

Published in final edited form as:

J Happiness Stud. 2017 August ; 18(4): 993–1011. doi:10.1007/s10902-016-9756-7.

Income and wellbeing in a society on the verge to market integration: The case of the Tsimane' in the Bolivian Amazon

Dmitrij Minkin¹ and Victoria Reyes-García^{1,2}

¹Institute of Environmental Sciences and Technology, Universitat Autònoma de Barcelona, 08193 Bellaterra, Barcelona, Spain

²Institució Catalana de Recerca i Estudis Avançats (ICREA), Barcelona, Spain

1 Introduction

Social sciences have long been concerned with the understanding of the association between monetary income¹ and wellbeing. Since the outset of related investigation using quantitative measures of subjective wellbeing (SWB)², researchers have reported many ambiguous findings in relation to the role of income on wellbeing. In a pioneering study from 1974, Richard Easterlin explored the link between economic growth and SWB. His results—ever since known as the Easterlin Paradox—indicated no association between SWB and per capita income on a macro level, i.e. neither in cross-country comparisons nor in within country longitudinal data. In contrast, a significant connection between SWB and income seemed to exist at a micro level, i.e. for people from different income classes within a country at a given point of time. Having caused a lot of controversy, these findings have been reassessed, with some studies challenging Easterlin's findings and others showing associations between income and SWB even at the macro level (Stevenson and Wolfers 2013, 2008; Deaton 2008). A few other studies provide a more nuanced view of the association: while economically undeveloped countries seem to experience an increase in SWB with economic growth, richer countries do not (Diener and Biswas-Diener 2002; Diener and Seligman 2004; Di Tella and MacCulloch 2008), which have led researchers to hypothesize that the association between income and SWB might be different at different income levels. Namely, the threshold hypothesis states that income might relate to SWB only until reaching a consumption satiation point at which all basic needs are met; beyond this threshold income would not increase wellbeing (c.f. Veenhoven 1991).

Appealing as it might seem, this hypothesis rests on the assumption that income only relates to wellbeing through the acquisition of material goods, which are then devoted to satisfy basic needs. In other words, it is assumed that basic human needs are mostly met through

Corresponding author Victoria Reyes-García, ICREA Research Professor, Institut de Ciència i Tecnologia Ambientals, Universitat Autònoma de Barcelona, 08193 Bellaterra, Barcelona, Spain, Tel: + 34 (93) 586 8976, Fax: + 34 (93) 581 4070, victoria.reyes@uab.cat.

¹The term monetary income refers to cash flows. A distinction is necessary, as in subsistence economies not all sources of income have a pecuniary basis. Here, income always refers to monetary income.

²Subjective wellbeing (SWB) refers to an individual's evaluation of experienced affect, happiness or life satisfaction (Frey and Stutzer 2002). We use the term SWB when referring to observable, albeit subjective, measures of the latent variable wellbeing. The term wellbeing is used when talking about theoretical matters, thus referring to a construct, whose dimension is not observable.

market transactions. But, although this has largely been the case since the emergence of capitalism, neither market transactions nor the economic behavior that comes with it are universal human characteristics, as experimental and quasi-experimental research assessing the economic behavior of people in non-Western small scale societies has shown (see for example Henrich et al. 2001).

Furthermore, the hypothesis neglects that income might relate to SWB through other –more complex- pathways, such as through social comparisons (see Suls and Wheeler 2000 and Buunk and Mussweiler 2001 for reviews of this theoretical framework). Thus, research in the developed (Grolleau & Saïd 2008) and the developing world (Reyes-García et al. 2015) has stressed that people might derive satisfaction from the status related to their relative economic position in comparison to others of their reference groups or through income comparisons to themselves in the past (see also Clark et al. 2008; Diener et al. 1993). According to this research, individual income would raise individual wellbeing, not because income helps the individual to meet basic needs, but because of the satisfaction that comes with the feeling of being “better off” than others or than oneself in the past.

So, the unanswered question that remains is: Is income irrelevant in terms of wellbeing gains in a situation in which people do not depend on income to satisfy their basic needs? We can think of at least three ways through which income could affect SWB in a subsistence-based society. First, income could relate to wellbeing if economic activities providing income substituted for more arduous subsistence activities. This pathway could occur if the costs of obtaining income to materially satisfy basic needs were considerably smaller than the costs of incurring in subsistence activities to satisfy the same needs. We consider this pathway as rather improbable, since in each particular society, subsistence activities constitute a culturally impregnated and unaffiliated activity, where we expect the costs of working (i.e. physical efforts and stress) to be embedded in the cultural system (Reyes-García 2012). In contrast, it has been documented that in such societies, obtaining income via market activities implies psychological costs of adaptation to new social structures, stress, and subordination (see e.g. Izquierdo 2005).

Second, income might indirectly influence SWB, by satisfying non-material needs which go beyond the basic needs. According to Maslow’s need theory (1943) these could be the need for safety, for example in form of insurance; or the need for social recognition in form of status, power or prestige (Godoy et al. 2007). Finally, it is also conceivable that in subsistence-based societies income affects SWB through the satisfaction of some material needs which go beyond basic needs, such as luxuries, improved transport, or new forms of leisure. The arguments for the plausibility of such a pathway can work in both directions: one could argue that a society which is not influenced by consumerism will not necessarily experience wellbeing gains through material consumption (see Masferrer-Dodas et al. 2012), but one could also argue that some goods and services which become more accessible through income, such as safer transportation, might well be sources of SWB.

Assessing the role of the alternative pathways that might drive the relation between income and SWB is difficult as, to do so, one need to separate the income effect on wellbeing which arises through the satisfaction of basic needs, from the disputable income effect on

wellbeing which might possibly arise through alternative pathways. The goal of this work is to narrow this knowledge gap using a unique set of data collected among the Tsimane', a small-scale society of largely self-sufficient foragers and horticulturalists in the Amazon region of Bolivia. As the Tsimane' continue to satisfy most of their basic needs through subsistence activities, this case study allows us to explore the relation between income and SWB somehow independently of the effect that income might have in the satisfaction of basic needs.

2 Background: The Tsimane' society and the satisfaction of basic needs

The Tsimane' are a small-scale indigenous society of foragers and horticulturalists. The population consists of about 12,000 individuals living in about 100 villages in the Amazonian basin of Bolivia (Reyes-García et al. 2014). The Tsimane' maintained a self-sufficient lifestyle until the late 1940s (Reyes-García et al. 2012). Since the 19th century, and specially after 1952, the Bolivian state intensified their influence in the area inhabited by the Tsimane' through the enactment of a series of new agro-economic policies, the construction of new roads in the area, and the subsequent arrival of colonist farmers who intended to draw upon the abundant resources in the Tsimane' lands (Reyes-García et al. 2014). Despite these contextual changes, many Tsimane' kept on living in relative autarky through subsistence activities like hunting, fishing or slash-and-burn farming. Alongside, some Tsimane' started to engage in market-based activities like wage labor (as loggers or tourist operators), cattle ranching, or the sale of forest or agricultural products (Vadez et al. 2008; Zycherman 2013). Growing pressure generated through increasing extraction of natural resources and the intrusion in Tsimane' lands, mainly for commercial purposes, sparked political activism among the Tsimane'. Nowadays, representation of common interests, mostly related to land and resource rights, is carried out through two political organizations: the Great Tsimane' Council and the Regional Council Tsimane'-Mosekene which have gained influence since 2006, when Evo Morales -the first president from indigenous origin- took office (Reyes-García et al. 2014).

Most goods that the Tsimane' consume to satisfy their basic needs of food and shelter are derived from the natural resources found in their surrounding lands (fish, fruit, and timber). Thus, over three quarters of the food Tsimane' households consume is obtained through farming, hunting, and fishing (Godoy et al. 2007). Concerning the satisfaction of other needs, previous research indicates that Tsimane' satisfy some of their needs through social relations, a key component of a 'good life' for the Tsimane'. For example, Reyes-García (2012) reports that the Tsimane' understanding of wellbeing focuses on fostering social relations like visiting kin and friends or spending time with family members. Furthermore, she describes the event of drinking *shocdye*, a fermented beverage made from manioc, plantains or other crops, as central in Tsimane' social life. Additionally, the Tsimane' consider success in subsistence activities like hunting or fishing as important for their wellbeing. Moreover, the author states that —despite increasing integration into the market economic system— valuation of possessing material goods or money, or participating in market activities are only subordinate in their own rankings of elements that contribute to wellbeing. Sharing is also an important cultural norm among the Tsimane': apart from goods like medicine or tools, food is largely shared (Godoy et al. 2007).

In sum, while the Tsimane' stand in the early stages of integration into the market economy, defined as the participation in market-based economic activities and the increasing dependence of market-acquired products for subsistence, they still continue to satisfy most of their basic needs through subsistence activities, and not through income (Masferrer-Dodas et al. 2012). As such, the Tsimane' represent an ideal case for our study.

3 Materials and Methods

Data were obtained from the Tsimane' Amazonian Panel Study (TAPS) which operated during 2002-2010 with the main goal to study market exposure and its effects on welfare of indigenous peoples in Bolivian Amazonia. The panel focused on 13 Tsimane' villages where researchers and trained enumerators collected data through individual interviews lasting about one hour (Leonard et al. 2015). The surveys were conducted every year between June and August.

3.1 Sample

The actual study period for this work consisted of seven years, embracing the period from 2002 to 2006 and from 2009 to 2010. We have an unbalanced panel as TAPS collected no data regarding wellbeing in the years 2007 and 2008. The sample for the analysis presented here consisted of interview responses from 982 adults (> 16 years of age) living in 345 households from 13 different villages, or a total of 3,406 observations. Due to missing data in some of the variables, the final sample size is reduced to 3,303 observations. Only 7.82% of the subjects participated throughout the whole study period, which contributes to about 16% of the observations.

3.2 Dependent variables

TAPS collected data on the frequency (i.e., never, sometimes, often) with which the individual experienced four emotions (i.e., happiness, anger, sadness and fear) during the week before the interview. We used such data as our measure of SWB. Our variables refer to emotional wellbeing, or "to the emotional quality of an individual's everyday experience — the frequency and intensity of experiences of joy, fascination, anxiety, sadness, anger, and affection that makes one's life pleasant or unpleasant" (Kahneman and Deaton 2010, p. 16489). Following this definition, we acknowledge that our data only captured one aspect of emotional wellbeing, namely frequency, leaving the intensity to random variation. We are aware that emotional wellbeing differs from life evaluation, the measure commonly used in research on SWB (Kahneman and Deaton 2010). Nevertheless, we defend the use of such data for theoretical as well as for practical reasons. At the theoretical level, some work shows that these emotions strongly predict self-reported ratings of individual's wellbeing like life satisfaction (Diener et al. 2009), and that the expression of emotions might bear significant relations with income (Kahneman and Deaton 2010; Diener et al. 2009). At the practical level, Godoy et al. (2006) and Godoy et al. (2010) report that Tsimane' recognize and use distinctive expressions for these emotions, which means that the questions had cultural validity.

We treat each emotion independently. Based on Kahneman and Deaton (2010), we consider happiness as a positive affect and sadness as “blue affect”. As the emotions of anger and fear are related to feelings of stress, which is rather undesirable, we consider them as negative affect. The appearing overrepresentation of non-positive emotions somehow reflects the different dimensionality of positive and negative affect. Emotions expressing positive affect, i.e., happiness, joy or contentment, are highly inter-correlated as they arguably measure the same underlying dimension (Kahneman and Krueger 2006; OECD 2013). By contrast, negative affect is more multifaceted: a person can feel fear without feeling anger or sadness.

The original question in the TAPS survey was “In the last week, how often have you felt [*emotion*]? Often (=3), sometimes (=2), never (=1). Across the different years and from different coders, the dataset contained 9.9% of the observations with a value =0 and 11.2% with values >3. We assumed that 0 corresponded to “never” and recoded those observations accordingly (=1). Since we were not able to interpret values >3, we did not include these observations in the analysis. The response variables on perceived happiness, sadness, fear and anger are treated as ordinal, under the assumption that they have a natural ordering (1: never, 2: sometimes, 3: often). It remains unclear if the cardinality assumption for these data might be taken realistically, as it cannot be ruled out that Tsimane’ follow a cultural norm in their response behavior, i.e. answering particularly positive or negative for all or some emotions³.

Concerning the explanatory power of the data, Robinson and Clore (2002) state that self-reports of current emotional experiences are likely to be more valid than self-reports of emotions made in a somewhat distant time from the relevant experience, with a two-week time frame in which the subjects are mentally able to make emotion judgments more accurately. This fits well to our data, as responses collected by TAPS are within the named two-week period.

3.3 Monetary variables

Our model includes two explanatory variables that measure different economic aspects: income, defined as the individual monetary input obtained through market activities, and wealth, or the monetary equivalent of a set of market goods owned by a subject. By including the two variables in the model, we hope to get a more detailed picture of the monetary effects on SWB.

Individual income was calculated as the sum of earnings resulting from wage labor, sale of goods and barter in Bolivianos (Bs) in the two weeks before the interview.⁴ This sum was adjusted for inflation in order to obtain a total income measure in real terms.⁵ As real total income had a relatively high variation (SD=229, with a maximum income of 8,000Bs), its logarithm was used to facilitate interpretation and improve fit (see Gelman and Hill 2007, p. 65).⁶ Moreover, Kahneman and Deaton (2010) suggest that taking the log of income is

³As we are using an ordered logit, and not OLS based model, this assumption has not to be taken explicitly (Ferrer-i-Carbonell and Frijters 2004).

⁴The exchange rate of Euro to Boliviano is about 1: 9.4 (exchangerates.org.uk; stand: 08.07.2014).

⁵Inflation rates data were obtained at <http://www.indexmundi.com/g/g.aspx?v=71&l=de>. Access date: 12.08.2014.

⁶People with zero income were treated by adding one to each income to be able to take logarithm thereafter.

advisable when applied to quantitative dimensions of perception and judgment, as individuals at very different levels of income will perceive absolute income changes differently.

Wealth was measured as the value in Bs of a selected set of modern assets owned by an individual. Modern assets refer to goods obtained through market transactions and do not include animals or traditional goods like bows, arrows or canoes which are produced by the Tsimane' themselves. As Tsimane' spend most of their cash income on durable commercial goods like metal tools, watches or radios (Masferrer-Dodas et al. 2012), the isolated consideration of modern assets allows to assess the effect of income earnings through the value of obtained modern property.

3.4 Control variables and variables for subsistence activities and social relations

Along with standard controls for personal characteristics like age, sex and schooling, our model includes variables related to social behavior and subsistence activities. Tsimane' lifestyle is characterized by high mobility, emphasized through the cultural importance of traveling and visiting (*sóbaqui*) (Ellis 1996). Therefore our model includes a variable that captures the frequency of visits from other Tsimane'. In order to control for social relations within the household, we also include a variable on the frequency of being angry at other family members. We also include information on the amount of game brought home, as hunting is a culturally important subsistence activity (Luz 2015). Tsimane' place a great importance to the type of food consumed, with strong preference for game and fish (Ellis 1996; Zycherman 2013). To account for that, we include a variable which comprises information on subjective appraisal of the quality of food consumed. We also include a control for the frequency of consumed *shocdye'*, which represents an important social ritual among the Tsimane'. Our last control relates to the frequency of travels to the closest market town.

3.5 Empirical Strategy

Data are organized in three clusters which are structured hierarchically. At the bottom is the individual. Individuals are nested in households, which in turn are nested in villages. We therefore applied a multilevel model. In order to keep model complexity in acceptable bounds we specified a two-stage model with households as the top level.⁷ Moreover, to account for intra subject variation, we used a mixed-effects model. The presence of ordinal data tenders the use of an ordered logit regression. Hence, the final model applied is a multilevel mixed-effects ordered logit regression. Equation (1) depicts the assumed linear regression model for latent continuous responses y_{it}^* .

$$y_{it}^* = \beta_0 + \beta_1 \text{Econ}_{it} + \beta_2 \text{Pers}_{it} + \beta_3 \text{Socio}_{it} + \alpha_k + \theta t + \varepsilon_{it} \quad (1)$$

⁷Following Bryan and Jenkins (2013) multi-level models benefit from having a big variation of second level variables ($J=345$).

Where y_{it}^* depicts the unobserved responses of individual i in the point of time t to the four defined emotional proxies. $Econ_{it}$ is a vector containing monetary variables related to income and wealth. $Pers_{it}$ includes control variables related to personal characteristics. $Socio_{it}$ contains the variables linked to social behavior and subsistence activities, α_k stands for the village fixed-effects, and θ_t depicts time fixed-effects (period time-effect). In general $i = 1, \dots, N$ depicts the contained individuals, $j = 1, \dots, J$ the households, $k = 1, \dots, K$ the villages and $t = 1, \dots, T$ the years. β_0j denotes a random intercept that varies over j households. Fixed-effects on the village level might, for instance, arise through different accessibility to the market town. The inclusion of village dummy variables helps control for this type of heterogeneity. In the same sense, time fixed-effects control for heterogeneity which might arise through e.g. yearly climatic variations or political shifts.

Equation (2) shows the associated threshold model, where observed ordinal responses y_{it} are generated from latent continuous responses y_{it}^* . Threshold values are depicted by κ_1 and κ_2 .

$$y_{it} = \begin{cases} 1(\text{never}) & \text{if } y_{it}^* \leq \kappa_1 \\ 2(\text{sometimes}) & \text{if } \kappa_1 < y_{it}^* \leq \kappa_2 \\ 3(\text{often}) & \text{if } \kappa_2 < y_{it}^* \end{cases} \quad 2)$$

Obtained estimates from $Econ_{it}$ can be interpreted as the effects income and wealth have on the dependent variables. The income variable captures the overall association of income on SWB. The wealth variable indicates if SWB is related to income through the consumption of not-convenience material goods (i.e. goods which persist and therefore are not dissipated in a long term which in term excludes goods which satisfy basic needs) obtained through income. Consequently, if income yielded positive estimates related to happiness and the wealth variable produced no significant results, this would mean that income probably buys SWB through other pathways than the acquisition of material goods. The relation between SWB and different variables proxying success in subsistence activities and frequency of social interactions can be assessed by the estimates from $Socio_{it}$. The variables related to subsistence activities indicate the chance that income generating activities substitute for subsistence activities. If subsistence activities yielded positive estimates with considerable magnitudes, it would appear implausible to expect this substitution. The estimated results cannot be interpreted as causal effects, as our identification strategy does not determine if e.g. higher incomes causes more happiness or vice versa (see e.g. Diener and Biswas-Diener 2002).

4 Results

4.1 Sample description

Table 1 comprises the definitions and summary statistics for the dependent variables and all explanatory variables. When pooling data across years, 34% of the Tsimane' declared that they never felt happy the week before the interview. A majority of 43% responded they had felt "sometimes" happy, whereas 23% responded as being "often" happy. The mean of the variable is about 0.4 points above the average of the 1-3 scale. Anger is not uncommon, with the average lying only 0.24 points below the arithmetic mean of the scale. Sadness seems to

be a more pronounced emotion: considering that the mean of this variable (1.63) is considerable larger as compared to the mean of the other emotions. Moreover, it should be pointed out that the four dependent variables exhibit a relatively high variation (0.5 SD 0.75), reflecting a big discrepancy in responses. The four measures on emotional wellbeing are all positively (pairwise) correlated to each other in a modest way (all <0.38) which shows that positive affect is not necessarily linked to blue or negative affect: in other words, emphasized feelings of happiness do not have to go hand in hand with repressed feelings of sadness, anger or fear or vice versa.

The two main explanatory variables, real income and wealth exhibit a rather low correlation (0.24, $p=0.0$, $N=3,378$), which suggests that in the Tsimane' society income is not necessarily used to build up wealth.

Figure 1 depicts changes in the happiness variable throughout time. The figure shows a trend towards less stated feelings of happiness: the fraction of the “never” category starts to dominate the answers since 2005 and it sextuples over the whole period.

The temporal development of all four emotional indices is summarized in Figure 2. The trend of the growing low scores in self-reported happiness seems to be also present in the other three variables: the arithmetic means of each variable sink notably throughout time. Assuming that the four emotional indicators characterize the human emotional system adequately, it can be followed that the Tsimane', on average, reported a sinking overall emotionality or rather emotional numbing (see section 5.4). Note here that the years 2007 and 2008 are absent in the analysis. Running a Wald test suggested no structural break in the data. A smooth overall transition from 2006 to 2009 is therefore assumed hereinafter.

The Tsimane' have a relatively low level of income: 32% of the observed individuals did not report any income during the two weeks before the interviews but only about 0.6% of the interviewed subjects had an income of more than 1000Bs. Figure 2 also depicts income over time, showing that income growth is only present if not controlling for inflation. To assess whether there is a trend in increasing participation in market activities throughout time, we looked at the share of subjects with zero income and at the frequency of travels to a market town. The results (not shown) are somewhat ambiguous, indicating that over the course of time the number of people obtaining income remained more or less constant, although people increased their frequency to travel to market towns. Overall, Figure 2 does not disclose a common trend between income (neither nominal nor real) and any of the four emotions.

4.2 Regression results

Table 2 contains the results from the multilevel mixed-effects ordered logit regressions on the four variables that capture emotional wellbeing. The columns with odd numbers ([1], [3], [5], [7]) contain the results from regressions with village fixed-effects and the columns with even numbers contain results from regressions with village- and time fixed-effects. The magnitudes of the estimates in Table 2 can be interpreted in terms of log odds ratios. Regular odd ratios can be obtained by exponentiating the listed coefficients. For instance being male increases the odds to report being “often” happy against the combination of being

“never” or “sometimes” happy in the last two weeks by 1.594 ($e^{0.466}$) respectively 1.255 ($e^{0.2271}$), if all the other variables are held constant. In order to enunciate the estimation results outright, in the following we will just talk about the odds to report a superior category of a response variable.

The two measures of economic status suggest different relations with the dependent variables. Hence log real income is positively related to self-reported happiness and fear ($p < 0.05$ and $p < 0.10$ with control for time effects), whereas wealth bears a negative association with most emotions, although those results lack consistency. Furthermore, the magnitude of both variables is low in real terms, as a one percent increase in real income changes the odds to report a superior category of happiness by 1.043 ($e^{0.042}$) respectively 1.036 ($e^{0.036}$); an increase of wealth by 1,000Bs lowers the odds to report a superior category of happiness by 0.867 ($e^{-0.143}$) (column [1]).

Estimates for the control variables related to social behavior Tsimane’ visits and family conflict are significant and have the assumed signs related to happiness. According to the results from our model, on average Tsimane’ seem to experience greater happiness the more often they have company from fellows. As anticipated, family conflicts are related to lower happiness and increased feelings of anger and fear. The variable food quality produces three significant ($p < 0.01$) estimates: it is positive for happiness and negative for fear and sadness. Eating well therefore seems to enhance overall emotional wellbeing. When not controlling for time fixed-effects, the travel variable shows a negative effect on each of the four dependent variables ($p < 0.001$). Moreover, to go hunting seems to have a positive effect on happiness. The variable for traditional drinking of *shocdye* yielded no significant effect on any of the dependent variables.

Finally, the variation of estimates suggests that the dummy variables for the particular years in which the data were collected include a bulk of information which should not be neglected. The inclusion of year-dummies sometimes changes the significance level and even the signs of estimates (e.g. wealth for sadness). The importance of the year-dummies is emphasized by the significance levels of the respective estimates which are not reported here (over 75%, $p < 0.001$).

In sum, the obtained results suggest an ambiguous relation of monetary factors on self-reported happiness: while acquiring more income increases the odds to report more happiness, already acquired goods appear to have a converse effect. Among the personal characteristics, men report higher levels of happiness than women. Variable coefficients associated with social life are robust across the regressions and interpretably high in magnitude. To have frequent contact with kith and kin, eat well, and get along with family members raises the odds to report more positive and less negative affects. In contrast, getting out of the familiar social environment lowers the probability to report high values for any of the four emotions.

We performed a final test. We have argued that income and wealth generating activities might substitute activities related to social life, as Tsimane’ have to go to market towns, or rather away from home, to be able to earn money. To test this intuition we performed an

ordered logit regression with the travel variable as dependent variable. The results (not presented here) show a significant (0.01%) positive relationship between the frequency of travels to the market town and income, wealth and family conflicts. To further analyze the possibility of the hypothesized side effects of the income generating activities, we also ran a number of ordered logit regressions where the variables related to social life and subsistence activities constituted the dependent variables. In doing so, the monetary variables and variables related to personal characteristics constituted the explaining variables. Without presenting the concrete results here, it can be said that the outcome consists of a number of significant correlations like e.g. between income and food quality and between income and Tsimane' visits. The implications of these findings will be discussed in the next section.

5 Discussion

In this paper, we have analyzed the relation between two economic variables (income and wealth) and SWB, measured through four emotions with the particularity that our data come from an autarkic society which has only recently started to enter the market economy. Three main findings from the research presented here deserve discussion. First, we found that income bears a positive association with the positive emotion (happiness), whereas wealth bears a weak negative association. Second, neither income nor wealth is associated to emotions carrying a negative affect, with the exception of fear, which bears a positive association with income. Third, although statistically significant, the magnitude of the coefficients for income is small, at least when compared to the estimates related to subsistence activities or social interaction.

5.1 Income, wealth and positive affect

Our results do not allow for a straightforward explanation to the relation between income-related measures and SWB among the Tsimane'. While income has a significant positive effect on happiness, wealth appears to lower happiness.

At the onset of this work, we presented the idea that, in a society in which income is not used to satisfy basic needs, such a hypothetical association would have to be explained through other pathways. Ethnographic data from our case study suggest that Tsimane' sense of happiness revolves around social interaction and success in subsistence activities and not around material possessions, however, our empirical results advocate that the association between income and SWB does exist among the Tsimane'.

Within the study context, one possible pathway for this association is that the earning of income creates social effects which favor SWB. For example, the Tsimane' partly use their income to buy material goods to signal status. Godoy et al. (2005) and Godoy et al. (2007) show that, as their income levels rise, Tsimane' spend higher shares of their income on commercial luxury goods like watches, backpacks or mobile phones, and not necessarily on items that could be used to cover basic needs. The authors interpret this finding as that Tsimane' use income to signal status among fellows.

But, if income increases Tsimane' SWB through changes in social status, then why does not wealth have the same effect? Indeed, among the Tsimane', not much of the cash income is

transferred to wealth: Tsimane' supposedly spent a good share of their income on transportation services or convenience goods (Masferrer-Dodas et al. 2012), which might help explain why income is only weakly correlated to wealth. Moreover, ethnographic research suggests that Tsimane' sense of ownership concerning durable goods is based on the disposition of free sharing: any Tsimane' can enter the house of any other fellow Tsimane' and borrow his property (i.e. machetes, cooking pots) without permission, under the mutual agreement that the object will be returned after use. According to that, item ownership is not a condition for item use, a circumstance that might possibly dilute the effect of bought durable goods (wealth) on SWB. Finally, our findings of the negative association between wealth and SWB coincide with some prior studies on psychological processes associated with wealth. Godoy et al. (2010) show that the more Tsimane' participate in market related activities, i.e. engage as wage-workers, sell, and buy, the more they regret their purchases of durable assets.

In sum, a plausible interpretation of the conflicting estimation results of the variables income and wealth is that, as Tsimane' spend earned income with the positive perspective to improve their wellbeing through the accumulation of modern goods, they eventually adapt to these assets and possibly even regret their purchase.

5.2 Income, wealth and negative affect

We have detected only one significant association between the monetary variables and the three emotions carrying negative affect: there is an apparently positive association between income and fear. Although we do not have a fully convincing explanation for this relation, we advance that it might relate to negative emotions associated with income inequality. As a big percentage of the Tsimane' do not engage in income generating activities and income concentrate in a small section of the population, the Tsimane' society might be experiencing an increase in income inequality. Research in a large set of contexts (Kawachi & Kennedy, 2002; Macinko, Shi, Starfield, & Wulu, 2003; Marmot & Wilkinson, 2001), including among the Tsimane' (Godoy et al. 2006), suggests an association between income inequality and negative emotions. Thus, it is possible that, coming from a highly egalitarian society, Tsimane' with higher income might fear the development of negative emotions (i.e., envy, jealousy, hostility, cynicism) among fellows with lower or no income, or the potential outcomes of such emotions (i.e., increasing demands to share, social isolation, insecurity, or feelings of inadequacy).

Although data do not allow for a test of such explanation, the argument resonates with current research on the effects of income inequality on SWB. For example, a recent study with a large sample of individuals residing in rural areas of 21 developing countries, found that village-level income inequality seem to exacerbate negative effects of local peer-group comparisons on subjective wellbeing (Reyes-Garcia et al. *under review*). In sum, although negative affect seems unrelated to income, it appears that happiness gains, resulting from more income, come at a cost of increased fear which brings up the question concerning the effect of income on overall SWB.

5.3 Comparison of the empirical results

The third important finding from this work is that, although statistically significant, the magnitude of the coefficients for income is small when compared to the estimated coefficients for the social behavior variables. These results coincide with findings from prior surveys and data evaluations suggesting that Tsimane' understanding of happiness strongly centers on social aspects. Thus, receiving visits from friends and kin, avoiding family conflicts, and enjoying good food all appear to significantly ($p < 0.001$ for 5/6 of the estimates) favor happiness. Moreover, the magnitude of the estimates shows their importance in real terms. For instance, receiving "some" visitors in the last month, instead of "none", increases the odds to report a higher happiness category by about 35%. The results show similar real term effects for family conflicts and enjoying "good food", or dishes prepared with wild meat or fish (Reyes-García 2012), which in turn emphasizes the importance of success in subsistence activities.

Having assessed the importance of social relations and common subsistence activities, and in order to assess the importance of income in real terms, we need to discuss the relation between the pursuit of income and the social life of the Tsimane'. As endorsed by the results from the regressions including the variable travel, individuals pursuing income-generating activities might miss time to participate in social- and subsistence activities.⁸ However, this assumption is not straightforwardly backed by the results from the different regressions with the variables related to social life and subsistence activities as dependent variables. On one hand, income is positively associated with visits received; on the other hand, the travel variable is expectedly not. Moreover, traveling to the market town appears to favor more family conflicts. We interpret these associations in the following way: the more economic success a person has, the more likely that person attracts visitors, but at the same time this person simply cannot receive visitors due to frequent absence from home which moreover apparently creates tensions within the family. Due to the ambiguity of the obtained results related to the income and travel variables and due to the different scales of the variables, attempting to quantify and compare the size of the particular regressions is not appropriate, and we leave this issue to further research.

5.4 Caveats and Future Research

Before concluding, we would like to highlight some caveats of the work presented here. The first caveat relates to one of the assumptions of our model: in the introduction we speculated that people who live in a subsistence-based economy will rather not use income in order to substitute for subsistence activities as the pursuit of income supposedly implies psychological costs of adaptation to new social structures, stress and subordination. However, there might be reasons which could lead Tsimane' to voluntarily substitute subsistence by market-based economic activities. The pursuit of income itself might lead to a departure from the dominant cultural model, and hence Tsimane' might accustom themselves to having cash and to satisfy their basic needs through monetary transactions, thus departing from their traditional self-sufficient lifestyle. In this regard, Godoy et al.

⁸However, it has to be also noted that income generating activities are not necessarily connected to the requisite to travel to a market town; traveling traders come to Tsimane' village to swap and sell goods too (Godoy et al. 2005).

(2005) report that some Tsimane' resettle closer to market towns in order to take advantage of health- and education facilities, consequently increasing their dependence on market related activities. In contrast, others move to more remote locations to be able to follow their autarkic lifestyle in areas richer in natural resources. In any case, if people move out of the sampled villages, we cannot control for the potential effect of income on SWB.

These notions moreover point out the possibility of a self-selection bias in the sample. Godoy et al. (2005) argue that the decision to participate in market activities is probably not exogenous for the Tsimane': it rather depends on education and unobserved characteristics like personality, language skills and social status. With the exception of education, we do not have the possibility to control for the other unobserved characteristics. We had expected to run an individual based fixed-effects model, but since only 7.82% of the subjects participated throughout the whole study period, the sample was too small for an accurate estimation. Therefore, we cannot foreclose that our estimated are biased.

The second caveat relates to the overall time trend according to which our informants tend to report less frequency of emotions, particularly happiness, and the apparent importance of time fixed-effects. This result might suggest that our model suffers from an omitted variable bias. The trend can hardly be explained by possible interviewer effects or related measurement bias (see e.g. Bertrand and Mullainathan 2001). However, it could result from an unobserved trend related to the overall changing environment around the Tsimane' society. Cohen notes that it is essential that "each culture provides pathways by which individuals may satisfy their need for positive affect, prestige, and meaning" (Cohen 1999, p.12). The Tsimane' society has traditionally done so through success in subsistence activities, strong social relations, and its cosmologic belief system. These pathways are increasingly endangered by market integration, Christian proselytism, the extraction of natural resources, and the confrontation with modern Bolivian society (Reyes-García et al. 2014b). We speculate that this process leads to a confusion of worldview, values and beliefs among the Tsimane', which manifests itself in a sort of emotional numbing which in turn results in sinking overall emotions. To assess the indirect effects of income on SWB, the cultural changes in form of altered behavior related to subsistence activities and social life, which occur due to the involvement in income generating activities, also need to be determined quantitatively.

The third caveat relates to potential bias originated during data collection, in relation to both the proxy measure used and the imbalance of asking about one positive and three negative emotions. On the one side, TAPS data only capture the frequency, but not the intensity with which people feel the selected emotions. It is not clear to which degree our approximation may indeed describe individuals' emotional wellbeing. On the other side, the imbalance in the emotions selected could influence the response behavior and exercise a sort of priming thus biasing the respondents to focus more on negative affect. In light of these caveats, future research should aim for *i*) a more complete measure of emotional wellbeing, with *ii*) a more balanced set of positive and negative emotions, and *iii*) the inclusion of variables that capture other concepts of SWB, like life satisfaction.

The last discussed caveat arises through the fact that TAPS data were collected between June and August, which coincides with the rice-selling period. In practical terms, this means that measured income probably reached an above-average high during data collection. Further variability of the income variable through seasonal differences is thinkable, which leads to the suspicion that results from multivariate analysis with income data collected during different seasons of the year (e.g. in winter when no selling of cash crops occurs) may be different from the ones obtained here. To further understand the role of income for SWB in autarkic societies it would make sense to also include non-monetary income into the analysis in order to account for the value of consumption from non-market production.

6 Conclusion

The threshold hypothesis predicts that in poor societies income will bear a positive association with wellbeing because it would enable people to satisfy their basic needs. The threshold hypothesis would therefore predict a positive association between income and SWB among the Tsimane', a society just above the standard poverty line (Masferrer-Dodas et al. 2012). We questioned the validity of this hypothesis on the basis that such society does not met basic needs mostly through the market, and indeed found a positive relation between income and happiness. We assert that this is probably explained by socio-psychological effects, like status gains, and not by the acquisition of material goods. However, we also found a positive association between income and emotions of fear, which depreciates the principal positive effect of income on happiness. Our analysis also suggests that the latter might come at costs due to subsequent deprivation of social life and subsistence activities, which appear to be the most important wellbeing determinants for the Tsimane'.

Results from this work do not support for the threshold hypothesis as income appears to affect the SWB of Tsimane' positively without being used for the satisfaction of basic needs. This finding lets us conjecture that, apart from its importance for the satisfaction of basic needs, income might drive SWB through socio-psychological effects which are related to the market economy itself.⁹ Moreover, our results do not give support to the Easterlin paradox, as for the Tsimane', a largely self-sufficient non-Western society, income appears to stand in a positive relation to SWB over time and across individuals.

Acknowledgements

We are grateful to all Tsimane' informants who, during years, have contributed their time to make this research possible. We thank the Tsimane' Amazonian Panel Study (TAPS) and National Institute of Child Health and Development (NICHD Grant # 1R21HD050776) for making the data available. We thank A. Angelsen, J. van den Berg, and A. Pyhälä for comments to a previous version of this article. Reyes-García acknowledges financial support of the European Research Council under the European Union's Seventh Framework Programme (FP7/2007-2013) / ERC grant agreement n° FP7-261971-LEK during data analysis and writing.

⁹Status gains might arise from better jobs or enhanced income levels. The importance of these socio-psychological effects is demonstrated by studies which clearly point out the role of unemployment as the major SWB stressor in Western societies (e.g. Winkelmann and Winkelmann 1998).

References

- Bryan ML, Jenkins SP. Regression analysis of country effects using multilevel data: a cautionary tale. ISER Working Paper Series. 2013:2013–14.
- Buunk B, Mussweiler T. New directions in social comparison research. *European Journal of Social Psychology*. 2001; 31:467–475.
- Clark AE, Frijters P, Shields MA. Relative Income, Happiness, and utility: An Explanation for the Easterlin Paradox and Other Puzzles. *Journal of Economic Literature*. 2008; 46(1):95–144.
- Cohen A. The Mental Health of Indigenous Peoples: An International Overview. 1999; 99(1):11–15. World Health Organization, Department of Mental Health.
- Deaton A. Income, health, and well-being around the world: Evidence from the Gallup World Poll. *Journal of Economic Perspectives*. 2008; 22(2):53–72. [PubMed: 19436768]
- Di Tella R, MacCulloch R. Gross national happiness as an answer to the Easterlin Paradox? *Journal of Development Economics*. 2008; 86:22–42.
- Diener E, Biswas-Diener R. Will money increase subjective well-being? *Social Indicators Research*. 2002; 57(2):119–169.
- Diener, E., Kahneman, D., Arora, R., Harter, J., Tov, W. Income's Differential Influence on Judgments of Life Versus Affective Well-Being. *Assessing Well-Being: The Collected Works of Ed Diener*. Diener, E., editor. 2009. p. 233-245. *Social Indicators Research Series 39*
- Diener E, Sandvik E, Seidlitz L, Diener M. The Relationship between Income and Subjective Well-Being: Relative or Absolute? *Social Indicators Research*. 1993; 28:195–223.
- Diener E, Seligman MEP. Beyond Money: Toward an Economy of Well-Being. *Psychological Science in the Public Interest*. 2004; 5(1):1–31. [PubMed: 26158992]
- Easterlin, RA. Does economic growth improve the human lot? Some empirical evidence. *Nations and Happiness in Economic Growth: Essays in Honor of M. Abramowitz*. David, P., Reder, M., editors. New York: Academic Press; 1974. p. 89-125.
- Ellis, R. A Taste for Movement: An Exploration of the Social Ethics of the Tsimane' of Lowland Bolivia. PhD dissertation, St Andrews University; Scotland: 1996.
- Ferrer-i-Carbonell A, Frijters P. How important is methodology for the estimates of the determinants of happiness? *Economic Journal*. 2004; 114:641–659.
- Frey, B., Stutzer, A. *Happiness and Economics: How the Economy and Institutions Affect Well-Being*. Princeton, NJ: Princeton University Press; 2002.
- Gelman, A., Hill, J. *Data Analysis Using Regression and Multilevel-Hierarchical Models*. New York: Cambridge University Press; 2007.
- Godoy R, Reyes-García V, Huanca T, Leonard WR, McDade T, Tanner S, et al. Signaling by consumption in a native Amazonian society. *Evolution and Human Behavior*. 2007; 28(2):124–134.
- Godoy R, Reyes-García V, Huanca T, Leonard WR, Vadez V, Valdes-Galicia C, et al. Why do subsistence-level people join the market economy? Testing hypotheses of push and pull determinants in Bolivian Amazonia. *Journal of Anthropological Research*. 2005; 61(2):157–178.
- Godoy R, Zeinalova E, Reyes-García V, Huanca T, Kosiewicz H, Leonard WR, et al. Does civilization cause discontentment among indigenous Amazonians? Test of empirical data from the Tsimane' of Bolivia. *Journal of Economic Psychology*. 2010; 31(4):587–598.
- Godoy R, Reyes-García V, McDade T, Huanca T, Leonard WR, Tanner S, et al. Does village inequality in modern income harm the psyche? Anger, fear, sadness, and alcohol consumption in a pre-industrial society. *Social Science & Medicine*. 2006; 63(2):359–372. [PubMed: 16519979]
- Grolleau G, Saïd S. Do you prefer having more or more than others? Survey evidence on positional concerns in France. *Journal of Economic Issues*. 2008; 42(4):1145–1158.
- Heinrich J, Boyd R, Bowles S, Camerer C, Fehr E, Gintis H, McElreath R. In search of *homo economicus* in 15 small scale societies. *American Economic Review*. 2001; 91:73–78.
- Izquierdo C. When “health” is not enough: societal, individual and biomedical assessments of well-being among the Matsigenka of the Peruvian Amazon. *Social Science & Medicine*. 2005; 61(4): 767–783. [PubMed: 15950090]

- Kahneman D, Deaton A. High Income Improves Evaluation of Life But Not Emotional Well Being. *Proceedings of the National Academy of Sciences of the United States of America*. 2010; 107(38): 16489–16493. [PubMed: 20823223]
- Kahneman D, Krueger AB. Developments in the measurement of subjective well-being. *The Journal of Economic Perspective*. 2006; 20:3–24.
- Kawachi, I., Kennedy, BP. *The Health of Nations. Why Inequality is Harmful to Your Health*. New York: The Free Press; 2002.
- Leonard W, Reyes-García V, Tanner S, Rosinger A, Schultz A, Vadez V, Zhang B, Godoy R. The Tsimane' Amazonian Panel Study (TAPS): Nine years (2002-2010) of annual data available to the public. *Economics and Human Biology*. 2015; 19:51–61. [PubMed: 26280812]
- Luz AC, Guèze M, Paneque-Gálvez J, Pino J, Macía M, Orta-Martínez M, Reyes-García V. How does cultural change affect indigenous peoples' hunting activity? An empirical study among the Tsimane' in the Bolivian Amazon. *Conservation and Society*. 2015 In press.
- Macinko JA, Shi LY, Starfield B, Wulu JT. Income inequality and health: A critical review of the literature. *Medical Care Research and Review*. 2003; 60:407–452. [PubMed: 14677219]
- Marmot M, Wilkinson RG. Psychosocial and material pathways in the relation between income and health: a response to Lynch et al. *British Medical Journal*. 2001; 322:1233–1236. [PubMed: 11358781]
- Masferrer-Dodas E, Rico García-Amado L, Huanca T, TAPS Bolivia StudyTeam. Reyes-García V. Consumption of market goods and wellbeing in small-scale societies: An empirical test among the Tsimane' in the Bolivian Amazon. *Ecological Economics*. 2012; 84:213–220.
- Maslow A. A Theory of Human Motivation. *Psychological Review*. 1943; 50(4):370–396.
- OECD. *OECD Guidelines on Measuring Subjective Well-being*. OECD Publishing; 2013.
- Reyes-García, V. Happiness in the Amazon: Folk Explanations of Happiness in a Hunter-Horticulturalist Society in the Bolivian Amazon. *Happiness across Cultures*. Selin, H., Davey, G., editors. Dordrecht: Springer; 2012. p. 209-225.
- Reyes-García V, Angelsen A, Shively G, Minkin D. Subjective wellbeing and income inequality in the developing world. *World Development*. under review.
- Reyes-García V, Babigumira R, Wunder S, Pyhälä A, Zorondo-Rodriguez F, Angelsen A. Subjective wellbeing and income: empirical patterns in the rural developing world. *Journal of Happiness Studies*. 2015; doi: 10.1007/s10902-014-9608-2
- Reyes-García V, Gravlee CC, McDade TW, Huanca T, Leonard WR, Tanner S. Cultural Consonance and Psychological Well-Being. Estimates Using Longitudinal Data from an Amazonian Society. *Culture Medicine and Psychiatry*. 2010; 34(1):186–203.
- Reyes-García V, Ledezma JC, Paneque-Galvez J, Orta M, Gueze M, Lobo A, et al. Presence and purpose of non-indigenous peoples on indigenous lands. A descriptive account from the Bolivian Lowlands. *Society & Natural Resources*. 2012; 25(3):270–284.
- Reyes-García V, Paneque-Galvez J, Luz AC, Gueze M, Macía MJ, Orta-Martinez M, et al. Cultural Change and Traditional Ecological Knowledge: An Empirical Analysis from the Tsimane' in the Bolivian Amazon. *Human Organization*. 2014b; 73(2):162–173. [PubMed: 27642188]
- Reyes-García V, Paneque-Galvez J, Bottazzi ME, Luz AC, Gueze M, Macía M, et al. Indigenous land reconfiguration and fragmented institutions: A historical political ecology of the Tsimane' lands (Bolivian Amazon). *Journal of Rural Studies*. 2014; 34:282–291.
- Robinson MD, Clore GL. Episodic and Semantic Knowledge in Emotional Self-Report: Evidence for Two Judgment Processes. *Journal of Personality and Social Psychology*. 2002; 83(1):198–215. [PubMed: 12088126]
- Stevenson B, Wolfers J. Economic Growth and Subjective Well-Being: Reassessing the Easterlin Paradox. *Brookings Papers on Economic Activity*. 2008; (1):1–102.
- Stevenson B, Wolfers J. Subjective Well-Being and Income: Is there any Evidence of Satiation? *American Economic Review*. 2013; 103(3):598–604.
- Suls, JM., Wheeler, L., editors. *Handbook of social comparison: Theory and Research*. New York: Plenum Press; 2000.

- Vadez V, Reyes-García V, Huanca T, Leonard WR. Cash Cropping, Farm Technologies, and Deforestation: What are the Connections? A Model with Empirical Data from the Bolivian Amazon. *Human Organization*. 2008; 67(4):384–396.
- Veenhoven R. Is happiness relative? *Social Indicators Research*. 1991; 24:1–34.
- Winkelmann L, Winkelmann R. Why Are the Unemployed So Unhappy? Evidence from Panel Data. *Economica*. 1998; 65:1–15.
- Zycherman, A. The Changing Value of Food: Localizing Modernity among the Tsimane' Indians of Lowland Bolivia. PhD Dissertation; University of Columbia: 2013.

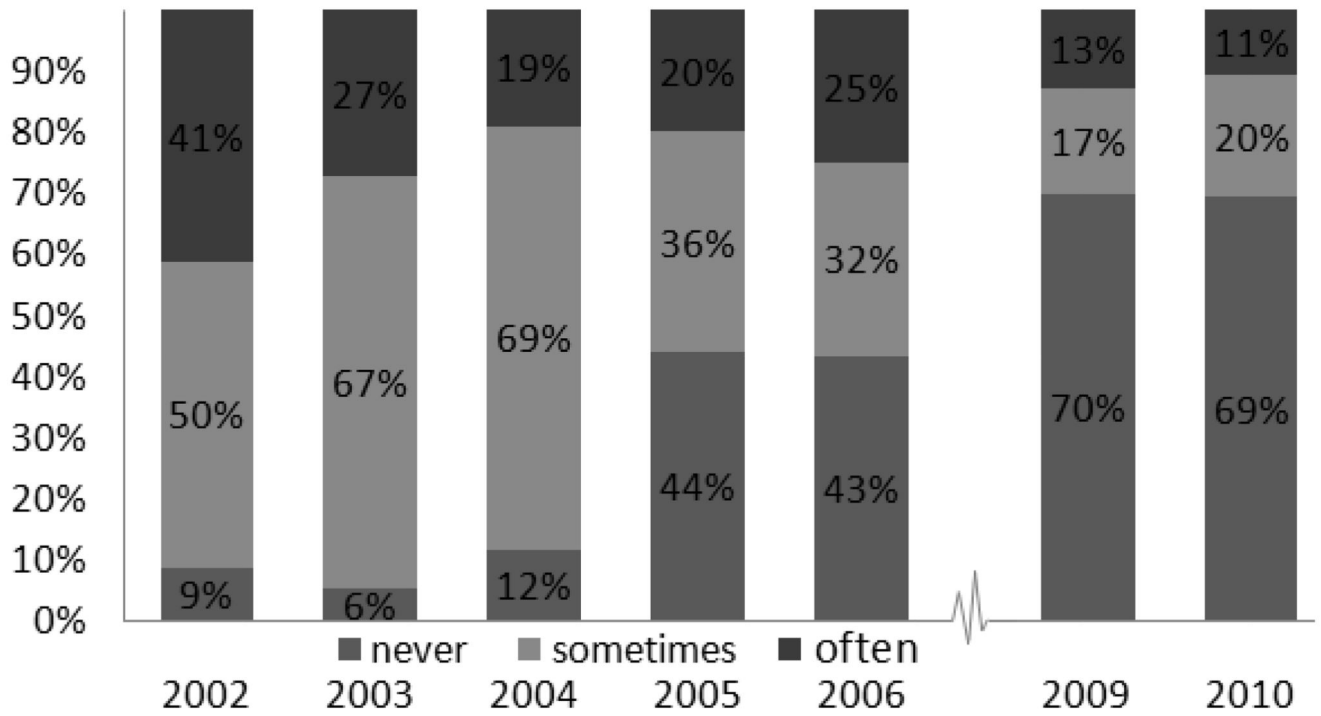


Figure 1.

Development of self-reported happiness throughout time

Notes: “never”, “sometimes” and “often” represent the three categories of the variable happiness

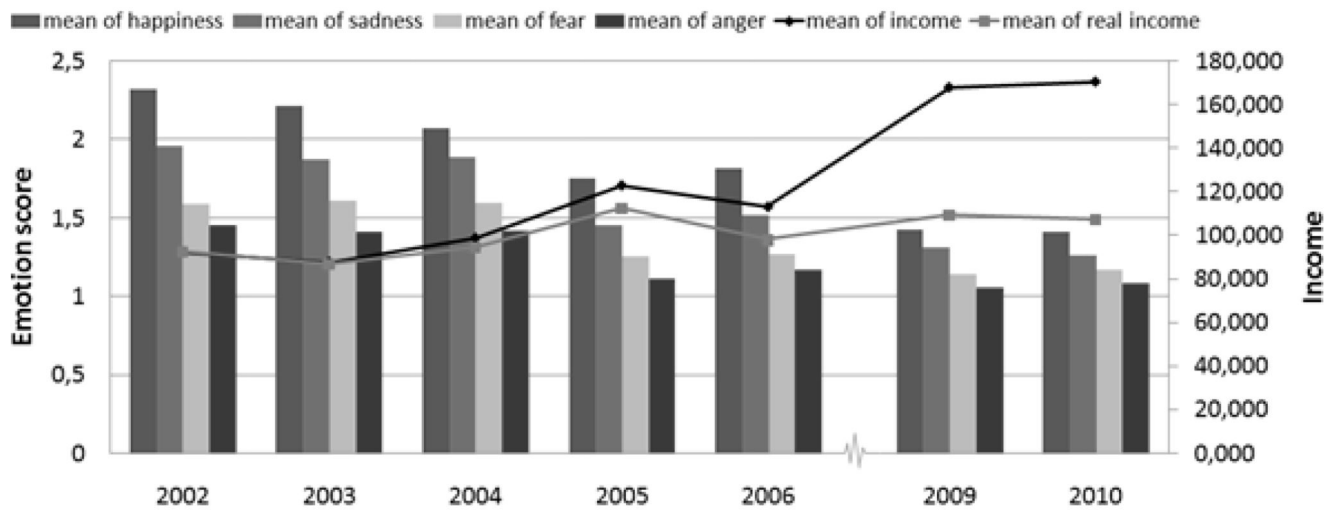


Figure 2.

Nominal and real income in relation to the four self-reported emotions throughout time

Notes: Happiness, sadness, anger and fear are the four dependent variables - their scores are on the left y-axis; Real income: inflation corrected income; Measurement unit of the right y-axis: Bolivianos.

Table 1
Definition and descriptive statistics of variables used in regression analysis

| Variable | Definition | N | Mean | SD |
|--|---|------|-------|-------|
| <i>I. Dependent Variables:</i> | | | | |
| Self-reported happiness | Response to the question: "Last week, how often did you feel happy?" All variables are presented using a range from "Never" (1) over "Sometimes" (2) to "Often" (3) | 3406 | 1.88 | 0.75 |
| Self-reported anger | Response to the question: "Last week, how often did you feel angry?" | 3406 | 1.26 | 0.50 |
| Self-reported fear | Response to the question: "Last week, how often did you feel afraid?" | 3406 | 1.39 | 0.62 |
| Self-reported sadness | Response to the question: "Last week, how often did you feel sad?" | 3406 | 1.63 | 0.72 |
| <i>II. Main Explanatory Variables:</i> | | | | |
| Real income * | Inflation adjusted income calculated as the sum from barter-, sales- and wage income in Bolivianos (Bs). The particular income types represent the respective total earnings in Bs in the last two weeks. | 3396 | 100 | 231 |
| Wealth | Value in 100 Bs of modern assets owned by subject. | 3378 | 956 | 1306 |
| Tsimane' visits | Number of times subject received visits by other Tsimane' in last month Scale: 0-nobody; 1-some; 2-many | 3406 | 0.67 | 0.62 |
| Family conflict | Number of times subject has "recently" gotten mad at members of his family Scale: 0-never; 1-sometimes; 2-often | 3406 | 0.62 | 0.74 |
| Food quality | Subjects self-assessment on the food quality he consumed last week Scale: 0-poorly; 1-ok; 2-well/good | 3406 | 1.44 | 0.58 |
| Travel to market town | Frequency of travels to market town of San Borja in last year | 3322 | 8.00 | 13.58 |
| Hunting | Subjects' self-assessment on game brought home from hunting. Scale: 0-nothing; 1-little; 2-lots | 3406 | 0.50 | 0.58 |
| Chicha | Number of days the subject drank fermented beer in last week | 3406 | 0.42 | 0.73 |
| <i>III. Control Variables:</i> | | | | |
| Male | Subject's sex (male=1) | 3406 | 0.49 | 0.50 |
| Age | Best estimate of subject's age, in years | 3403 | 35.87 | 16.35 |
| Education | Maximum education level attained by subject, in years | 3406 | 2.09 | 2.54 |

Explanation: N: Number of observations; Mean: arithmetic mean; SD: standard deviation.

* The logarithm of real income is used in the regressions.

Table 2

Results from multilevel mixed-effects ordered logistic regressions

| | Happiness | | Anger | | Fear | | Sadness | |
|--------------------------|-------------------------|------------------------|-------------------------|------------------------|-------------------------|-------------------------|------------------------|------------------------|
| | [1] | [2] | [3] | [4] | [5] | [6] | [7] | [8] |
| <i>Log Real income</i> | 0.0424* (-0.0189) | 0.0357* (-0.0182) | -0.003 (-0.0236) | -0.0155 (-0.0249) | 0.0425* (-0.0199) | 0.0362° (-0.0205) | 0.0129 (-0.0187) | 0.0025 (-0.0188) |
| <i>Wealth</i> | -0.0143*** (-0.0039) | 0.0018 (-0.0039) | -0.0155* (-0.0065) | -0.001 (-0.0065) | -0.0082° (-0.0047) | 0.0067 (-0.0048) | -0.0075° (-0.0041) | 0.0084* (-0.0038) |
| <i>Male</i> | 0.4660*** (-0.0913) | 0.2271* (-0.0943) | -0.0745 (-0.1216) | -0.3356** (-0.1234) | -0.3636** (-0.1138) | -0.6401*** (-0.1145) | -0.0734 (-0.0984) | -0.369*** (-0.1016) |
| <i>Age</i> | 0.019 (-0.0119) | 0.0028 (-0.0118) | 0.0306* (-0.0145) | 0.0124 (-0.0158) | 0.0230° (-0.0139) | 0.0099 (-0.0139) | 0.0607*** (-0.0131) | 0.0521*** (-0.0131) |
| <i>Age²</i> | -0.0002 (-0.0001) | 0 (-0.0001) | -0.0003* (-0.0002) | -0.0002 (-0.0002) | -0.0001 (-0.0002) | 0 (-0.0002) | -0.001*** (-0.0001) | -0.0004** (-0.0001) |
| <i>Education</i> | 0.005 (-0.0191) | 0.026 (-0.0177) | 0.0072 (-0.0222) | 0.0303 (-0.0235) | -0.0042 (-0.0221) | 0.0172 (-0.0228) | -0.0567** (-0.0209) | -0.0395* (-0.019) |
| <i>Tsimane' visits</i> | 0.2972*** (-0.0662) | 0.3223*** (-0.067) | 0.1195 (-0.082) | 0.1450° (-0.0829) | 0.0428 (-0.0793) | 0.0423 (-0.0834) | 0.0533 (-0.0656) | 0.0554 (-0.0665) |
| <i>FamilyConflict</i> | -0.3227*** (-0.0636) | -0.1871** (-0.0615) | 0.4972*** (-0.0713) | 0.8249*** (-0.0806) | 0.0535 (-0.0652) | 0.2357*** (-0.0694) | -0.0204 (-0.0574) | 0.1459** (-0.0559) |
| <i>Foodquality</i> | 0.2596*** (-0.0769) | 0.3865*** (-0.0722) | -0.2068* (-0.083) | -0.1078 (-0.0803) | -0.2915*** (-0.0725) | -0.2110** (-0.0712) | -0.305*** (-0.0749) | -0.2231** (-0.076) |
| <i>Travelto S. Borja</i> | -0.0417*** (-0.0059) | 0 (-0.0042) | -0.0557*** (-0.0114) | 0.0148** (-0.0054) | -0.0342*** (-0.0069) | 0.0117* (-0.0052) | -0.036*** (-0.0053) | 0.0047 (-0.0043) |
| <i>Hunting</i> | 0.1282° (-0.0751) | 0.1469° (-0.0755) | 0.1259 (-0.0851) | 0.1404 (-0.0883) | 0.1087 (-0.0777) | 0.1149 (-0.0771) | 0.0624 (-0.071) | 0.0665 (-0.0744) |
| <i>Chicha</i> | 0.052 (-0.0615) | 0.0222 (-0.0606) | 0.0859 (-0.0615) | 0.0836 (-0.0628) | 0.0323 (-0.0541) | 0.0048 (-0.0567) | 0.0135 (-0.0646) | -0.0095 (-0.0679) |
| Village FE | X | X | X | X | X | X | X | X |
| Time FE | | X | | X | | X | | X |
| <i>N</i> | 3303 | 3303 | 3303 | 3303 | 3303 | 3303 | 3303 | 3303 |

° p<0.10, * p<0.05, ** p<0.01, *** p<0.001

Notes: Standard errors in parenthesis. Village FE and Time FE rows: An "X" indicates the use of village- or time dummy-variables in the regression. Results for dummy-variables are not shown. N: Number of observations