch with their offspring.

The Tsimane'

The Tsimane' number ~8,000 people and live in more than 100 villages along riverbanks and logging roads, mostly in the department of Beni, Bolivia. Like many native Amazonian societies, Tsimane' practice cross-cousin marriage (e.g., a man marries his mother's brother's daughter) and are highly endogamous. In our sample, <1% belonged to another ethnic group.

Subsistence centers on hunting, plant collection, fishing, and slash-and-burn farming (Vadez et al. 2004). In recent publications, we provide ethnographic and historical background information on the Tsimane' (Godoy et al. 2006b; Godoy et al. 2000c); here we summarize prior research on how Tsimane' adults report on the area of forest they clear for agriculture, their age, their parents' standing physical stature, and their income. We then provide a brief sketch of schooling among the Tsimane'.

Forest Clearance

In an earlier publication in this journal, we assessed the accuracy of adult self-reports of the size of farm plots cleared from the forest (Vadez et al. 2003). A trained research team used a tape and a compass to measure each field ($N = 36$) cleared in 1999 by twenty-five households in two villages. About 4–5 months after they had cleared the forest, we asked the plot owners and the male head of the household to estimate the area of each plot they had cleared. We found a high correlation between estimates from informants and the research team. The plot owner provided more accurate information than the male head of the household. Measurement errors bore a negative association with an informant's level of schooling and a positive association with field size.

Own Age

In 2001, we asked 4,657 adults for their age and recorded the date of the interview (Godoy et al. 2006a). Because Tsimane' typically lack birth certificates, many guessed when answering. We returned about a year later and asked the same people the same question, even though we knew their age had increased by ~1 year. Because we recorded the exact date of the first interview in 2001, we could estimate the elapsed time from the first interview in 2001 to the second interview in 2002. Only 20% of adults reported age consistently between the two interviews. Consistency does not imply accuracy, as people may have guessed their age during the first interview and stuck to the estimate during the second interview. A quarter of the sample reported an age that represented an increase of more than a year and a half. For example, a person who had reported being 20 years old in June 2001 would have reported being 21 years and 6 months old in June 2002. Fifty-five percent of the people reported an age that represented a decrease of more than 6 months. In sum, the evidence suggests that estimates of self-reported age among Tsimane' adults contain substantial random rather than systematic measurement errors—some adults overestimated their age and others underestimated it.

Parental Height

In 2005, we asked 268 women and 287 men 20+ years of age whether their mother was taller, of the same height, or shorter than they and to estimate the height difference by marking on a paper the perceived difference (Patel et al. 2007). We repeated the question for the father. More than half the sample reported inaccurately the height of their same-sex living parent, with a tendency by both women and men to report no difference in height when, in fact, significant differences existed.

Income

As part of the 2005 survey, we asked 611 adults to report their monetary earnings and the value of goods received in barter for two periods in the past: (1) the 7 days before the day of the interview and (2) the 8–14 days before the day of the interview. Average income should not have differed significantly between the two periods because one expects high intrasubject correlation over a period of only 2 weeks. We found considerable forward telescoping bias when reporting income. People brought forward to the more immediate past (last 7 days) income earned farther back in time (8–14 days before the day of the interview) and imputed the latter income to the

7 days preceding the interview. The value of sales, wage earnings, and goods received in barter were 52%, 85%, and 8% higher for the 7 days preceding the interview than for the 8–14 days before the day of the interview. Within-subject Pearson correlation coefficients between the two periods were as follows: sales = .07, barter = .42, and wage earnings = .68.

In sum, Tsimane' provide accurate estimates of field size but provide inconsistent data about their own age and inflated estimates of income from the recent past.

Schooling

The first recorded contact of Tsimane' with Westerners dates back to the 17th century, but continual exposure to Westerners dates back only to the 1940s when Protestant missionaries from the United States 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 missionaries the responsibility of schooling remote native Amazonian populations such as the Tsimane' (Castro Mantilla 1997). The agreement between the Bolivian government and Protestant missionaries lasted from 1954 until 1985. As part of the agreement, missionaries in 1955 set up a center in the town of Tumichuco, several days away from the Tsimane' territory, to train Tsimane' to become bilingual schoolteachers and to translate the Bible into Tsimane'. 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' teachers could proselytize in Tsimane' when they returned to their villages.

After 27 years of operating in Tumichuco, missionaries transferred the training center to the town of San Borja, which lies next to the main Tsimane' territory. After receiving training, Tsimane' returned to their villages, where they worked as lay missionaries and teachers using instructional materials in Tsimane' prepared by missionaries. In 1985, when the agreement with the government of Bolivia ended, the government took over the responsibility for educating Tsimane', which meant keeping Tsimane' as schoolteachers and paying their salary. 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. Of the villages in the sample, one has a permanent

high school, and two offer a high school degree to adults who attend classes 1 week a month.

Despite nearly five decades of exposure to schools, Tsimane' adults have low levels of schooling, with men having more schooling than women. The average adult in the sample had completed 1.99 years of schooling (standard deviation [SD] = 2.41). The average woman had completed 1.25 years of schooling (SD = 1.51), but 44.14% of women had no schooling. In contrast, the average man had more than twice as many years of schooling (mean = 2.72 years; SD = 2.88) as the average woman. Only 28.52% of men had no schooling. Ninety-one percent of men but only 51% of women knew some Spanish, and 49.82% of men but only 12.11% of women spoke fluent Spanish.

Elsewhere, we show that schooling bears no significant association with monetary earnings after controlling for standard covariates (Godoy et al. forthcoming). Among Tsimane', schooling might produce no large monetary returns because of poor school quality and the absence of technological innovations in farming. We have no data on school quality, but we have data to suggest that Tsimane' continue to farm using traditional farm technologies (Vadez et al. 2004). The Tsimane' area has yet to experience a technological transformation in farming. In rural areas of developing nations, demand for schooling increases with the introduction of technological innovations in farming because the innovations increase the premium of mastering academic skills, which farmers need to decode the information in the new technology (Foster and Rosenzweig 1996). We return to the significance of this point later when interpreting results.

In closing this section, we discuss briefly the social desirability of schooling because it might lead Tsimane' to overestimate their own and parental school attainment. In 2002, we asked parents whether they thought it important for their children to attend school; 98.23% said "yes," suggesting that even in this remote rural society, parents perceive schooling as a desirable trait. About 15% of our adult sample (females = 9.94%; males = 19.51%) attended school 1 week/month in selected villages at the time of the survey as part of the government program of adult education.

MAIN RESULTS

Offspring were more uncertain about the school attainment of their fathers than of their mothers. About 10% of offspring (daughters = 9.97%; sons = 10.74%) did not know the school attainment of their fathers, but only 3.12% of daughters and 4.59% of sons did not know the school attainment

TABLE 1
Over- and Underestimation by Offspring (16+ Years of Age) when
Reporting Parental School Attainment: Tsimane', 2005

<i>Offspring Reporting</i>	<i>Agreement</i>	<i>Offspring Estimates the School Attainment of:</i>			
		<i>Mother</i>		<i>Father</i>	
		<i>N</i>	<i>%</i>	<i>N</i>	<i>%</i>
1. Daughters and sons:					
	Underestimate	23	7.82	26	10.74
	Accurate	243	82.65	164	67.77
	Overestimate	28	9.52	52	21.49
	Total	294	100.00	242	100.00
2. Daughters:					
	Underestimate	8	5.26	13	11.02
	Accurate	131	86.18	83	70.34
	Overestimate	13	8.55	22	18.64
	Total	152	100.00	118	100.00
3. Sons:					
	Underestimate	15	10.56	13	10.48
	Accurate	112	78.87	81	65.32
	Overestimate	15	10.56	30	24.19
	Total	142	100.00	124	100.00

of their mothers. When matching responses from parents with responses from offspring, we exclude offspring who did not know the school attainment of their mother or father.

Table 1 (section 1) suggests that a higher share of offspring agreed with their mothers about the latter's school attainment (82.65%) than with their fathers about the school attainment of their fathers (67.77%). The results mean that of the combined sample of daughters and sons, 17.35% provided answers about the school attainment of their mothers that did not match the responses of mothers, and 32.23% provided answers about the school attainment of their fathers that did not match the responses of fathers.

We estimated Pearson correlation coefficients to assess agreement about parental school attainment between answers supplied by offspring and parents (Table 2). Daughters and sons showed greater agreement when reporting the school attainment of their fathers than when reporting the school attainment of their mothers. The correlation coefficients for the school attainment of fathers were .82 (daughter-father) and .88 (son-father), whereas the correlation coefficients for the school attainment of mothers

TABLE 2
Pearson Correlation Coefficients of Parental School Attainment as Reported
by Adult Offspring (16+ Years of Age) and Parent: Tsimane', 2005

<i>Parent Reporting</i>	<i>Offspring Responding</i>	
	<i>Daughter</i>	<i>Son</i>
Mother	.74 (<i>N</i> = 152)	.54 (<i>N</i> = 142)
Father	.82 (<i>N</i> = 118)	.88 (<i>N</i> = 124)

were only .74 (daughter-mother) and .54 (son-mother). Even with the highest correlation coefficient (son-father = .88), the correlation deviates from 1 or perfect correspondence, and two of the other correlation coefficients were as low as .54 (son-mother) and .74 (daughter-mother), implying considerable disagreement.

We next compare answers between daughters and sons. Table 1 (sections 2–3) suggests that daughters were more likely to agree with answers from their parents than sons. For example, section 2 suggests that 86.18% of daughters provided estimates of the school attainment of their mothers that agreed with the estimates of the mothers and 70.34% of daughters provided estimates of the school attainment of their fathers that agreed with the estimates of their fathers. Only 78.87% of sons supplied estimates that matched the estimates of their mothers, and 65.32% of sons supplied estimates that matched the estimates of fathers. Chi-square tests comparing responses between daughters and sons about the school attainment of mothers and fathers produced no statistically significant results (mothers: $\chi^2 = 3.42$, $p < .18$; fathers: $\chi^2 = 1.10$, $p < .57$).

We next assess the direction of the bias. Offspring overestimated the school attainment of their parents, particularly their fathers, consistent with what we might expect from the literature on social desirability. For example, Table 1 (section 1) suggests that of the combined sample of daughters and sons, 9.52% and 21.49% overestimated the school attainment of their mothers and fathers, whereas only 7.82% and 10.74% underestimated the school attainment of their mothers and fathers. A chi-square test with the pooled sample (daughters and sons) comparing responses about the school attainment of mothers and fathers produced statistically significant results ($\chi^2 = 9.53$, $p < .04$). Section 2 of Table 1 suggests that 8.55% of daughters overestimated the school attainment of their mothers

and 18.64% overestimated the school attainment of their fathers. A chi-square test comparing the answers of daughters about the parental school attainment of their mothers and fathers produced no statistically significant results ($\chi^2 = 1.73, p < .78$). Sons (section 3) overestimated only their fathers' school attainment; 24.19% of sons overestimated the school attainment of their fathers. A chi-square test comparing the answers of sons between their mothers and fathers produced statistically significant results ($\chi^2 = 13.41, p < .009$).

Because the most prevalent bias in Table 1 has to do with offspring overestimating the school attainment of their parents, we next describe the magnitude of the net overestimation. We define net overestimation as the maximum school grade completed by the parents as reported by the offspring minus the maximum school grade completed by the parent as reported by the parent. Because we are dealing with relatively small samples, we focus on median rather than mean differences. Among daughters, the net median overestimation was 1 year of schooling for mothers and 1 year of schooling for fathers. Among sons, the net median overestimation was 1 year of schooling for mothers and 2.5 years of schooling for fathers. For the pooled sample (daughters and sons combined), the net median overestimation was 2 years for either mothers or fathers. Since the typical Tsimane' adult in our sample reported having completed 1.99 years of school, a net median overestimation of school achievement of 2 years for parents by offspring represents a large bias.

Does Table 1 provide support for social desirability bias? It depends. True, the share of offspring who overestimated parental school attainment is generally larger than the share of people who underestimated parental school attainment, as discussed in the previous paragraph. That said, note that the share of people who underestimated varied from 5.26% to 11.02% and that, at least in one case (sons reporting on mothers), the share (10.56%) equals the share of the sample who overestimated. Because the share of people who underestimated is far from 0, it is possible that lack of agreement might reflect random measurement error. These descriptive figures suggest that both random measurement error and social desirability bias may be operating. Later, we offer a more formal test to try to disentangle the two possibilities.

In Table 3, we use regression analysis to assess the direction of offspring bias while conditioning for selected covariates. In the regressions of Table 3, we include as outcomes the estimate by the offspring of the school attainment of their mother (section A) or father (section B). As covariates, we include the parent's self-assessed school attainment and the age, sex, and school attainment of the offspring. Rows 1a–1b suggest that reports by the

parent and the offspring about the school attainment of the parent bore a positive association, but offspring overestimated the school attainment of their parents, as shown by the positive coefficients. The results dovetail with the more descriptive analysis presented earlier. For example, the coefficient for the self-reported school attainment of a mother (section A [1]) or a father (section B [1]) suggests that an increase of 1 year in the school attainment reported by the parent was associated with the offspring saying that their mothers had 2.67 more years of school (section A [1]) and that their fathers had 1.21 more years of school (section B [1]).

Regression analysis disaggregated by sex (columns [2]–[3]) produced essentially the same coefficients as the coefficients for the pooled sample; daughters and sons both overestimated the school attainment of their parents by about the same amount. For example, an additional year of schooling reported by the mother was associated with her daughter saying that her mother had 2.46 more years of schooling (section A [2]); the same increase in a mother's self-reported schooling was associated with her son saying that his mother had 2.77 more years of schooling (section A [3]).

Complete agreement would have produced regression coefficients of 1 for the self-assessed school attainment of parents (rows 1a–1b). In row 6 of Table 3, we show the results of an *F* test to assess whether the coefficients of parental self-reports of school attainment equaled 1; in all cases, we reject the hypothesis that the coefficients equal 1 at the 95% confidence level or higher.

ADDITIONAL ANALYSES

We did other analyses to assess agreement between parents and offspring in the following other dimensions of human capital of the parents: writing skills, fluency speaking Spanish, and practical indigenous knowledge of medicinal plants. Unlike parental school attainment, with these dimensions, we had objective measures for parents, so we can assess the accuracy with which offspring reported these dimensions of their parents' human capital.

We asked participants whether their parents could write and coded answers as follows: 0 = *cannot*; 1 = *some*; 2 = *well*; 3 = *do not know*. We also asked them about the ability of their parents to speak Spanish and coded answers as follows: 0 = *none*; 1 = *some*; 2 = *fluent*; 3 = *do not know*. Last, we asked offspring to compare themselves to their parents in knowledge of how to use medicinal plants and coded answers as follows: 1 = *parent knows more than offspring*; 2 = *parent and offspring know the same*;

3 = *offspring reports knowing more than the parent*; 4 = *offspring does not know who knows more (parent or self)*.

To obtain objective measures of these dimensions, we followed several steps. To assess writing skills, surveyors asked people to sign their name on a white piece of paper under broad daylight during the interview. Interviewers coded answers as follows: 0 = *cannot*; 1 = *some*; 2 = *well*. During the interview, surveyors judged a person's ability to speak Spanish as follows: 0 = *none*; 1 = *some*; 2 = *fluent*. To measure practical knowledge of medicinal plants, we asked subjects whether they had ever used three medicinal plants. None of the questions was purposefully false. We added the number of positive responses to arrive at a total score of practical ethnobotanical knowledge.

Pearson correlation coefficients between the estimate of the offspring and the estimate for the parent were low. The reliability coefficients were as follows: offspring-father Spanish = .20; offspring-mother Spanish = .41; offspring-father writing = .68; offspring-mother writing = .08; offspring-father plant knowledge = .04; and offspring-mother plant knowledge = .05. Regressions (not shown) similar to the regressions of column [1], Table 3, suggests that daughters and sons significantly underestimated both their parents' ability to speak Spanish, overestimated their father's ability to write, and overestimated knowledge of medicinal plants of both their mother and father. Of the six outcomes, offspring provided accurate estimates only on the writing ability of their mothers.

DO ERRORS IN PERCEIVED PARENTAL SCHOOLING MATTER?

Errors in perceived parental schooling will matter for empirical research depending on whether the measurement error is random rather than systematic and whether the variable for parental schooling is an outcome or an explanatory variable. If measurement error is random and parental schooling enters the right side of the equation, then the errors will attenuate the coefficients; if errors are random and parental schooling enters the left side of the equation, then standard errors will rise, but the parameter estimates will not change much. If the error is systematic, as implied by the social desirability literature, then this will influence descriptive, summary statistics of the variables but should not change significantly the parameters. In particular, if parental schooling is an explanatory variable, and people consistently overestimate their parent's schooling, as seems to be the case here, then parameter estimates of parental schooling with offspring and parents' reports should not differ.

TABLE 4
 Regressions of Daily Income (Dependent Variable) on Own and Parental Schooling among Tsimane' 16+ Years of Age, 2005

Explanatory Variable	Females (N = 150)		Males (N = 117)	
	[A]	[B]	[A]	[B]
Schooling, own	1.04	0.91	-0.25	-0.25
Schooling, parental				
Daughters report on mothers	4.62	^	NA	NA
Mothers report on themselves	^	-1.48	^	^
Sons report on fathers	NA	NA	-0.32	^
Fathers report on themselves	^	^	^	-0.83***
Age	0.20*	0.08	-0.13	-0.16
Constant	9.98*	15.65***	31.17***	32.50***
R ²	.07	.01	.009	.03

NOTE: Regressions are ordinary least squares clustered by household. Samples exclude offspring uncertain of the schooling of their same-sex parent. ^ = variable intentionally left out. NA = not applicable. Daily income expressed in *bolivianos* (1 USD ~ 8 bolivianos in 2005). Income includes monetary earnings from sales and wage work, value of goods received in barter, transfers received, and value of goods produced for own consumption.
 * $p \leq .10$. *** $p \leq .01$.

We next test whether the two forms of parental schooling—as reported by the parent and by the offspring—produce an attenuation bias. If the measure of parental school attainment by offspring produces a significant attenuation bias, then this would imply that the error is chiefly random rather than systematic; if the parameters from the two different sources of parental school attainment (by parent and by offspring) resemble each other, this would support a social desirability interpretation.

To explore the topic, we estimate the association between the daily income of people 16+ years of age (outcome) and the schooling of the same-sex parent (covariate). Other covariates include the subject's age and schooling. We ran two separate regressions for each sex: In one regression, we include the reported schooling level of the same-sex parent as a covariate; in the other, we use the parent's self-reported schooling level, also as a covariate (Table 4).

The regression for men (column A) suggests that an additional year of schooling was associated with 0.32 less *bolivianos/day* ($p < .355$) (1 USD ~ 8 bolivianos in 2005) when using father's schooling, as perceived by the offspring as a covariate, but the regression in column B with parent's self-reported schooling level as a covariate produces a negative coefficient three

times larger and statistically significant (coefficient for father's schooling = -0.83 ; $p < .003$). Among females (column A), an additional year of schooling for the mother, as perceived by the daughter, was associated with 4.62 more bolivianos in daughter's earnings ($p < .33$), but an additional year of schooling, as reported by the mother, was associated with 1.48 less bolivianos ($p < .19$) in daughter's earnings. The results suggest that measurement errors by offspring of the schooling level of their parents produce nontrivial biases in estimations when using parental schooling as a covariate. They suggest that the bias reflects random measurement errors from processes such as faulty recall and guessing more than from social desirability.

DISCUSSION AND CONCLUSIONS

Sections 2–3 of Table 1 suggest that only 65.32%–86.18% of offspring supplied answers about parental school attainment that agreed with answers given by parents. Depending on the sex of the parent and offspring, 14%–35% of answers lacked agreement. The main bias consisted of overestimating the school attainment of parents; yet the share of people who underestimated was nontrivial. The descriptive statistics and the regression results of Table 3 suggest that both daughters and sons overestimated the school attainment of their mothers by ~ 2 years and of their fathers by ~ 1.2 years. Besides showing low agreement, offspring reported inaccurately other dimensions of parental human capital for which we had objective measures.

The findings mesh with two bodies of research. First, the findings are in line with prior work among the Tsimane', which suggested inconsistency reporting own age, forward telescoping bias reporting own income, and inaccuracy reporting parental height. Second, the findings agree with studies from the United States reviewed earlier, showing that adults display low agreements when reporting the school attainment of themselves and their near kin. Table 2 suggests that the agreement coefficients when reporting the school attainment of fathers ranged from .82 (daughters reporting on fathers) to .88 (sons reporting on fathers), roughly similar to the reliability coefficients found in the United States and Bangladesh when adults reported the school attainment of others (.80–.94). See above.

The fact that the correlation coefficients of parental school attainment as reported by offspring and by the parent of the offspring are roughly comparable to the correlation coefficients in the United States and Bangladesh suggests that the cause for less-than-perfect agreement cannot reflect aspects unique to the Tsimane'. Less-than-perfect agreement likely reflects

random measurement error in reported answers and overestimation by offspring, parent, or both.

But what might explain inaccuracy (not merely disagreement) in estimating other dimensions of parental human capital? We have no convincing explanation but sketch three hypotheses. First, Tsimane' may face a high incidence of marital breakups and serial marriages. If so, children might grow up having sporadic contact with their parents and few chances to get firsthand information about the human capital attributes of their parents. We lack data to test the hypothesis but doubt it applies because Tsimane' unions seem stable. Second, parents may have misrepresented themselves to their offspring and pretended to have more human capital skills than they had. Although possible, this explanation would not account for why Tsimane' did not report accurately other human capital attributes of their parents that they could experience directly (e.g., parents' ability to speak Spanish). Third, people might tend to remember accurately events that have economic and social significance; knowing each other's human capital attributes might not be useful in daily life. We noted earlier that schooling does not provide significant monetary returns, so Tsimane' may have weak incentives to learn about each other's human capital attributes. The contrast between the lack of precision with which Tsimane' report human capital attributes of their parents and the accuracy with which they report field size is instructive. Field size plays an important economic role in the daily life of Tsimane' because it determines the amount of crops the household will have for sale and consumption. Having an accurate estimate of field size has implications for the inputs the households will allocate over the course of the farming cycle; mismeasurement of fields could lead to economic inefficiencies, with real economic costs. Not so with mismeasurements of human capital attributes of parents.

It is possible that adults in other rural settings of developing nations will report accurately the human capital attributes of their parents, but this case study suggests that researchers should exercise caution when using data about parents obtained from adult offspring because the variables will likely contain noise. As noted, the consequences of disagreements or errors are non-trivial when using perceived parental schooling as an explanatory variable.

Because lack of agreement will likely reflect a mix of social desirability bias and random measurement errors, solutions will vary. If the main source of error is social desirability bias, then one might temper the bias by including in the research team local translators or surveyors native to the area who know the subject. This might put a lid on the tendency to misrepresent oneself. If lack of agreement reflects random measurement error from faulty recall, then one might use aids to memory.

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