

**ON THE MEASURE OF INCOME AND THE ECONOMIC
UNIMPORTANCE OF SOCIAL CAPITAL
Evidence from a Native Amazonian
Society of Farmers and Foragers**

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KEY WORDS: Amazon; Autarky; Bolivia; Income; Foragers; Horticulturalist; Insurance; Tsimane’

Economists equate economic self-sufficiency (autarky) with low income and stress the economic role of social capital as a form of self-insurance in poor rural areas of developing nations. In contrast, anthropologists speak of the “original affluence” of foragers and see social capital as serving economic and social roles. Economists do not work with highly autarkic peoples such as part- or full-time foragers, and cultural anthropologists have not provided formal, comprehensive estimates of income or of the monetary value of social capital in highly autarkic societies. Drawing on data from 611 adults of 244 households in 13 villages of a highly autarkic society of swidden farmers, hunters, and gatherers in the Bolivian Amazon, the Tsimane’, we present measures of personal income and of the monetary value of social capital. Daily personal income reaches US \$2.35–3.52, which is above the international poverty line of US \$1–2, on a par with the income in the rest of Bolivia, and three times higher than the income in the rest of rural Bolivia. The Tsimane’ do not have low income, at least not when compared with their rural neighbors. Social capital in the form of gifts and labor services

Journal of Anthropological Research, vol. 63, 2007

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received from the rest of the village accounted for a small share of daily personal income (<5%) and did not get activated to any great degree when people suffered a mishap. In sum, the study uncovers a more nuanced picture of well-being in a relatively autarkic society. People in such a society enjoy relative affluence, invest in social capital for social more than for economic reasons, but cope with adversity largely on their own.

IN RURAL AREAS OF DEVELOPING NATIONS, personal income refers to the value of goods and services accruing to a person over a specified period of time, such as a day or a year. It comes chiefly from three sources: (a) market transactions (e.g., sale of goods and services, rental income), (b) consumption of goods produced by the household, and (c) transfers. So defined, income bears a positive association with many dimensions of well-being (e.g., health, schooling) across a wide range of societies (Ray 1998). Because it contributes to many dimensions of well-being, economists have spent much effort refining methods to measure income (Deaton 1997).

Despite considerable attention being paid to measuring income, economists have paid scant attention to measuring income in rural societies with substantial economic self-sufficiency (autarky), such as societies of part- or full-time foragers or societies of swidden farmers. Economists do not collect primary data or do primary research in such societies—hence the neglect. Cultural and evolutionary anthropologists study such societies but have neglected to develop formal methods to obtain quantitative measures of income because income does not figure prominently in evolutionary or anthropological theory. Furthermore, as substantivist anthropologists have long stressed, the measure of income in societies with tenuous links to the market economy poses empirical challenges owing to the difficulties of separating income from consumption, supply from demand, and kinship from the economy.¹ Under these conditions, researchers have found it difficult to find valid methods for assigning monetary value to goods and labor (Deaton 1997; Netting 1993; Sahlins 1968, 1972). The absence of quantitative estimates of income in societies with a high degree of economic self-sufficiency deserves to be remedied for several reasons.

First, mainstream economic trade theory suggests that people in autarky should have low income (Bhagwati 2002),² but researchers have yet to test the idea with data from a highly autarkic society. The link between low income and autarky goes against the spirit of what anthropologists have learned about foraging societies before markets envelop them (Wiessner 2004b). Sahlins (1968) spoke of the “original affluent society” of foragers because they had ample leisure, but it is also possible to find that foragers have high income after some of the methodological hurdles mentioned earlier are overcome. An empirical estimate of income in a highly autarkic society would allow one to test competing hypotheses from economics and from anthropology about one dimension of well-being before highly autarkic societies strengthen their links with the market economy.

Second, anthropologists have long stressed the ubiquity of social capital in highly autarkic societies (Henrich et al. 2002; Malinowski 1922; Sahlins 1972),

but have yet to provide quantitative estimates of the contribution of social capital to income. Researchers have equated social capital with social networks, cultural norms, and behaviors that stand for civic-mindedness, such as sharing, reciprocity, and participation in civic organizations (Durlauf and Fafchamps 2005).³ We equate social capital with gifts and with labor help received from other households because these expressions of generosity are the most important forms of social capital in foraging-horticultural societies and because behavior is a more reliable indicator than cultural norms (Glaeser et al. 2000). Economists and anthropologists differ in their expectations about the contribution of social capital to income in highly autarkic societies.

Anthropologists using evolutionary theory (Hill and Kaplan 1993; Sugiyama 2004; Sugiyama and Chacon 2000; Sugiyama and Sugiyama 2003) and economists (Carter and Maluccio 2003; Dercon 2004; Morduch 1995, 2004) stress the economic importance of social capital in rural societies and see social capital as a way of mitigating idiosyncratic risks, or misfortunes that hurt only the individual (e.g., illness, poor luck in hunting). Wiessner (1986, 2004a) notes that social capital might also protect foragers against adverse covariant shocks, or misfortunes affecting many communities or a large area. She describes how the floods of 1974 in the territory of the Ju/'hoansi !Kung wreaked havoc on foraging but did not harm nutritional status because foragers migrated to live with long-distance exchange partners residing beyond the area affected by the floods.

But other anthropologists have noted that social capital might not necessarily contribute to income or protect consumption in highly autarkic societies because people in such societies might use many strategies besides social capital to self-insure (Baksh and Johnson 1990). Rural people self-insure by (a) taking precautionary steps before shocks strike (e.g., diversifying production); (b) relying on own saving or assets, migration, wild foods, or social capital after shocks strike; or (c) doing both (Cashdan 1985). The contribution of social capital to income will depend on the role of social capital within a broad suite of insurance strategies. It will also depend on whether society has well-placed mechanisms for punishing people who renege on their social obligations (Sugiyama and Chacon 2000) and on the strength of kinship bonds within the group.

If the flow of goods and services from other households to the household of the person suffering a mishap does not increase after a mishap, then one could conclude that social capital plays more of a social than an economic role or that people self-insure through other means besides social capital. The two views of social capital are not incompatible; social capital could serve as a safety net and contribute to personal income while serving as social glue. The empirical challenge lies in assessing which of the two roles predominates in a society.

Drawing on cross-sectional data from a highly autarkic society of farmers and part-time hunters and gatherers in the Bolivian Amazon, the Tsimane', with a history of continual exposure to Westerners dating back only to the late 1940s, in this article we have three aims: (a) to estimate of level of personal daily income, (b) to estimate the share of social capital in personal daily income, and (c) to assess the role of social capital in cushioning people against adverse shocks.

THE TSIMANE'

The Tsimane' number ca. 8,000 people and live in more than 100 nucleated villages along riverbanks and logging roads, mostly in the department of Beni, Bolivia. Like many native Amazonian societies, the Tsimane' live in small villages with much face-to-face daily interaction. Villages in our sample had an average of 24 households (s.d. = 10.88).

The location of households in villages and house construction facilitate visibility and social interactions. Within a village, related families live around an open courtyard. In villages closer to market towns people have started to put walls around their houses and locks on their doors so those outside cannot see inside the house. In remote villages houses often lack walls so any passerby can see most of a household's material possessions. During a survey in 2002 we counted the number of walls outside each house. We found that in remote villages houses had an average of 2.50 walls (s.d. = 1.60), but a quarter of houses had no walls. In villages closer to market towns houses had an average of 3.30 walls (s.d. = 1.20), and only 9.00% of the houses had no walls. The ease of visibility is higher than these figures suggest because Tsimane' keep many durable goods in their kitchens, and 71.43% of kitchens had no walls.

Tsimane' practice cross-cousin marriage. Residence is matrilocal shortly after marriage, followed by neolocal or independent postmarital residence. Polygyny in the past, the Tsimane' today mostly practice monogamy and live in nuclear households, run jointly by a wife and a husband. Only 10% of the households were run by just one parent (8% headed by a single female and 2% headed by a single male). Households had an average of 6.23 people (s.d. = 2.85), made up of 2.66 adults (s.d. = 1.10) and 3.59 children (s.d. = 2.31), defined as people less than 16 years of age not heading their own household.

Neolocal postmarital residence plus preferential cross-cousin marriage creates a wide and thick tangle of relatives linked by blood and marriage potentially available for social support. Thirty-six percent of female and 39% of male heads of households in our sample lived in their village of birth, hinting that adult women and men each likely benefit from social support of people known since childhood.

Elsewhere we describe Tsimane' traditional forms of reciprocity and sharing and note that they have a generous and a stingy side (Brabec et al. 2007; Reyes-García et al. 2006). Households share with other households a wide range of goods, including tools, medicines, and cooked and raw foods, and help each other in many subsistence tasks. Any Tsimane' can walk into a household drinking *chicha* (a fermented beverage) and expect to be served. On the other hand, Tsimane' will turn their backs when they eat to avoid sharing (Ellis 1996), have started to put walls around and locks on their homes to prevent theft, and have scored low in experimental games designed to assess prosocial behavior (Henrich et al. 2004). Their myths describe how humans stole crops from supernatural beings who had refused to share their crops. In one myth darkness envelops the earth, causing a collapse in the local food supply and much female and infant mortality. Myths also speak of sons refusing to share food or *chicha* with their siblings and elder parents.

Tsimane' subsistence centers on swidden farming, hunting, plant collection, and fishing (Vadez et al. 2004). More reliant on foraging in the past, Tsimane' have increased their dependence on swidden farming both to meet household food demands and to earn cash, principally through the sale of rice. Sixty-nine percent of the household energy intake comes from their farm plots, and 7% comes from wild animals and fish.

The first recorded contact of Tsimane' with Westerners goes back to the seventeenth century, but continual exposure to Westerners dates back only to the late 1940s. Mobile, scattered, decentralized, and politically acephalous, Tsimane' avoided sedentary living in Catholic missions or in Spanish towns until the twentieth century. The history of the Tsimane' through the seventeenth and eighteenth centuries is peppered with attacks against Catholic missionaries and Spanish towns (Chicchón 1992; Ellis 1996). We do not have information to assess how the rubber, quinine, and mineral booms of the nineteenth and early twentieth centuries in Bolivia affected the Tsimane', but they probably had a weaker effect than among neighboring native Amazonian groups because Tsimane' lived in small, scattered, and mobile settlements, making it hard for employers to recruit Tsimane' as laborers (Chicchón 1992). Also, the Tsimane' territory lacks rubber trees. The boom in pelts (1940–1970) affected some Tsimane' communities, but not enough to cause dislocation of settlements or modes of production; Tsimane' acquired firearms, but continued to sell pelts and buy goods in their own villages rather than relocate to new settlements (Jones 1995).

The 1950s produced a torrent of socioeconomic changes in the department of Beni. The changes included the establishment of permanent Catholic and Protestant missions, the expansion of cattle ranches, the construction of landing strips to transport beef to the highlands, and the building of roads across the Tsimane' territory as part of a government policy to thin out the highlands by encouraging migration to the lowlands (Jones 1995; Riestler 1993).

Agents of change have included missionaries and, more recently, encroachers such as loggers, cattle ranchers, colonist farmers, and traveling traders (Godoy et al. 1998). Encroachers hire Tsimane', buy crops and forest goods from them, and supply Tsimane' with commercial goods and credit. Non-governmental organizations started to work in the area during the late 1980s in projects related to health, education, farming, land demarcation, and the sale of forest goods (Añez 1992). To earn monetary income, Tsimane' work as unskilled laborers in cattle ranches, logging camps, and in the lands of colonist farmers, or else sell forest and farm goods. Sale of goods takes place when traveling traders arrive at the village, or in towns when Tsimane' take goods there to sell.

Despite five decades of intermittent exposure to the market economy and Westerners, Tsimane' remain highly autarkic. Goods bought in the market account for only 2.68% of the total value of household consumption of goods. As we shall see, 49.70% of adult women, 77.86% of adults in the bottom income quintile, and 45.30% of adults living far from the market town did not earn any monetary income during the two weeks before the day of the interview.

DATA AND METHODS

The data come from a survey done during June–September 2005 among all households ($n = 244$) in 13 Tsimane' villages straddling the Maniqui River in the province of Beni. The survey formed part of a panel study dating back to 1999 (Godoy et al. 2005). We do not use data from previous surveys because we did not ask about the economic value of social capital in those surveys.

The surveyed villages differ in their proximity to the closest market town (San Borja; population ca. 19,000). Experienced interviewers and translators who had been part of the panel from the start did the 2005 survey. We collected data on income only from persons 16+ years of age because younger people still depend on their parents. We estimated income levels among people less than 16 years of age only if they headed a household. The final sample with information on personal income comprised 661 people (women = 334, men = 327). When we include children, the total sample reached 1,540 people (females = 744, males = 796).

Mindful of the empirical difficulties when quantifying income in societies with tenuous links to the market economy, we equate income with the value of the following five components: (a) wage labor and sale of goods, (b) goods received in barter, (c) monetary remittances received, (d) consumption of animal wildlife extracted by the household and consumption of crops from the household's plots, and (e) social capital (gifts and labor help received from other households). We estimated the monetary value for each of the five components as follows.

(a) Wage Labor and Sale of Goods

We first asked people to list the monetary value of all the goods they had sold and all the earnings they had received from wage labor for the 7 days before the day of the interview, and we then asked them the same questions for the period from 8–14 days before the day of the interview. We limited the recall period to two weeks to reduce measurement error from recall bias.

(b, c) Goods Received in Barter and Monetary Remittances Received

We asked people to list all the goods and the value of each good they had received in barter during the 7 days before the day of the interview, and we repeated the questions for the period from 8–14 days before the day of the interview. Because remittances were so infrequent (95.61% of respondents had not received remittances), we did not divide the recall period for remittances into the preceding 7 days and the preceding 8–14 days. Instead, we asked one question about the total value of all monetary remittances received during the 14 days before the day of the interview. Ten people or 1.47% of the sample received the government pension (Bonosol) for people 65+ years of age (US \$248/year/person).⁴ We exclude the pension from the estimation because few had received it and because the high level of the pension would have distorted mean tendencies. Later we discuss the consequence of the omission.

(d) Consumption of Animal Wildlife Extracted by the Household and Consumption of Crops from the Household's Plots

We measured food consumption at the household level by asking the two household heads jointly to indicate the amount of selected farm crops (plantains, manioc, rice, and maize) and animal wildlife (game, fish, and birds) consumed by the household during the 7 days before the day of the interview. These goods Tsimane' typically produce or procure on their own from the forest or from their farm rather than buy. We focus on the value of consuming these goods rather than on the value of consuming other foods because Tsimane' might have bought other foods in the market. Had we included the value of purchased foods, then we would have counted the value of food consumption twice because we would already have included the money to buy the foods when estimating monetary earnings (see section *a* above). We restricted the recall period to the preceding 7 days before the day of the interview (instead of two weeks) to reduce omission bias.

To estimate the value of farm crops consumed we asked village leaders about the most recent village selling price for the crop. If villagers had not sold a crop recently, we asked about the sales price for the crop for the preceding three months. All villages had price data for farm crops. Because Tsimane' rarely sell animal wildlife, we had to find a proxy for the price of wild animals. To do so, we asked about the village selling price of one wild bird (pava [*Penelope jacquacu*]), two game animals (deer [*Mazama americana*] and jochi pintado [*Agouti paca*]), and two fish (sábalo [*Prochilodus cf. nigricans*] and surubi [*P. fasciatus*]) that Tsimane' sell in towns. We used the price of these animals to assign values to other types of game, fish, and birds. If the village lacked a selling price for a wild animal or fish, we computed the value using the average price for the good from the other villages in the sample. The validity of this method hinges on how well integrated the villages' economies are with one another. Estimated values are likely fragile because only two villages had prices for birds, six for deer, and seven for birds or for *Agouti paca*.

(e) Social Capital: Gifts and Labor Help Received from Other Households

We asked about all the gifts and all the unremunerated labor help received from non-kin during the 7 days before the day of the interview. We valued gifts received using village prices. Estimates of the amount of labor help received were converted to person-days of help, which, in turn, were converted to monetary values using the village daily wage. Employers pay with money or with goods, and some add a meal as part of the wage. To estimate the value of labor help received we used the average of the two village daily wages: with and without food. The mean daily wage without food in the 13 villages was 28.84 bolivianos (s.d. = 3.62; min. = 25, max. = 35), 19% higher than the mean daily wage with food (mean = 24.23 bolivianos, s.d. = 3.44; min. = 20, max. = 30) (8.00 bolivianos = US \$1, August 2005).

Since the recall period used to estimate income varied between 7 and 14 days for parts *a*, *b*, *c*, and *e*, we estimated the daily value for these components by dividing their total amount by either 7 or 14 days. We added the daily figures for

a, *b*, *c*, and *e* to arrive at an estimate of total daily personal income that excluded daily food consumption. To add an estimate of the value of daily food consumption for each person we divided the total value of household food consumption (*d*) for the previous 7 days by the number of people in the household at the time of the survey, and we then divided the result by 7 days. Adding estimates *a–e* expressed per person per day yields an estimate of the total daily personal income in bolivianos for an adult.

To arrive at estimates of personal daily income for all people in the household, including children, we followed three steps. First, we added estimates *a*, *b*, *c*, and *e* for all the adults in a household and we then added the daily value of total household food consumption (*d*). Second, we made adjustments for the different recall periods to express the estimates in terms of daily values for each household. Last, we divided the total daily value of a household by either (1) the number of people in the household or (2) the male-adult equivalents in the households.

Male-adult equivalent refers to the notion that people differ in their energy requirements as a function of their sex and age, so a child might represent a fraction of an adult in terms of energy requirements. We calculated the energy requirements using the most recent FAO-WHO protocol (FAO-WHO-UNU 1985; James and Schofield 1990). The FAO-WHO method determines energy needs based on body size and on typical activity levels. This has become the preferred approach for determining food and energy requirements since dietary recalls do not accurately reflect variation in food and energy requirements. The reference category for estimating adult equivalents was a male 18–59 years of age.

The estimates of daily income in bolivianos were converted into US dollars by dividing the value in bolivianos by the local exchange rate at the time of the study. We multiplied the income figures in US dollars by Bolivia's latest Purchasing Power Parity index (2.77) as computed by the International Monetary Fund's World Economic Outlook Database.⁵ Purchasing Power Parity refers to the amount of foreign currency needed to buy a standard basket of goods in a foreign nation that in the USA would cost a fixed number of dollars (e.g., \$1). The measure allows one to control for differences across countries in the costs of living that are not captured by the market exchange rate.

BIASES IN ESTIMATE OF INCOME

Our estimate of income contains biases working in opposite directions, producing a net bias of unknown magnitude and direction.

Biases That Lower Income

We underestimated true income because self-reports of income likely exclude the value of goods stolen. Tsimane' engage in petty theft within their villages. When asked to report all the misfortunes they had experienced during the 12 months before the day of the interview, Tsimane' said they often had goods stolen: 12.11% of responses had to do with theft or with the loss of objects. If respondents reporting consumption did not include goods they had stolen, or if they sold or swapped the goods they stole and did not include the value of the sales when

reporting monetary earnings or the value of goods received in barter, then daily personal income will be underestimated.

A second source of downward bias has to do with the use of a narrow range of foods to measure consumption. Recall from our discussion of household consumption that we only measured the value of selected farm and forest goods. Had we included the other, non-traded domesticated and wild plants and animals Tsimane' routinely use for food, construction, medicines, and other ends (Reyes-García et al. 2005), we would have obtained a higher level of income.

A third source of a downward bias has to do with possible omissions when recalling gifts and free labor help received. If gift giving and other expressions of prosocial behavior permeate daily life, people may have forgotten to mention all the gifts and help received, particularly if they took place outside the household. For example, people are often offered food and chicha when visiting other households; respondents may have failed to take into account these events when responding about all the gifts and help received. We return to the significance of this point later. A related omission bearing on social capital has to do with our failure to measure other possible expressions of social capital as a form of income (e.g., informal income from having served in a village position or from having helped a third party sponsor a festivity). We doubt this latter point introduces a large bias because any return for holding office would accrue in the form of labor, gifts, or remittances received, all of which we measured.

Last, we did not ask about other possible sources of income, such as rental income, and we did not include income from government pensions. We doubt the omissions introduce much bias since Tsimane' do not rent goods or land, and only 1.47% of the sample received government pensions.

Biases That Increase Income

Two biases likely increased the estimate of income. First, our estimate of income came from information collected during the dry season, roughly from May until October. In an earlier panel study covering five consecutive quarters (May 2002–July 2003) we found that the value of sales, wage earnings, and goods received in barter during the dry season were 44%, 17%, and 22% higher, respectively, than during the rest of the year.

Second, average income should not have differed significantly between the two periods—the preceding 7 and 8–14 days before the day of the interview—because with a large sample one expects high intra-subject correlation of income over a period as short as two weeks. Instead, we found considerable forward telescoping bias. People brought forward to the more immediate past (preceding 7 days) income earned farther back in time (8–14 days before the day of the interview). The value of sales, wage earnings, and goods received in barter were 52%, 85%, and 8% higher, respectively, for the 7 days before the day of 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 follow: sales = 0.07, barter = 0.42, and wage earnings = 0.68. The results suggest that figures for wage earning were most reliable, and figures for sales least reliable.

Biases with Unclear Effects on Income

Two biases produced unclear effects on income. First, data on age contained random measurement errors because most adults did not have a birth certificate and provided educated guesses when estimating their age (Godoy et al. 2006a). Random measurement error in the estimate of age would affect estimates of daily income based on adult-male equivalents.

The second source of error has to do with estimation techniques. Since the area has inchoate markets for labor and products we had to assign values for many goods received in barter, gifts and help received, and farm crops and animal wildlife consumed. It is possible that the techniques described above may have produced higher or lower estimates than the true value of the goods and services.

RESULTS*Level of Daily Personal Income of Adults*

In Table 1 we present estimates of the level and composition of income for the pooled (women + men) sample of people 16+ years of age. Three results stand out.

First, section A of Table 1 suggests that the average Tsimane' adult had a daily personal income of 26.13 bolivianos (s.d. = 21.15) or \$3.26. Daily personal income reached \$9.05 when expressed with the index of Purchasing Power Parity. Second, sections B and C suggest that 36% of adults (238 of 611) had no monetary earnings. Adults who earned monetary income (section C) had a mean daily personal income of 31.99 bolivianos (\$3.99), twice as high as the mean daily personal income of adults who earned no monetary income (15.72 bolivianos; \$1.96) (section B). Third, for the pooled sample (section A) most (59.08%) income came from the value of consuming farm crops and animal wildlife, followed by monetary earnings (31.52%) from the sale of goods (17.56%) and from wage labor (13.96%). Goods received in barter accounted for only 2.79% of daily personal income, and social capital—gifts and labor help received—accounted for 3.74% of daily personal income. Among people without monetary income, 90.26% of daily personal income came from the value of consumption (section B).

Composition of Daily Personal Income of Adults in Relation to Sex, Income Quintiles, and Town Proximity

The information in Table 2 (section B) suggests that in the pooled sample women earned 21.29 bolivianos, 31% less than men, who earned 31.08 bolivianos. Half (49.70%) of the women, but only 22.01% of the men, had no monetary earnings. The most striking difference between women and men in the composition of their daily personal income has to do with the share of consumption and monetary earnings in daily personal income. Among women, the value of consumption accounted for 72.19% of daily personal income, whereas among men the value of consumption accounted for 49.90% of daily personal income. Among women, monetary earnings accounted for only 17.51% of daily personal income, but among men monetary earnings accounted for 41.40% of daily personal income. Monetary remittances, barter, and social capital accounted

TABLE 1
Composition of daily personal income among Tsimane' adults, 2005,
in bolivianos, US dollars, and Purchasing Power Parity (PPP)

Item	Bolivianos			US dollars		PPP	
	Mean [a]	s.d. [b]	% [c]	Mean [d]	s.d. [e]	Mean [f]	s.d. [g]
A. Pooled sample (<i>n</i> = 661)							
1. Monetary earnings							
Sales	4.59	12.11	17.56	0.57	1.51	1.59	4.19
Wages	3.65	8.83	13.96	0.45	1.10	1.26	3.06
Subtotal	8.25	15.01	31.52	1.03	1.87	2.86	5.20
2. Barter	0.73	2.35	2.79	0.09	0.29	0.25	0.81
3. Remittances	0.71	7.50	2.71	0.08	0.93	0.24	2.60
4. Social capital							
Gifts	0.42	1.47	1.60	.05	.18	0.14	0.51
Labor	0.56	3.30	2.14	.07	.41	0.19	1.14
Subtotal	0.98	3.70	3.74	0.12	1.08	0.34	1.28
5. Consumption	15.44	8.69	59.08	1.90	1.08	5.35	3.01
Total	26.13	21.15	100.00	3.26	2.64	9.05	7.33
B. Adults without monetary earnings (<i>n</i> = 238)							
1. Monetary earnings							
Sales				Not applicable			
Wages				Not applicable			
Subtotal				Not applicable			
2. Barter	0.39	1.19	2.48	0.04	0.14	0.13	0.41
3. Remittances	0.71	8.46	4.51	0.08	1.05	0.24	2.93
4. Social capital							
Gifts	0.19	0.59	1.20	0.02	0.07	0.06	0.20
Labor	0.23	1.63	1.46	0.02	0.20	0.08	0.56
Subtotal	0.42	1.77	2.66	0.05	0.22	0.14	0.61
5. Consumption	14.19	0.04	90.26	1.77	1.13	4.19	3.13
Total	15.72	14.70	100.00	1.96	1.83	5.45	5.09
C. Adults with monetary earnings (<i>n</i> = 423)							
1. Monetary earnings							
Sales	7.18	14.51	22.44	0.89	1.81	2.49	5.03
Wages	5.71	10.50	17.84	0.71	1.31	1.98	3.64
Subtotal	12.90	17.09	40.28	1.61	2.13	4.47	5.92
2. Barter	0.93	2.79	2.90	0.11	0.34	0.32	0.96
3. Remittances	0.70	6.92	2.18	0.08	0.86	0.24	2.39
4. Social capital							
Gifts	0.55	1.77	1.71	0.06	0.22	0.19	0.61
Labor	0.75	3.93	2.34	0.09	0.49	0.26	1.36
Subtotal	1.30	4.40	4.05	0.16	0.55	0.45	1.52
5. Consumption	16.14	8.42	50.45	2.01	1.05	5.59	2.91
Total	31.99	21.98	100.00	3.99	2.74	11.08	7.61

PPP=2,839. Exchange rate: 8 bolivianos = US \$1. Household size was used to determine consumption/person. Consumption is measured by summing the daily value of maize, rice, plantains, manioc, pigeon peas, and all animal wildlife consumed by the household during the 7 days before the interview and then dividing by the total number of people residing in the household at the time of the interview.

TABLE 2. Composition (%) of daily personal income among Tsimane' adults, 2005, by sex, income quintiles, and proximity to market

	Sex		Income Quintiles					Proximity to Market	
	Women	Men	≤20%	20 – ≤40%	40 – ≤60%	60 – ≤80%	>80%	Close	Far
	[a]	[b]	[c]	[d]	[e]	[f]	[g]	[h]	[i]
Observations (n)	334	327	131	133	131	132	134	288	373
A. Level of income in bolivianos from different sources									
1. Monetary earnings									
Sales	3.34	5.88	0.34	1.50	2.57	4.27	14.12	6.94	2.78
Wages	0.39	6.99	0.06	0.43	1.40	4.51	11.72	3.72	3.60
Subtotal	3.73	12.87	0.41	1.94	3.97	8.78	25.84	10.67	6.39
2. Barter	0.49	0.99	0.32	0.22	0.62	1.06	1.44	0.94	0.57
3. Remittances	0.62	0.80	0.01	0.02	0.06	0.26	3.13	0.83	0.61
4. Social capital									
Gifts	0.46	0.38	0.14	0.23	0.41	0.39	0.91	0.49	0.36
Labor	0.60	0.52	0.11	0.02	0.14	0.30	2.20	1.04	0.19
Subtotal	1.06	0.90	0.26	0.26	0.56	0.69	3.11	1.53	0.56
5. Consumption	15.37	15.51	7.36	12.39	15.70	18.76	22.82	17.70	13.69
Total income									
Mean	21.29	31.08	8.38	14.86	20.93	29.58	56.36	31.69	21.84
s.d.	18.07	22.89	2.44	1.87	1.73	3.48	28.30	24.63	16.83
% without monetary earnings	49.70	22.01	77.86	48.12	34.35	12.87	7.46	23.95	45.30
B. Share (%) of total income from different sources									
1. Monetary earnings									
Sales	15.68	18.91	4.05	10.09	12.27	14.43	25.05	21.89	12.72
Wages	1.83	22.49	0.71	2.89	6.68	15.24	20.79	11.73	16.48
Subtotal	17.51	41.40	4.76	12.98	18.95	29.67	45.84	33.62	29.20
2. Barter	2.30	3.18	3.81	1.48	2.96	3.58	2.55	2.96	2.60
3. Remittances	2.91	2.57	0.11	0.13	0.28	0.87	5.55	2.61	2.79
4. Social capital									
Gifts	2.16	1.22	1.67	1.54	1.95	1.31	1.61	1.54	1.64
Labor	2.81	1.67	1.31	0.13	0.66	1.01	3.90	3.28	0.86
Subtotal	4.97	2.89	2.98	1.67	2.61	2.32	5.51	4.82	2.50
5. Consumption	72.19	49.90	87.82	83.37	75.01	63.42	40.48	55.85	62.68
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

"Close" and "far" mean below and above median village-to-town distance.

for roughly the same share of daily personal income among women and men. Among women, monetary remittances, barter, and social capital accounted for 2.91%, 2.30%, and 4.97% of daily personal income, respectively, whereas among men monetary remittances, barter, and social capital accounted for 2.57%, 3.18%, and 2.89% of daily personal income, respectively.

The composition of daily personal income changed in systematic ways as one moved from the lowest to the highest income quintiles (Figure 1 and columns c to g on Table 2). First, the share of monetary earnings in daily personal income increased from 4.76% in the bottom quintile to 45.84% in the top quintile. Second, the share of consumption in daily personal income fell from the bottom quintile, where it accounted for 87.82% of daily personal income, to the top quintile, where it accounted for 40.48% of daily personal income. Monetary remittances accounted for a low share of daily personal income in the pooled sample, but they accounted for a progressively larger share of daily personal income as one moved from the bottom quintile (0.11%) to the top quintile (5.55%). We cannot fully explain why remittances represent such a large share in the top quintile; it could reflect a combination of greater consumption expenditures, debts, and investments. That is, people with more income might have wanted to make greater outlays in consumption or investments, or wanted to cancel debts, and so requested—and got—remittances from others to meet those needs. The share of barter or social capital in daily personal income showed no clear trend across income quintiles. The share of income from social capital fell and increased in the bottom four quintiles and reached an apex among people in the top quintile, where it accounted for 5.51% of daily personal income.

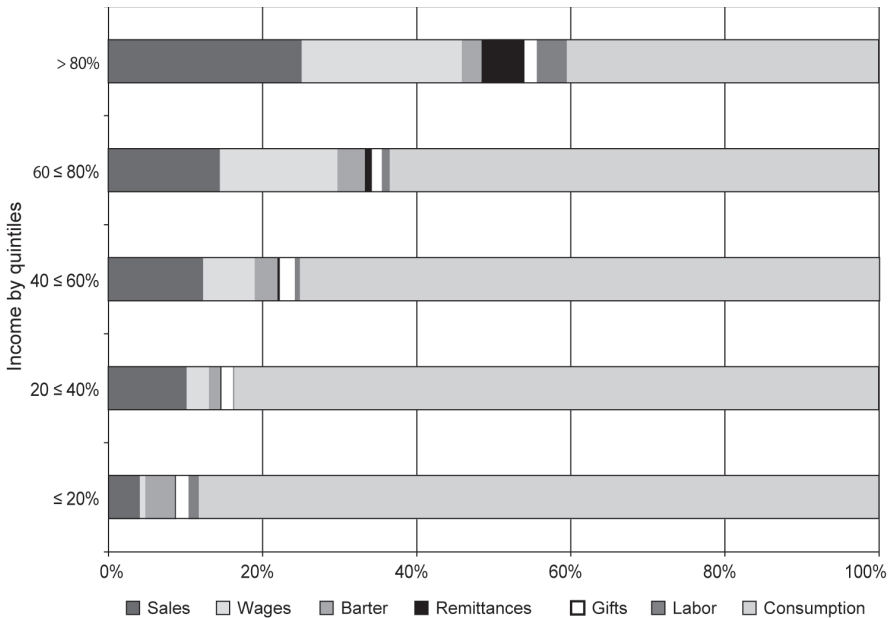


Figure 1. Composition (%) of daily personal income among Tsimane' adults by income quintiles.

Last, columns h and i suggest that people who lived far from the market town had a daily personal income of only 21.84 bolivianos, 31% lower than people who lived near the market town, who had a daily personal income of 31.69 bolivianos. Slightly under half (45.30%) of the people far from the market town had no monetary earnings, but only 23.95% of people close to the market town had no monetary earnings. The composition of income did not differ in visible ways in relation to town propinquity. Among adults near the market town, monetary earnings and social capital accounted for 33.62% and 4.82% of daily personal income, respectively, whereas among adults far from the market town monetary earnings and social capital accounted for a respective 29.20% and 2.50% of daily personal income. Among adults far from the market town, barter and consumption accounted for 2.60% and 62.68% of daily personal income, respectively, but among adults near the market town barter and consumption accounted for a respective 2.96% and 55.85% of daily personal income.

Level of Personal Income for All People in the Household

In Table 3 we provide estimates of daily personal income for all people in the household, including children. Two findings stand out.

First, if we use a head count to estimate household size, as is done in section A of Table 3, then estimates of daily personal income reach 18.86 bolivianos, or \$2.35. Expressed with the index of Purchasing Power Parity, daily personal income reaches \$6.53. If, instead, we use male-adult equivalents to proxy for household size, as is done in section B, then estimates of daily personal income reach 28.19 bolivianos (\$3.52), or \$9.77 using the index of Purchasing Power Parity.

The second finding has to do with the composition of income. As seen in Table 1 (column c), in Table 3 (parts A and B) we see that the largest share of daily personal income for the entire population continued to come from the value of consumption (75.55–75.73%), followed by monetary earnings (18.76–18.58%). Barter, monetary remittances, and social capital accounted for only 1.69–1.73%, 1.59–1.63%, and 2.22–2.23% of daily personal income, respectively, which is consistent with the findings presented earlier.

Contribution of Social Capital to Income and Self-Insurance

The information in Tables 1–3 suggests that social capital accounted for a small share of daily personal income. For the pooled sample of adults (column c, Table 1), the share reached 3.74%, and for the pooled sample of all people, including children, (column c, Table 3) the share was even lower (2.22%). The share of daily personal income that came from social capital among women, men, people of different income levels, and people living far and close to the market town ranged from an average of ~2% to 5%.

The evidence on social capital we have presented may be accurate but incomplete. The monetary value of social capital may not reflect its economic importance if social capital serves as self-insurance. We therefore next examine the role of social capital in cushioning people against adverse idiosyncratic shocks.

TABLE 3
Composition of daily personal income among all Tsimane', 2005, in bolivianos,
US dollars, and Purchasing Power Parity (PPP) ($n = 1,540$)

Item	Bolivianos			US dollars		PPP	
	Mean [a]	s.d. [b]	% [c]	Mean [d]	s.d. [e]	Mean [f]	s.d. [g]
A. Household size = head count							
1. Monetary earnings							
Sales	1.98	3.46	10.49	0.24	0.43	0.68	1.20
Wages	1.56	2.61	8.27	0.19	0.32	0.54	0.90
Subtotal	3.55	4.25	18.76	0.44	0.53	1.23	1.47
2. Barter	0.32	0.60	1.69	0.04	0.07	0.11	0.20
3. Remittances	0.30	3.86	1.59	0.03	0.48	0.10	1.34
4. Social capital							
Gifts	0.18	0.46	0.95	0.02	0.05	0.06	0.16
Labor	0.24	1.30	1.27	0.03	0.16	0.08	0.45
Subtotal	0.42	1.43	2.22	0.05	0.17	0.14	0.49
5. Consumption	14.25	7.74	75.55	1.78	0.96	4.94	2.68
Total	18.86	11.21	100.00	2.35	1.40	6.53	3.88
B. Household size = male-adult equivalents							
1. Monetary earnings							
Sales	2.96	5.18	10.50	0.37	0.64	1.02	1.79
Wages	2.28	3.59	8.08	0.28	0.44	0.79	1.24
Subtotal	5.24	6.14	18.58	0.65	0.76	1.81	2.13
2. Barter	0.49	0.95	1.73	0.06	0.11	0.17	0.33
3. Remittances	0.46	6.12	1.63	0.05	0.76	0.16	2.12
4. Social capital							
Gifts	0.28	0.71	0.99	0.03	0.08	0.09	0.24
Labor	0.35	1.82	1.24	0.04	0.22	0.12	0.63
Subtotal	0.63	2.05	2.23	0.07	0.25	0.21	0.71
5. Consumption	21.35	11.40	75.73	2.66	1.42	7.40	3.95
Total	28.19	16.54	100.00	3.52	2.06	9.77	5.73

PPP = 2,839; 8 bolivianos = US \$1

During the survey we asked adults to list *all* misfortunes they had experienced during the 12 months before the day of the interview, and for each misfortune we asked them how they had coped. In only 11.66% of the 223 episodes of misfortunes did people rely on unrelated persons for help; most people weathered the mishap on their own. The results are not unique to the 2005 survey. In an earlier panel study over five consecutive quarters (1999–2000) with all households ($n = 42$) in two villages we asked the same two questions each quarter. We found that most households (82.08%) weathered mishaps on their own, without help from others (Godoy et al. 2006b).

DISCUSSIONS AND CONCLUSIONS

To conclude we turn to the queries motivating the article: Do people in a highly autarkic society of foragers and farmers have low income? Does social capital account for a large share of personal income? Does social capital protect against mishaps?

Do People in a Highly Autarkic Society of Foragers and Farmers Have Low Income?

The information in Table 3 suggests that for the total sample, including children, daily personal income in US dollars ranged from a low of \$2.35 to a high of \$3.52; the range depends on how one expresses household size. Is this a reliable estimate of income? During the 1999–2000 panel study over five quarters in two villages we measured income among all households by doing monthly income surveys and weigh days (Godoy et al. 2002). On weigh days we identified, counted, weighed, and valued all goods entering households from 7 AM until 6 PM on a day chosen at random each quarter. On those days we also asked about the provenience of goods (e.g., bought, gifts). We found that mean personal daily income reached \$0.90, about half the current estimate of \$2.35. The difference between the two estimates five years apart could reflect a rise in prices and wages and the inclusion of aspects of income ignored in the earlier study (e.g., monetary remittances, social capital).

The present estimate of daily personal income (\$2.35–3.52) lies above the international poverty line of \$1–2 and puts the Tsimane' at the same level of income as the rest of Bolivia. The latest (1999–2001) official information on income in Bolivia puts personal daily income at \$2.44, but personal daily income in rural areas of the highlands and valleys reaches only \$0.83 (Jiménez and Lizárraga 2003).⁶ The comparison is not entirely valid because the measure of income for Bolivia includes only monetary earnings, whereas our measure takes into account the value of consumption from a household's own production. That said, the figures allow for a first comparison, but they also help explain encroachment into the Tsimane' territory by outsiders.

The highlands and valleys of Bolivia have a long tradition of participating in the market economy, dating back to the sixteenth century, when they started to supply labor and goods to the Spanish crown. Compared with the rest of rural Bolivia, Tsimane' fare better. However, the fact that Tsimane' have income levels three times higher than rural dwellers in the rest of Bolivia helps to explain why almost no Tsimane' leaves the Tsimane' territory, and why, on the contrary, people from the rest of Bolivia move into the Tsimane' territory (Godoy et al. 1998).

Does a daily personal income of \$2.35–3.52 mean Tsimane' live in affluence? The answer depends on the currency used to measure income and on the point of comparison. A daily personal income of \$2.35–3.52 translates into much higher levels of daily personal income (\$6.53–9.77) if one uses the index of Purchasing Power Parity. Furthermore, a daily personal income of only \$2.35–3.52, though low by absolute international standards, is three times higher than the income of people in the rest of rural Bolivia. If people judge their own well-being based on that of their neighbors—that is, if people use their relative standing rather than their level of income to assess their well-being—then a daily personal income of \$2.35–3.52 would make the Tsimane' feel affluent relative to their neighbors. An important query for future research centers on what might account for the relative affluence of Tsimane'. Possible answers include abundance of natural resources and local knowledge of natural resources developed over generations, which enables them to use the resources. Unfortunately, we did not explicitly ask the Tsimane' to compare their well-being relative to that of other Bolivians.

At present, many members of foraging societies feel marginalized and inferior compared with people in the rest of the nation (Wiessner 2004b). In sum, we find stronger support for Sahlin's idea that people in relative autarky might live in relative affluence than for the idea from standard trade theory that equates autarky with low income.

Does Social Capital Account for a Large Share of Personal Income?

When we examine the pooled sample, and when we break up the sample by sex, income quintiles, or proximity to market town, we find that social capital accounted for a small share of daily personal income. Even among people without any monetary income (section B, Table 1), social capital accounted for only 2.66% of daily personal income.

Is ours a reliable estimate of the financial value of social capital? Again, we turn to the 1999–2000 panel study of two villages. Analysis of data from weigh days suggests that gifts and remittances accounted for 6.88% of the value of consumption of all goods in the household. Column a of Table 3 suggests that gifts and remittances during the 2005 survey accounted for 3.36% of food consumption [$3.36\% = (0.30 + 0.18) / 14.25$]. The difference in estimates between the two surveys (6.88% in 1999–2000 vs. 3.36% in 2005) might reflect one or more of the following: decline in prosocial behavior between 1999–2000 and 2005, greater measurement errors in 2005 from omissions of gifts when asking people to recall gifts received during the 7 days before the day of the interview, and a greater value for food consumption during 2005 because the survey took place during the dry season. Note, though, that the higher financial value of social capital in the earlier study still amounts to only 6.88% of consumption. We may have underestimated the share of social capital in daily personal income, but even if we make generous allowances and double the share of social capital in daily personal income, that share would still amount to only ~7.00%.

Our finding that social capital accounts for a small share of personal income contrasts with the work on transfer by economists. For example, Cox and Jimenez (1990) found that private transfers between households in developing nations accounted for 20–50% of income. It also contrasts with the case study from the !Kung San during the flood of 1974 (Wiessner 1986), which suggests that foragers increased their dependence on exchange partners living far away.

Does Social Capital Protect Against Mishaps?

We found evidence that social capital did not get activated in times of need. This finding meshes with results of studies by economists in low-income rural areas of developing nations, which suggest that informal transfers provide incomplete insurance in times of need (Dercon 2004; Morduch 2004; Rosenzweig 1988). It also meshes with what we know about the vulnerability of foragers to seasonal changes in the supply of food. In a recent article we review the anthropological literature on vulnerability to the seasonal supply of food among full- and part-time foragers and find that anthropometric indicators of short-run nutritional status (e.g., body-mass index) changed across seasons in response to the availability of food (Godoy et al. 2006b). If social capital or other forms of self-insurance

afforded complete protection, then we should have seen no significant change in anthropometric indicators across seasons, but that does not seem to be the case. In another study, we show that a 10% increase in the coefficient of variation (s.d. / mean) of rainfall, a proxy variable for climatic risk, during years 2–5 of a woman's life was associated with 2–3 cm shorter physical stature as an adult. Exposure to climate risk early in life left a lasting imprint on a long-run indicator of nutritional status. Again, if social capital protected in full against climate risk, we should have seen no association between exposure to rainfall variability early in life and adult height. Even among the Yora and Shiwiari hunters and gatherers of the Peruvian Amazon studied by Sugiyama and Chacon (2000:389), injury and illness produced “substantial” drops in consumption despite widespread sharing and reciprocity of meat. Clearly, social capital is present in societies heavily dependent on foraging, such as the Yora and Shiwiari, and in societies displaying a more balanced mix of farming and foraging, such as the Tsimane' or the Matsigenka of the Peruvian Amazon (Baksh and Johnson 1990), but social capital does not insure people in full.

Why might this be the case? First, it is possible that government transfers reduce incentives to rely on each other (Cox and Jimenez 1990). Among the Ju'hoansi of Nyae Nyae in the Kalahari, who farm and forage, government pensions during 2002 accounted for 7% of personal cash income (Wiessner 2004:154) and may have contributed—along with government employment (36% of income) and restrictions on long-term movement—to a decline in the number of exchange partners. We doubt this line of thinking explains the lack of reliance on social capital to brook mishaps, however, because only 1.47% of our sample had access to government pensions for older people.

Second, focusing on illness and injury, Sugiyama and Sugiyama (2003) suggest that foragers help the ill and injured, but only if the latter have previously displayed generosity. If they are right, then in a society with low levels of generosity we would not expect the rest of society to offer a helping hand in times of need. Tsimane' scored low in prosocial behavior during a laboratory experiment (Henrich et al. 2004), so the explanation of Sugiyama and Sugiyama might apply.

Third, Tsimane' might not need to rely on social capital because they have access to other forms of self-insurance. Baksh and Johnson (1990) discuss the wide range of strategies—some social, some related to subsistence practices—used by the Matsigenka, an Amazonian society of horticulturalists and foragers in Peru, to self-insure against adverse risks. The strategies included such things as (a) over-production and storage of crops; (b) reliance on hardy perennials, tubers, and wild plants resistant to pests, diseases, and floods; and (c) maintaining small, self-reliant, mobile, very autonomous households. The Tsimane' also use these strategies. It is possible that among the Tsimane' the availability of some of these other forms of self-insurance plus a weak ethos of prosocial behavior reduce incentives to extend help to needy neighbors. Baksh and Johnson (1990) compare the strategies to self-insure between two Matsigenka communities and find that households in one community self-insured mainly by building up a stock of surplus food or own savings, which they drew down in times of need, and the other community relied more heavily on social support from other households. In

a wide-ranging review of the literature on social responses during food shortages and famines across cultures, Dirks (1980) finds much variation in the use of social capital to cope with adversity, and cross-cultural evidence to support the idea that reliance on social capital increases during the early stages of low-level food shortage, but then declines. He speaks of an “accordion effect,” with social capital expanding when food is plentiful and contracting when food is in short supply.

Irrespective of the possible causes for social capital not figuring more prominently in times of need, our finding goes against the view of economists and evolutionary anthropologists who see material underpinning in prosocial behavior and instead supports a more cultural interpretation of social capital, at least in this mixed farming-foraging population. Generalized sharing and reciprocity probably contribute to group cohesion, signal status, and give people a sense of belonging and fairness, as Wiessner (1986, 2004a, 2004b) and Baksh and Johnson (1990) point out. But unlike societies that depend heavily on foraging, such as the !Kung San, among the Tsimane’ social capital does not contribute much to income or serve as a significant form of self-insurance in times of need, consistent with the wide range of forms used by native Amazonians to self-insure (Baksh and Johnson 1990).

In sum, this study uncovers a more nuanced picture of well-being in a farming-foraging society. People with a weak toehold in the market economy enjoy relative affluence, invest in social capital for social more than for economic reasons, but cope with adversity largely on their own. Unfortunately, a case study of only one society does not allow one to assess whether the results apply only to the Tsimane’ or to other rural societies.

NOTES

Research was funded by grants from the programs of Biological and Cultural Anthropology of the National Science Foundation (0134225, 0200767, and 0322380). Thanks go to J. Cari, S. Cari, E. Conde, V. Cuata, B. Nate, D. Pache, J. Pache, P. Pache, M. Roca, and E. Tayo for help collecting data and logistical support and to the Gran Consejo Tsimane’ for their continuous support throughout this research project. Special thanks to Ori Heffetz, Lawrence G. Straus, and *JAR* reviewers for commenting on an earlier version of the paper.

1. For a review of the debate between formalists and substantivists, see Plattner (1989).

2. The view that trade enhances income has come under attack by skeptics of globalization. For a summary of the two positions see Rodrik (2003), a critic, and Srinivasan and Bhagwati (2001), two defenders.

3. Coleman (1988) and Bourdieu (1977) introduced the concept of social capital (Portes 1998), but Putnam (2000; Putnam et al. 1993) brought it to the foreground. Researchers still disagree on how to define or measure social capital. Durlauf and Fafchamps (2005) provide a recent review of the concept.

4. All dollar (\$) amounts are US dollars. Bolivianos are labeled as such.

5. Website: <<http://imf.org/external/pubs/ft/weo/2006/01/data/index.htm>>

6. The information on income for Bolivia comes from the Unidad de Análisis de Políticas Sociales y Económicas (UDAPE) in the Ministry of the Presidency. The figures cited in the article come from an unpublished study by Jiménez and Lizárraga (2003) of UDAPE. The website for UDAPE is <<http://www.udape.gov.bo/institucion/u06resumen.htm>>

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