Income Comparison and Subjective Well-Being: Evidence from Self-Perceived Relative Income Data from China

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Abstract

This paper studies the impact of self-perceived relative income on subjective well-being (SWB) using data from China. The results show that perceiving a lower relative income in comparison with different reference groups leads to lower life satisfaction and happiness. The effect of the self-perceived relative income on SWB is monotonic—the lower the position of an individual in income comparisons, the larger the negative effect. In addition, favorable and unfavorable relative income positions have asymmetric impacts on life satisfaction, but not on happiness. The results hold when controlling for individual fixed effects by utilizing the panel structure of the data.

Introduction

Social comparisons are important in affecting people's behaviors and outcomes. It has been well addressed in the literature that relative achievement can affect individuals' labor market performance, health conditions, educational achievement, and other aspects of life (e.g., Boudreau et al. 2016; Kale et al. 2009; Morin 2006; Yu 2019a). A growing literature has emerged in the past two decades studying specifically the role of relative income in determining individuals' subjective well-being (SWB). As suggested by Hirschman and Rothschild (1973) and Clark and Senik

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(2010), there are two possible mechanisms through which relative income affects SWB. The first one is through the "envy" channel. If an individual envies the income level of his/her reference groups, we should expect a positive relationship between relative income position and SWB. On the contrary, through the "signal" channel, if an individual treats his/her reference groups' income as his/her own potential future income, one should expect a negative correlation between relative income position and SWB.

A number of studies report that when making comparisons to different reference groups, a higher relative income position of the individual is correlated with a higher level of SWB for that individual (see, e.g., Ferrer-i-Carbonell 2005; McBride 2001; Luttmer 2005; Blanchflower and Oswald 2004; Clark et al. 2008; Clark and Senik 2010; Clark et al. 2013; Huang et al. 2016; Oshio et al. 2011). One shortcoming of these studies, however, is that the reference groups for income comparisons are arbitrarily selected, to some extent. In these studies, relative income is usually constructed by the researchers. Specifically, a cell defined by age, gender, profession, etc., is chosen by the researcher, and all people within this category are treated as the reference group. The average-income or predicted income of the category would be considered as the reference group's income (e.g., Blanchflower and Oswald 2004; Clark and Oswald 1996; Clark et al. 2013; Luttmer 2005; Ferrer-i-Carbonell 2005).

This average-income approach sometimes could be inappropriate. The reason is that the income of the reference groups constructed by the researcher might be different from the one to which individuals are comparing. Some recent papers show that people are more likely to compare their income with that of "local" reference groups like friends and colleagues, but not with the income of more "general" groups such as city average (e.g., Clark and Senik 2010; Clark et al. 2013; Goerke and Pannenberg 2015; Mayraz et al. 2009; Dumludag 2015). Therefore, the relevance of the researcher-constructed reference income is a matter of debate. Moreover, using data from the German Socio-Economic Panel and the British Household Panel Survey, Pfaff (2013) questions the validity of this average-income approach. He shows that the relationship between researcher-constructed reference income and life satisfaction is inconsistent.[1]

Differently, McBride (2001) and Pfaff (2013) suggest that a preferred measure of relative income shall be self-perceived relative income. Yet, due to the lack of data, evidence from using self-perceived relative income was not available until recently. A few recent studies find that higher self-perceived relative income leads to higher well-being for that individual using self-perceived relative income (Senik 2009; Mayraz et al. 2009).[2]

In this paper, I contribute to the literature by providing direct evidence for the impact of self-perceived relative income on SWB using data from China. It is particularly interesting to study this issue using data from China because the majority

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[1] Pfaff (2013) shows that even a simple change in the measure of the income variable may change the coefficients of the self-constructed relative income on both significance and sign.

[2] More examples are Asadullah et al. (2018), Dumludag (2015), Goerke and Pannenberg (2015), Knight and Song (2009), Otis (2017) and Wolbring et al. (2016).

of the previous studies focus on developed countries. Owing to the low data availability, evidence from developing countries is rare. Because of the large population and high level of income inequality, China provides an ideal setting for investigating the association between people's well-being and social comparisons. Two studies that have specifically addressed the correlation between self-perceived relative income and SWB using data from China are Knight and Song (2009) and Asadullah et al. (2018). Using data from China, Knight and Song (2009) show that in comparison with village average income, a higher relative income is correlated with a higher level of happiness of the villagers. They also show that if a villager perceives a better living standard than that in five years ago, the villager's contemporaneous happiness is higher. Asadullah et al. (2018) find similar results using data from the China General Social Survey. The authors show that in comparison with individuals who perceive a high income than city average income, all other individuals have a lower level of happiness." In the present paper, I exploit data collected from the China Health and Retirement Longitudinal Study (CHARLS) which contains rich information on people's self-perceived relative income against five predetermined reference groups, including relatives (family members), schoolmates with the same educational level as the survey respondent, colleagues, neighbors and city/county average. Taking advantage of such rich information on individuals' self-perceived relative income, the present study largely extends the findings of Knight and Song (2009) and Asadullah et al. (2018).[3]

The biggest obstacle to identifying a causal effect of self-perceived relative income on SWB is the potential endogeneity caused by omitted variables, especially unobservable personality traits that may be simultaneously correlated with subjective well-being and self-perceived relative income.[4] In a similar setting, Yu (2019a) investigates the causal effect of self-perceived income on life satisfaction using panel data on elderly people from the UK. The author controls for individual fixed effects to largely eliminate the impact of unobservable but supposedly stable personality traits of elderly people. In this paper, I follow Yu (2019a) and overcome the potential endogeneity caused by controlling for individual fixed effects taking advantage of the panel structure of the CHARLS data.[5]

I estimate the relationship between self-perceived relative income and both affective and cognitive subjective well-being. Cognitive SWB refers to general life satisfaction which is usually used in the income-SWB literature, while affective SWB refers to people's emotional feelings (such as happiness, sadness and depression). Compared with the strong correlation between general life satisfaction and income and/or relative income found in most previous studies, few studies have shown that

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[3] A number of studies address various other aspects of issues related to SWB in China (e.g., Chen, 2015; Cheng et al. 2014; Knight and Gunatilaka, 2010; Smyth et al. 2010; Smyth and Qian, 2008).

[4] Personality traits have been known as important determinants of individual's subjective well-being (e.g., Emmons and Diener 1985; Diener et al. 2003).

[5] In a different setting, a recent study by Nobles et al. (2013) also implements the fixed-effect model to eliminate potential endogeneity that could be caused by unobservable personality traits when investigating the impact of individuals' self-perceived socioeconomic status on their health conditions.

the impact of income and/or relative income on affective SWB is limited.[6] In this paper, I use both people's frequency of being happy in the "last week" and people's general life satisfaction to measure SWB.

The main findings have multiple dimensions. First, self-perceived relative income has a positive and significant impact on general life satisfaction as well as on happiness. The findings remain intact even after I control for unobserved personality traits using fixed effects. The effect of self-perceived relative income on SWB is monotonic in that the lower the relative income, the lower the propensity for people to be happy or satisfied with their lives. Second, I find asymmetric effects of relative income on life satisfaction but symmetric effects on the emotion of happiness. The results show that the magnitudes of the impacts of having favorable and unfavorable relative income positions on life satisfaction are significantly different, while the magnitudes of the impacts on "recent" happiness are the same. Third, people care about their relative income against different reference groups differently. The results suggest that, in general, comparisons against neighbors and relatives have a seemingly larger effect on SWB than when the reference group is schoolmates, colleagues or city/county average. Fourth, similar patterns are detected in subsamples of males and females. Unlike Mayraz et al. (2009) who find no effect of relative income on females' SWB, the results of this paper suggest strong impacts of relative income on SWB for both females and males.

It is worth emphasizing that the CHARLS is designed to focus on the population whose age is older than 45. Therefore, one limitation of this study is that individuals included in the analyses in this study are all people above middle age or elderly people. Consequently, the CHARLS dataset is not an ideal source for testing the "signaling" channel since one would be less likely to expect to find evidence for the "signaling" channel among elderly people. Yet, the findings of this study are particularly relevant in providing guidance to public policies that aim to improve social protection or general welfare for elderly people.

The rest of the paper is organized as follows: "Data" section is the description of data. Empirical results are reported in "Empirical Framework" section. "Robustness tests" section presents the robustness tests. "Conclusions" section concludes.

Data

In this study, data are collected from the *China Health and Retirement Longitudinal Study* (CHARLS). CHARLS is a nationally representative survey targeting the population who is 45 years old and older. CHARLS provides abundant information on respondents' demographics, health, assets, work and retirement status. CHARLS randomly selects 450 communities and villages from 150 counties from China. These counties are stratified and randomly selected based on GDP and population.

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[6] For example, Di Tella et al. (2003) show that income level is not statically significantly correlated with individuals' happy emotion in the USA or Europe. Kahneman and Deaton (2010) suggest that income is more related with life satisfaction but not daily emotional well-beings.

Table 1 Frequencies of self-reported *Life Satisfaction* and *Happiness*

	Whole sample	Male	Female
How satisfied are you with your life?			
Completely satisfied	389	190	199
	(3.2%)	(3.3%)	(3.2%)
Very satisfied	2610	1190	1420
	(21.6%)	(20.5%)	(22.7%)
Somewhat satisfied	7491	3821	3670
	(62.0%)	(65.7%)	(58.53%)
Not very satisfied	1279	515	764
	(10.6%)	(8.9%)	(12.2%)
Not at all satisfied	320	103	221
	(2.7%)	(1.8%)	(3.5%)
N	12,089	5819	6270
During the last week, how many days were you happy?			
None of the time (< 1 day)	3498	1665	1833
	(28.9%)	(28.6%)	(29.2%)
A little of the time (1–2 days)	1786	849	937
	(14.8%)	(14.6%)	(14.9%)
Moderate amount of the time (3–4 days)	2622	1210	1412
	(21.7%)	(20.8%)	(22.5%)
Most of the time (5–7 days)	4183	2095	2088
	(34.6%)	(36.0%)	(33.3%)
N	12,089	5819	6270

Happiness measures self-reported level of happiness. *Satisfaction* is self-reported level of life satisfaction. In the parentheses are the percentages. The values are rounded to decimal

Around 80 households from each of the 450 communities or villages are randomly selected to answer the survey. The raw data contain more than 17,500 observations. I restrict the sample to respondents who are at least 45 years old.[7] In the panel data analysis, the sample is restricted to respondents who responded to both 2011 and 2013 waves. In the cross-sectional analysis, wave 2013 of CHARLS is used.

Measures of Subjective Well-Being

In both waves of the survey, individuals are asked to rate their general life satisfaction by answering the following question: "*Please think about your life as a whole. How satisfied are you with it? Are you completely satisfied, very satisfied, somewhat satisfied, not very satisfied, or not at all satisfied?*" The answers to this question range from *1. Completely satisfied* to *5. Not at all satisfied*.

[7] Totally, 441 observations are dropped when I restrict the sample to respondents who are at least 45 years old. Including these observations in the analyses do not affect the empirical results.

Respondents are also asked to describe their emotional well-being during the week right before the interview. Specifically, the respondents are asked to choose an option for the statement "*I am happy*." The options are *1. rarely or none of the time (<1 day); 2. some or a little of the time (1–2 days); 3. occasionally or a moderate amount of the time (3–4 days); 4. most or all of the time (5–7 days).*

Table 1 presents the distribution of the answers to life satisfaction and happiness questions from wave 2013 for the cross-sectional analysis. In the whole sample, life satisfaction is normally distributed, although it is a little skewed toward the "satisfied" side. specifically, about 24.8% of the respondents are *satisfied* or *completely satisfied* with their lives, while only around 13% of the respondents are *not very satisfied* or *not at all satisfied*. More than 60% of the respondents hold a moderate opinion stating that they are *somewhat satisfied* with their lives. The self-reported happiness, on the other hand, is distributed among the four levels of happiness more evenly. Around 29% of the respondents *never* felt happy during the week before the interview. More than 34% of the respondents report being happy *most of the time* during the preceding week of the interview. The proportions of the respondents who were happy for *a little of the time* or *moderate amount of the time* are 14.8% and 21.7%, respectively.

The distributions in the female and male subsamples are similar to those in the whole sample. A larger proportion of males report a neutral life satisfaction than females, and females are 5 percentage points more likely to report that they are *not very satisfied* and *not at all satisfied*. The distributions of happiness in the two subsamples are similar. Males are slightly more likely to be happy most of the time than females (around 3% percentage points higher), if anything. In general, more than 70% of the respondents are at least somewhat satisfied with their lives and more than 50% of them are happy at least some of the time in the preceding week.

Self-Perceived Relative Income

In the 2013 wave, the survey has some questions about relative income. Interviewees are asked to rate their relative income when replying to the following questions: *1. Compared to the average living standard of your relatives, how would you rate your standard of living? 2. Compared to the average living standard of your schoolmates who are at the same level of education as you, how would you rate your standard of living? 3. Compared to the average living standard of your colleagues, how would you rate your standard of living? 4. Compared to the average living standard of your neighbors or others in your village or neighborhood, how would you rate your standard of living? 5. Compared to the average living standard of people in your city or county, how would you rate your standard of living?* I use the self-perceived relative standard of living as a proxy for self-perceived relative income, and I note the relative standard of living as relative income hereafter.

For each question, the respondents can choose one from the following choices: *1. much better; 2. a little better; 3. about the same; 4. a little worse; 5. much worse; 6. I don't know.* When comparing with their colleagues and schoolmates, respondents can also choose to answer "*not applicable.*" These reference groups are

Table 2 Frequencies of self-perceived relative income in comparison with the reference groups

	In comparison with…				
	(1) Relatives	(2) Schoolmates	(3) Colleagues	(4) Neighbors	(5) City/county average
Much better	177 (1.5%)	95 (0.8%)	69 (0.6%)	98 (0.8%)	38 (0.3%)
A little better	839 (7.0%)	606 (5.0%)	463 (3.9%)	864 (7.1%)	377 (3.1%)
About the same	6553 (54.2%)	4465 (36.9%)	4,09 (36.5%)	6907 (57.1%)	3177 (26.3%)
A little worse	2220 (18.4%)	1959 (16.2%)	1557 (12.9%)	2278 (18.8%)	2691 (22.3%)
Much worse	2154 (17.8%)	1816 (15.0%)	1031 (8.5%)	1662 (13.8%)	5021 (41.5%)
I don't know	146 (1.2%)	486 (4.0%)	180 (1.5%)	280 (2.3%)	785 (6.5%)
Not applicable		2662 (22.0%)	4380 (36.2%)		
N	12,089	12,089	12,089	12,089	12,089

Five predetermined reference groups are relatives (family members)/schoolmates who have the same educational as the survey respondent/colleagues/neighbors/city or county average. In the parentheses are the percentages. The values are rounded to decimal. When asked to rate their relative standard of living against schoolmates and colleagues, survey respondents could choose "not applicable" as their answer

predetermined in the survey, which alleviates the concerns that people may endogenously choose specific reference groups to compare.

Table 2 contains the descriptive statistics of the self-perceived relative income, using data from wave 2013. When making comparisons with relatives, schoolmates who have the same educational level as the respondents, colleagues and neighbors, about 54% of the respondents hold the point that their income is *about the same* as the reference groups. Meanwhile, totally less than 10% percent of the respondents rate their relative income position as *a little better* or *much better* than the reference groups. In the first four columns in Table 2, around 13–19% of the sample think their income is a little lower than the reference groups while approximately 8.5–18% of the sample believe that their income is much lower than their relatives and neighbors, etc. The column 5 of Table 2 shows that when comparing with the county or city average, more than 63% of the interviewees think that they are in a worse situation in terms of income, and among them, around 41% believe that their relative living standard is much worse than the county or city average.

Notice that when asked to compare their own income with that of their family members, schoolmates, neighbors and colleagues, only a small proportion of the interviewees report "*I don't know*." It indicates that the majority of the respondents are aware of their relative income positions which further indicate strong comparison intensity, which is consistent with the findings in Clark and Senik (2010). When comparing with the county/city average, slightly higher than 6% of the respondents choose "*I don't know*." One possible reason is that life is generally local; people care

more about and make comparisons with people around them, especially relatives, colleagues, neighbors and schoolmates (Senik 2009). It could also be the case that people have less information about the city/county average; thus, a nontrivial proportion of them have no idea of their relative income compared to the county/city average.

In "Appendix" Table 11, I present the distributions of self-reported relative income for male and female subsamples. The data suggest that a larger proportion of women than men report "Not Applicable" when comparing with their colleagues and schoolmates with the same educational level.[8] Females are also less aware of the average income of the county or city than males are.

The majority of the analysis in this paper will be based on the cross-sectional data from the 2013 wave. However, it is important to control for personality traits which may affect SWB and relative income simultaneously. Ideally, if one can use both waves of CHARLS, unobserved personality traits can be controlled for. Yet, the relative income questions are not consistent in wave 2011 and 2013 of CHARLS. In wave 2011, the respondents are asked to report their "overall" income relative income. The answers range from "1. very high" to "5. poor." Because no specific reference group is provided, different individuals may have different reference groups in mind when they judge their "overall" relative income. In order to connect the two waves, for each individual, I construct an "overall" self-perceived relative income by averaging the respondents' answers to the 5 relative income questions in the 2013 wave,[9,10] In this way, each individual also has a self-perceived "overall" relative income in wave 2013, and the overall relative income becomes a continuous variable whose values range from 1 to 5. The summary statistics of the variables used in the panel analysis are reported in "Appendix" Table 12.

Other Covariates

Table 3 reports the summary statistics of other covariates. In the regression sample (wave 2013), 52% of the respondents are female. The average age is around 60. Health status follows a normal distribution where about half of the sample report *fair* health. About 38% of the population live in urban areas. Due to the large number of missing values in wage, pension and other forms of incomes in the raw dataset, I use the sum of the respondents' cash, bank deposits as well as their total living expenditures on 14 items in the preceding year, 7 items in the preceding month and 3 items in the preceding week, as a proxy for household disposable income.

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[8] Among all those who report N/A when comparing with schoolmates, 87.5% of them never finish primary school, while all of them do not have a middle school degree. Those respondents who claim to be not applicable to be compared with colleagues are either farmers or unemployed.

[9] Individuals who choose "6. I don't know" and "7. Not applicable" are dropped in this process.

[10] By doing so, I assume that when the respondents rate their "overall" standard of living, they compare with the five reference groups provided in wave 2013 and these 5 reference groups are equally weighted in the process of comparison.

Table 3 Descriptive statistics of the covariates the 2013 wave of CHARLS (for the cross-sectional analyses)

Variables	Details	Mean	SD
Age	Age of the respondents measured as the survey year minus the student's birth year	60.46	9.13
Female	Dummy variable (=1) if the respondent is female	0.52	0.50
Highest education			
No formal education	Dummy variable (=1) if the respondent has no formal education	0.25	0.43
Some primary school/Sishu[a]/primary school	Dummy variable (=1) if the educational level of the respondent is some primary school, Sishu education or primary school	0.41	0.49
Middle school	Dummy variable (=1) if the educational level of the respondent is middle school	0.22	0.41
High school and above	Dummy variable (=1) if the educational level of the respondent is above high school	0.13	0.33
Marital status			
Married/married but is not living with spouse temporarily	Dummy variable (=1) if the respondent is currently married (living with or temporarily not living with his/her spouse).	0.88	0.32
Divorced/widowed/separated	Dummy variable (=1) if the respondent is currently divorced, widowed or separated with his/her spouse	0.11	0.31
Never married	Dummy variable (=1) if the respondent is never married	0.01	0.08
Health status			
Very good	Dummy variable (=1) if the respondent self-reports very good health	0.09	0.28
Good	Dummy variable (=1) if the respondent self-reports good health	0.14	0.35
Fair	Dummy variable (=1) if the respondent self-reports fair health	0.53	0.50
Poor	Dummy variable (=1) if the respondent self-reports poor health	0.19	0.39
Very poor	Dummy variable (=1) if the respondent self-reports very poor health	0.05	0.21
Household income	Real household income (in Chinese Yuan) measured using price in 2011, including living expenditure, cash and bank deposits	23,346	65,562
Size of dwelling	The size of the apartment/house where the respondent lives, measured in square meters	122.8	81.95
Urban	Dummy variable (=1) if the respondent lives in the urban area	0.38	0.49
N		12,089	

The cross-sectional sample only includes data from the 2013 wave of CHARLS. Respondents who are younger than 45 years old are dropped

[a] A form of private education in China which no longer exists. Because some of the respondents are quite old, a trivial proportion of them were educated in Sishu when they were kids

The household incomes are calculated using the price in 2011 in China. The sample average size of the dwelling is around 123 square meters.

Empirical Framework

Empirical Methodology

Following Clark and Senik (2010), a well-being function is expressed in the following way:

$$U_i = U_i(Y_i, Y_i - Y_i^r, X_i, \ldots) \tag{1}$$

where U_i is the well-being of individual i. Y_i is individual i's income, Y_i^r is the income of i's reference group. X_i is the vector of other covariates. To analyze the effects of relative income on SWB, the following model is estimated:

$$SWB_i = \alpha_0 + \alpha_1 Y_i + \alpha_2 RY_i + \alpha_3 X_i + \varepsilon_i \tag{2}$$

where SWB_i individual's subjective well-being including general life satisfaction and happiness in the preceding week. Specifically, *Life Satisfaction* = 1 if the interviewee chooses "*completely satisfied*," "*very satisfied*" or "*somewhat satisfied*"; otherwise, *Life Satisfaction* = 0. If the respondent reports being happy in the preceding week for "*most or all of the time (5–7 days)*" or "*occasionally or a moderate amount of the time (3–4 days)*," then *Happiness* = 1; otherwise *Happiness* = 0.

RY_i is the main explanatory variable, the self-perceived relative income. RY_i consists of a group of dummies which represent relative positions perceived by individual i in the income comparisons, ranging from "*much better*" to "*much worse*."[11] I estimate the impact of relative income against 5 reference groups, including relatives, schoolmates at the same educational level as the individual, colleagues, neighbors and city/county average, on SWB respectively. Y_i is the log form of household income of individual i. X_i is the vector of control variables, including education, age, age^2, gender, the size of the house, marital status, self-reported health status, provincial fixed effect and whether the individual is living in the rural or urban area. Equation (2) is estimated using OLS regression to show baseline results. A probit model is used as one of the robustness checks. Standard errors are clustered at the city level.

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[11] Only about 1 percent of the respondents consider themselves as having "much better" income than the reference groups. I thus merge the groups of people who perceive "much better" or "a little better" income into a single category. I treat this category has the group of people who perceive better income than the reference groups. This category is the omitted category when estimating Eq. (2).

In order to make the results comparable to those of the studies that analyzed the correlation between SWB and self-perceived relative income,[12] the following specification is also estimated by OLS[13]:

$$\text{SWB Score}_i = \beta_0 + \beta_1 Y_i + \beta_3 \text{Higher\_RY}_i + \beta_3 \text{Lower\_RY}_i + \beta_4 X_i + \mu_i \qquad (3)$$

The values of the dependent variables are now the scores of cardinal life satisfaction or happiness. Specifically, *Life satisfaction* takes the values of 1, 2, 3, 4 and 5 indicating one's level of life satisfaction ranging from "1. not at all satisfied" to "5. completely satisfied." Similarly, *Happiness* takes the value of 1, 2, 3 and 4 indicating one's level of happiness ranging from "1. rarely or none of the time" to "4. most or all of the time."

Higher_RY_i and Lower_RY_i are two dummies indicating whether the respondent perceived a better or worse position in the income comparisons against reference groups, respectively. For instance, when comparing with colleagues, if an individual reports that he/she lives "*much better*" or "*a little better*" than colleagues, I build a dummy variable called "better than colleagues"; similarly, I build a "worse than colleagues" dummy to indicate that an individual lives "a little worse" or "much worse" than colleagues. These two dummies are estimated in the same regression, and the omitted category is the group of individuals who report "about the same" income as their colleagues. People who report "*I don't know*" or "*not applicable*" will be dropped in this specification.

In addition, I also employ a fixed-effects model to account for unobserved personality traits.,[14][15] As discussed before, the biggest obstacle to finding causal effects of self-perceived relative income on SWB is that an individual's personalities may affect SWB and self-perceived relative income simultaneously. Therefore, the sample is restricted to individuals who responded to both the 2011 and 2013 waves of CHARLS and estimate the following regressions:

$$\text{SWB}_{i,t} = \gamma_0 + \gamma_1 Y_{i,t} + \gamma_2 \text{Overall\_RY}_{i,t} + \gamma_3 X_{i,t} + \nu_{i,t} \qquad (4)$$

The self-perceived relative income is now Overall_$RY_{i,t}$ which represents an individual's "overall" self-perceived relative income. In the 2011 wave of CHARLS,

[12] They are Knight and Song (2009), Senik (2009), Mayraz et al. (2009) and Goerke and Pannenberg (2015).

[13] An ordered probit (logit) model can also be tested because the raw values of the dependent variables of SWB are cardinal. For each value of life satisfaction and happiness, marginal effects can be calculated for the self-perceived relative income dummies. The regression results obtained from ordered probit (logit) models are consistent with those in OLS estimations. The results are provided in the "Appendix."

[14] Previous studies find that linear fixed effects and fixed-effects logit models give similar results in studying life satisfaction (e.g., Dickerson et al. 2014). I do not conduct fixed-effect (ordered) logit estimation because a logit model would cause a significant drop in the number of observations in our sample due to the fact that for some of the respondents, the outcome variable may display no variation in the two waves of the survey.

[15] Ferrer-i-Carbonell and Frijters (2004) propose an estimator from fixed-effects ordered logit model which may not suffer the problem of losing observations. However, Baetschmann et al. (2015) suggest that the estimator proposed by Ferrer-i-Carbonell and Frijters (2004) is generally inconsistent.

respondents were asked to report their overall self-perceived relative income on a scale from 1 "very high" to 5 "poor." The 2011 wave made no mention of specific reference groups. In the 2013 wave, survey respondents were asked 5 questions, where they were to report their self-perceived relative income against the following reference groups: relatives, neighbors, colleagues, schoolmates and city/county average. The answers range from 1 "much better" to 5 "much worse" than the reference groups. Consequently, the self-perceived relative income variable is inconsistent across these two waves of CHARLS. To address this problem, I construct an "overall" self-perceived relative income variable for the 2013 wave by averaging the respondents' answers to the 5 relative income questions. In this way, a self-perceived "overall" relative income variable is built in the 2013 wave. Now the self-perceived "overall" relative income variable becomes a continuous variable whose values range from 1 to 5, and to make the results easy to read, I change the order of the values of this variable such that a higher value indicates a higher level of self-perceived "overall" relative income.[16] In the fixed-effects model, I only include time-variant variables including self-reported health status, marital status and age.

Baseline Results

Our baseline results are reported in Table 4. In panel A, the dependent variable is an indicator to show whether an individual is satisfied with his/her life. The dependent variable is equal to 1 if the individual is "completely satisfied," "very satisfied" or "somewhat satisfied" with his/her life; otherwise 0.

Columns 1–5 in Table 4 show the estimates of self-perceived relative income against 5 different reference groups. Among all the covariates, household income is positively correlated with life satisfaction in all 5 regressions. The estimates suggest that a 100% increase in income is only associated with a 0.9–1.2 percentage points increase in the propensity of being satisfied with lives. This finding is largely consistent with previous studies using data from China. For instance, as is suggested by the results of Oshio et al. (2011), compared with per capita income, household income is much less important in determining life satisfaction. Their results indicate that household income is insignificantly and negatively correlated with life satisfaction using data from China, Japan and Korea. Asadullah et al. (2018) and Knight and Song (2009) also find that in terms of magnitude, there is a weak correlation between household income per capita, net wealth and life satisfaction using data from China. Asadullah et al. (2018) even find a negative and significant correlation between household income per capita and life satisfaction in the richest quartile of respondents in their sample.

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[16] I am aware that the "overall" self-perceived relative income I constructed for the 2013 wave may not perfectly match that in the 2011 wave. The reason is that the income comparisons with the 5 reference groups may be not enough to represent the "overall" income comparison. Moreover, the answer choices for the relative income questions in the 2011 and 2013 waves are slightly different. But based on the information available, this way of constructing the overall relative income in the 2013 wave is reasonable.

Table 4 Life satisfaction, happiness, and self-perceived relative income OLS regressions

	In comparison with…				
	(1) Relatives	(2) Schoolmates	(3) Colleagues	(4) Neighbors	(5) City/county average
Panel A: Life satisfaction					
Log (household income)	0.009***	0.011***	0.011***	0.009***	0.012***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Self-perceived relative income					
About the same	−0.009	0.001	−0.003	−0.015*	0.009
	(0.007)	(0.009)	(0.011)	(0.008)	(0.012)
A little worse	−0.089***	−0.049***	−0.058***	−0.094***	−0.019
	(0.011)	(0.012)	(0.013)	(0.011)	(0.013)
Much worse	−0.207***	−0.154***	−0.179***	−0.220***	−0.094***
	(0.014)	(0.016)	(0.019)	(0.015)	(0.014)
I don't know	−0.049*	−0.053***	−0.007	−0.062***	−0.012
	(0.030)	(0.018)	(0.026)	(0.023)	(0.017)
Not applicable		−0.044***	−0.046***		
		(0.012)	(0.013)		
N	12,089	12,089	12,089	12,089	12,089
Panel B: Happiness					
Log (Household Income)	0.004	0.005	0.006*	0.003	0.007*
	(0.004)	(0.003)	(0.004)	(0.004)	(0.004)
Self-perceived relative income					
About the same	−0.082***	−0.072***	−0.075***	−0.085***	−0.038
	(0.016)	(0.019)	(0.020)	(0.016)	(0.025)
A little worse	−0.160***	−0.129***	−0.138***	−0.165***	−0.047*
	(0.021)	(0.020)	(0.024)	(0.019)	(0.025)
Much worse	−0.203***	−0.190***	−0.181***	−0.242***	−0.108***
	(0.019)	(0.019)	(0.027)	(0.020)	(0.025)
I don't know	−0.176***	−0.099***	−0.024	−0.091***	−0.066**
	(0.049)	(0.028)	(0.038)	(0.032)	(0.030)
Not applicable		−0.142***	−0.119***		
		(0.021)	(0.022)		
N	12,089	12,089	12,089	12,089	12,089

The dependent variables are dummies of life satisfaction and happiness. Life Satisfaction = 1 if the interviewee chooses "completely satisfied," "very satisfied" or "somewhat satisfied"; otherwise, life satisfaction = 0. If the respondent reports being happy in the preceding week of the interview for "most or all of the time (5–7 days)" or "occasionally or a moderate amount of the time (3–4 days)," then happiness = 1; otherwise happiness = 0; the omitted category of relative income is the group of respondents who perceived much higher or a little higher income than the reference groups. Control variables include respondents' age, age^2, gender, the size of dwelling, marital status, educational levels, self-reported health status, whether he/she lives in the urban area and province fixed effects. Full report is presented in the "Appendix," Tables 13 and 14. All standard errors are clustered at city level and reported in parentheses

***$p<0.01$; **$p<0.05$; *$p<0.1$

Our main interest is the effect of self-perceived relative income on SWB. In column 1, the reference group is relatives. The omitted category of relative income

level is "*much better*" and "a little better." The results suggest that people whose income is "*a little worse*" or "*much worse*" than their relatives' are less likely to be satisfied with their lives. The negative effect of relative income on well-being is monotonically increasing in magnitude in the sense that the lower the relative income perceived, the lower the propensity for an individual to be satisfied with his/her life. Compared with the omitted group, while people whose income is "*a little worse*" than their relatives are 8.9 percentage points less likely to be satisfied with lives, those whose income is "*much worse*" are 20.7 percentage points lower.[17] Similar results appear when the reference groups are schoolmates who have the same educational level as the respondent, colleagues and neighbors.

When comparing with the average income of the city or county, only the group of people who perceive to have a "much worse" income are having less life satisfaction. Specifically, perceiving a much lower income than the city/county average lowers the propensity of being satisfied with his/her life by 9.4 percentage points for an individual.

Among the 5 reference groups, the absolute values of the coefficients are relatively larger when the reference groups are neighbors and relatives, while it is the smallest in magnitude when the reference group is the average income of the city or county where the respondent lived. One plausible explanation is that among the five reference groups, relatives and neighbors are the most observable groups, while the city or county average is the least observable.

The estimation results when using the happiness dummy as the dependent variable is presented in Panel B. The happiness dummy shows whether or not an individual was happy in the preceding week of the interview. The dependent variable takes the value of 1 if the individual was happy for "*most of the time*" or "*a moderate amount of time*" in the preceding week of the interview; otherwise 0; the results suggest that household income has at best a weak association with people's (emotional) happiness, which is largely consistent with the literature (Di Tella et al. 2003; Kushlev et al. 2015).

The results, however, show a strong impact of relative income on happiness. Different from the results in panel A, the impact of income comparisons with different reference groups, in general, tend to be similar in magnitude. Yet, the impact is significantly smaller in size when the reference is the city or county average income. It is worth noting that even having "*about the same*" income as one's relatives or neighbors makes an individual less likely to be happy. If an individual's income is much lower than his/her neighbors, the individual is almost 24.2 percentage points lower in the propensity of being happy in the preceding week. In panel B, the effects of relative income also increase in magnitude monotonically. The lower the self-perceived relative income, the less likely for the individual to be happy. Again, the city or county average income seems to be the least relevant among the five reference

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[17] F test of the differences between the coefficients of different categories is reported in the "Appendix," panel A of Table 16. Results suggest that there are significant differences between the coefficients of various categories.

groups. When compared with the city or county average income, the groups of people who have much lower or a little lower income are less happy.

In both panels A and B, people who assert that they do not know their relative income in comparison with these reference groups have a lower propensity of being satisfied with their lives. People who report not being applicable for income comparisons also have lower life satisfaction.

So far, results have shown similar patterns when outcomes are life satisfaction or happiness, although the coefficients of relative income have more statistical significance when the dependent variable is happiness. While the full results with the coefficients of all covariates are reported in Tables 13 and 14, I have the following findings: (1) larger dwelling size makes people happier; (2) bad health status is significantly and negatively correlated with SWB; (3) educational level and age cohort have a weak relationship with happiness; however, more educated people and older people tend to have higher life satisfaction[18]; (4) gender has no impact on happiness, while females are less likely to be satisfied with their lives; (5) people who are divorced, separated with their spouse, or widowed are less likely to be satisfied with their lives; (6) people who live in the cities report higher happiness but not life satisfaction.

Scores Based on Cardinal Subjective Well-Being

Following Senik (2009) and Goerke and Pannenberg (2015), I also use the raw scores of life satisfaction and happiness as the dependent variables. The scores are based on the cardinal values of life satisfaction or happiness. The scores of life satisfaction range from 1 to 5. The scores of happiness range from 1 to 4. The larger the value, the higher the life satisfaction or happiness. In order to make our results comparable with the results of relevant previous papers, I also change the relative income variables into two dummy variables which indicate whether the respondent perceives a better or worse position in the income comparisons against reference groups, respectively. Panels A and B in Table 5 present the results obtained by estimating Eq. (3) using OLS regressions for life satisfaction and happiness. Since the raw values of life satisfaction and happiness are cardinal, I also estimate Eq. (3) using an ordered probit model. The results are provided in the "Appendix."

In general, the results reported in Table 5 are consistent with our findings in Table 4. Having a higher self-perceived relative income people's life satisfaction as well as happiness; and vice versa. The interesting finding here is that the results suggest seemingly asymmetric effects of relative income on life satisfaction, but symmetric effects on happiness.

In the first column of Table 5, in panel A, it is clear that the coefficients of the two relative income variables are quite different in absolute magnitude. The effect of the favorable position in the income comparison is only about one-half of that of the coefficient of a disadvantageous position. On the contrary, in the first column

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[18] Coefficients for age may contain some measurement errors because some of the respondents report their birth year in Lunar calendar while some of them report in Solar calendar.

Table 5 The cardinal life satisfaction, happiness, and self-perceived relative income: OLS regressions

	In comparison with…				
	(1) Relatives	(2) Schoolmates	(3) Colleagues	(4) Neighbors	(5) City/county average
Panel A: Scores of life satisfaction					
Log (household income)	0.009 (0.006)	0.012* (0.006)	0.011* (0.006)	0.009 (0.006)	0.014** (0.006)
Self-perceived relative income					
Better than relatives	0.121*** (0.034)				
Worse than relatives	−0.256*** (0.020)				
Better than schoolmates		0.099*** (0.031)			
Worse than schoolmates		−0.199*** (0.019)			
Better than colleagues			0.119*** (0.031)		
Worse than colleagues			−0.226*** (0.020)		
Better than neighbors				0.152*** (0.029)	
Worse than neighbors				−0.253*** (0.022)	
Better than city/count average					0.080* (0.041)
Worse than city/count average					−0.184*** (0.020)
N	6442	6442	6442	6442	6442
Panel B: Scores of happiness					
Log (household income)	0.019 (0.011)	0.021* (0.011)	0.020* (0.011)	0.018 (0.011)	0.026** (0.011)
Self-perceived relative income					
Better than relatives	0.254*** (0.051)				
Worse than relatives	−0.229*** (0.037)				
Better than schoolmates		0.211*** (0.053)			
Worse than schoolmates		−0.199*** (0.030)			
Better than colleagues			0.235*** (0.059)		
Worse than colleagues			−0.229*** (0.037)		
Better than neighbors				0.239*** (0.052)	
Worse than neighbors				−0.245*** (0.035)	

Table 5 (continued)

	In comparison with…				
	(1) Relatives	(2) Schoolmates	(3) Colleagues	(4) Neighbors	(5) City/county average
Better than city/count average					0.134* (0.071)
Worse than city/count average					−0.143*** (0.038)
N	6442	6442	6442	6442	6442

The dependent variables are the cardinal scores of life satisfaction or happiness. The values of life satisfaction range from 1 to 5. The values of happiness range from 1 to 4. Higher value stands for higher life satisfaction or happiness. People who report of "*I don't know*" and "*not applicable*" to the relative income questions are dropped. Respondents who perceived the same income as the reference groups' are the omitted category. A full set of covariates including province fixed effects are controlled for. All standard errors are clustered at city level and shown in parentheses

***$p < 0.01$; **$p < 0.05$; *$p < 0.1$

of panel B, the two coefficients of advantageous and disadvantageous relative income positions are almost identical, except the opposite signs. Similar patterns can be observed in other columns as well.[19] The results indicate that having higher or lower income than the reference groups has asymmetric effects on life satisfaction but symmetric effects on happiness. The unfavorable relative income positions have much stronger effects on people's life satisfaction than favorable relative income positions. It is consistent with Senik (2009) and Goerke and Pannenberg (2015) who find asymmetric and larger effects of unfavorable relative income on life satisfaction.

Longitudinal Analysis

The results of the longitudinal analysis are displayed in Table 6. Summary statistics are reported in the "Appendix" Table 12. As discussed before, the self-perceived overall relative income is constructed as a continuous variable the values of which range from 1 to 5 indicating the lowest to the highest relative income positions. It is clear that the estimates obtained from the pooled OLS regressions are larger than the fixed-effect model estimates, which is consistent with the hypothesis that individual personality traits are strongly correlated with SWB. The fixed effects, however, remain both economically and statistically significant. Specifically, the results suggest that one unit increase in the overall relative income, the propensity of being satisfied with his/her life and being happy in the past week increases by around 3.2 and 2.6 percentage points, respectively. The results are consistent with our findings in the baseline results. For example, if an individual's overall relative income scale drops from 5 to 1 (from much better to much worse), according to the estimates in

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[19] F test of the differences between the coefficients of different categories are reported in the "Appendix," Panel B of Table 16.

Table 6 Life satisfaction, happiness, and "overall" self-perceived relative income fixed-effects estimations

Variables	(1) Life satisfaction (pooled OLS)	(2) Life satisfaction (fixed effect)	(3) Happiness (pooled OLS)	(4) Happiness (fixed effect)
Log (household income)	0.007*** (0.002)	0.001 (0.004)	0.005 (0.003)	−0.005 (0.005)
Overall relative income	0.103*** (0.006)	0.032*** (0.008)	0.087*** (0.008)	0.026** (0.011)
Age	0.008* (0.004)	0.015 (0.023)	−0.015** (0.007)	−0.098*** (0.034)
Age^2	−0.000 (0.000)	−0.000 (0.000)	0.000* (0.000)	0.000 (0.000)
Marital status				
Divorced/widowed/ separated	−0.041*** (0.016)	−0.019 (0.049)	−0.003 (0.020)	0.026 (0.060)
Never married	−0.041 (0.046)	0.140 (0.200)	−0.053 (0.056)	0.344* (0.199)
Health status				
Good	−0.009 (0.012)	−0.011 (0.014)	0.011 (0.019)	−0.015 (0.030)
Fair	−0.035*** (0.011)	−0.032** (0.015)	−0.109*** (0.018)	−0.080** (0.031)
Poor	−0.140*** (0.014)	−0.060*** (0.020)	−0.242*** (0.024)	−0.137*** (0.040)
Very poor	−0.240*** (0.031)	−0.157*** (0.034)	−0.388*** (0.036)	−0.248*** (0.055)
N	8224	8224	8224	8224

The dependent variables are dummies of life satisfaction and happiness. Life Satisfaction = 1 if the interviewee chooses "completely satisfied," "very satisfied" or "somewhat satisfied"; otherwise, life satisfaction = 0. If the respondent reports being happy in the preceding week of the interview for "most or all of the time (5–7 days)" or "occasionally or a moderate amount of the time (3–4 days)," then happiness = 1; otherwise happiness = 0; the values of self-perceived overall relative income range from 1 to 5 indicating the lowest to the highest self-perceived relative income positions. All standard errors are clustered at city level and shown in parentheses

***$p<0.01$; **$p<0.05$; *$p<0.1$

Table 6, the individual will be 12.8 (3.2*4) percentage points lower in the propensity of being satisfied with his/her life. Therefore, even after controlling for individual fixed effects, our main finding still holds. However, due to the limit of the data, I am not able to examine the sizes of the effects of income comparisons against a specific reference group in a panel setting.

Gender-Specific Regressions

I also estimate using separate subsamples of females and males to test for potential heterogeneous results across genders. Tables 7 and 8 show the results of OLS

Table 7 *Life Satisfaction* and self-perceived relative income for females and males OLS regressions

	In comparison with…				
	(1)	(2)	(3)	(4)	(5)
	Relatives	Schoolmates	Colleagues	Neighbors	City/county average
Male					
Log (household income)	0.008***	0.009***	0.010***	0.007**	0.010***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Self-perceived relative income					
About the same	−0.015*	−0.001	−0.008	−0.014	0.015
	(0.008)	(0.009)	(0.012)	(0.009)	(0.014)
A little worse	−0.091***	−0.050***	−0.043***	−0.076***	−0.017
	(0.013)	(0.011)	(0.014)	(0.014)	(0.016)
Much worse	−0.198***	−0.145***	−0.170***	−0.221***	-0.081***
	(0.019)	(0.016)	(0.021)	(0.020)	(0.017)
I don't know	−0.044	−0.074***	0.013	−0.031	0.005
	(0.035)	(0.026)	(0.033)	(0.027)	(0.018)
Not applicable		−0.051***	−0.048***		
		(0.014)	(0.014)		
N	5819	5819	5819	5819	5819
Female					
Log (household income)	0.010***	0.012***	0.012***	0.010***	0.013***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Self-perceived relative income					
About the same	−0.002	0.001	0.001	−0.016	−0.005
	(0.012)	(0.016)	(0.019)	(0.012)	(0.024)
A little worse	−0.088***	−0.051**	−0.079***	−0.112***	−0.031
	(0.016)	(0.020)	(0.021)	(0.017)	(0.024)
Much worse	−0.212***	−0.166***	−0.191***	−0.221***	−0.114***
	(0.018)	(0.025)	(0.031)	(0.019)	(0.025)
I don't know	−0.052	−0.038	−0.027	−0.089**	−0.034
	(0.047)	(0.024)	(0.043)	(0.036)	(0.028)
Not applicable		−0.041**	−0.046**		
		(0.018)	(0.021)		
N	6270	6270	6270	6270	6270

The dependent variable is a dummy variable of life satisfaction. Life Satisfaction = 1 if the interviewee chooses "completely satisfied," "very satisfied" or "somewhat satisfied"; otherwise, life satisfaction = 0. Respondents who perceived much higher or a little higher income than the reference groups' are the omitted category. Control variables include respondents' age, age^2, gender, the size of dwelling, marital status, educational levels, self-reported health status, whether he/she lives in the urban area and province fixed effects. All standard errors are clustered at city level and shown in parentheses

***$p < 0.01$; **$p < 0.05$; *$p < 0.1$

estimations for life satisfaction and happiness separately for males and females. In Table 7, results show that household income has a significant and positive impact on both male and female's life satisfaction. Yet the coefficients of household income are larger for females. Higher household income makes females more likely to be

Table 8 *Happiness* and self-perceived relative income for females and males OLS regressions

| | In comparison with… | | | | |
| | (1) | (2) | (3) | (4) | (5) |
	Relatives	Schoolmates	Colleagues	Neighbors	City/county average
Male					
Log (household income)	0.009*	0.010**	0.011**	0.009*	0.013**
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Self-perceived relative income					
About the same	−0.098***	−0.058**	−0.073***	−0.070***	−0.042
	(0.024)	(0.025)	(0.027)	(0.021)	(0.033)
A little worse	−0.194***	−0.115***	−0.132***	−0.165***	−0.061*
	(0.031)	(0.025)	(0.032)	(0.029)	(0.033)
Much worse	−0.205***	−0.155***	−0.166***	−0.199***	−0.093***
	(0.028)	(0.028)	(0.037)	(0.029)	(0.035)
I don't know	−0.264***	−0.107**	−0.020	−0.051	−0.078*
	(0.066)	(0.041)	(0.058)	(0.044)	(0.042)
Not applicable		−0.145***	−0.145***		
		(0.031)	(0.031)		
N	5819	5819	5819	5819	5819
Female					
Log (household income)	−0.000	0.000	0.001	−0.002	0.002
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Self-perceived relative income					
About the same	−0.060***	−0.088***	−0.075**	−0.099***	−0.031
	(0.022)	(0.030)	(0.030)	(0.021)	(0.040)
A little worse	−0.123***	−0.145***	−0.147***	−0.165***	−0.027
	(0.024)	(0.031)	(0.037)	(0.023)	(0.040)
Much worse	−0.191***	−0.228***	−0.198***	−0.276***	−0.116***
	(0.023)	(0.030)	(0.034)	(0.024)	(0.038)
I don't know	−0.098	−0.100***	−0.023	−0.121***	−0.053
	(0.062)	(0.037)	(0.045)	(0.043)	(0.043)
Not applicable		−0.150***	−0.098***		
		(0.030)	(0.033)		
N	6270	6270	6270	6270	6270

The dependent variable is a dummy variable of happiness. If the respondent reports being happy in the preceding week of the interview for "most or all of the time (5–7 days)" or "occasionally or a moderate amount of the time (3–4 days)," then happiness = 1; otherwise happiness = 0; respondents who perceived much higher or a little higher income than the reference groups' are the omitted category. Control variables include respondents' age, age^2, gender, the size of dwelling, marital status, educational levels, self-reported health status, whether he/she lives in the urban area and province fixed effects. All standard errors are clustered at city level and shown in parentheses

***$p < 0.01$; **$p < 0.05$; *$p < 0.1$

satisfied with their lives, compared with males. Relative income seemingly has a similar impact on males' and females' life satisfaction. The coefficients of different

relative income categories are similar in magnitude and statistical significance for males and females.

Results suggest that self-perceived relative income in comparison with neighbors has the largest effect on both males and females' life satisfaction. Having "*much worse*" income than neighbors lowers the propensity of being satisfied with their lives by about 22 percentage points for both genders.

The results reported in Table 8 indicate that happiness is not correlated with household income for females. The results show weak evidence that higher household income leads to higher happiness. Self-perceived relative income has a significant impact on happiness for males and females. The results are consistent with those reported in Table 4 using the whole sample. The results displayed in Tables 7 and 8 show that relative income affects the subjective well-being of males and females similarly.

Robustness Tests

The results are robust to a series of robustness tests. Besides the covariates used in estimating Eq. (2) in our main specification, I add two more variables to control for unobservable personal traits. One is a dummy variable, noted as "*depression*", which measures whether or not the respondent was depressed in the preceding week of the interview. The other is a variable, noted as "*social activity*", which measures how many social activities the respondents participated in the preceding week of the interview. Table 9 presents the results.

The results suggest that *depression* and *social activity* participation are significantly correlated with both life satisfaction and happiness. A higher level of depression is correlated with a lower level of life satisfaction and less happiness. Higher social activity participation is correlated with higher SWB.

The results regarding relative income in Table 9 are quite consistent with those in Table 4, indicating that the omitted personal trait has little impact on the results. Since *depression* could also be part of the outcome of having a lower relative income, it captures some of the effect of relative income on SWB. The effects of being depressed on SWB are negative and significant; it also causes a slight decrease in the effect of having a lower relative income.

Alternatively, I exploit a probit model to check the robustness from previous OLS estimations. I include all the control variables including the level of depression as well as social activity participation. The marginal effects of different categories of self-perceived relative income are reported in Table 10. The results are in accordance with the OLS outputs. Relative income again plays a significant role in affecting people's SWB. The disadvantage when making income comparisons with their reference groups leads to lower life satisfaction and/or happiness. The lower the relative income, the lower the propensity of being well-off for the respondents.

Table 9 OLS regressions controlling for depression and social activity participation

	In comparison with…				
	(1) Relatives	(2) Schoolmates	(3) Colleagues	(4) Neighbors	(5) City/county average
Panel A: Life satisfaction					
Log (household income)	0.010***	0.011***	0.012***	0.010***	0.012***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Self-perceived relative income					
About the same	−0.007	0.001	−0.007	−0.015**	0.006
	(0.007)	(0.009)	(0.011)	(0.007)	(0.012)
A little worse	−0.075***	−0.037***	−0.051***	−0.084***	−0.018
	(0.011)	(0.011)	(0.013)	(0.011)	(0.012)
Much worse	−0.179***	−0.129***	−0.156***	−0.189***	−0.078***
	(0.013)	(0.014)	(0.017)	(0.014)	(0.013)
I don't know	−0.045	−0.047***	0.001	−0.059**	−0.006
	(0.030)	(0.017)	(0.027)	(0.023)	(0.016)
Not applicable		−0.032***	−0.037***		
		(0.011)	(0.012)		
Level of depression					
A little depressed	−0.050***	−0.054***	−0.055***	−0.051***	−0.056***
	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
Somewhat depressed	−0.115***	−0.122***	−0.123***	−0.115***	−0.123***
	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)
Very depressed	−0.219***	−0.235***	−0.235***	−0.220***	−0.238***
	(0.014)	(0.015)	(0.014)	(0.014)	(0.014)
Social activity participation	0.006***	0.005***	0.006***	0.005***	0.006***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
N	11,979	11,979	11,979	11,979	11,979
Panel B: Happiness					
Log (household income)	0.002	0.003	0.004	0.002	0.005
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Self-perceived relative income					
About the same	−0.076***	−0.069***	−0.078***	−0.080***	−0.031
	(0.016)	(0.018)	(0.020)	(0.016)	(0.025)
A little worse	−0.143***	−0.112***	−0.128***	−0.148***	−0.030
	(0.020)	(0.019)	(0.023)	(0.019)	(0.024)
Much worse	−0.165***	−0.156***	−0.144***	−0.197***	−0.076***
	(0.018)	(0.019)	(0.026)	(0.020)	(0.025)
I don't know	−0.177***	−0.084***	−0.016	−0.085***	−0.043
	(0.048)	(0.027)	(0.039)	(0.032)	(0.030)
Not applicable		−0.120***	−0.102***		
		(0.021)	(0.022)		
Level of depression					
A little depressed	−0.062***	−0.063***	−0.066***	−0.061***	−0.066***
	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)
Somewhat depressed	−0.095***	−0.098***	−0.100***	−0.094***	−0.101***
	(0.015)	(0.015)	(0.015)	(0.014)	(0.014)

Table 9 (continued)

	In comparison with…				
	(1) Relatives	(2) Schoolmates	(3) Colleagues	(4) Neighbors	(5) City/county average
Very depressed	−0.288*** (0.018)	−0.294*** (0.019)	−0.299*** (0.019)	−0.285*** (0.018)	−0.298*** (0.018)
Social activity participation	0.031*** (0.004)	0.030*** (0.003)	0.031*** (0.004)	0.030*** (0.003)	0.031*** (0.004)
N	11,979	11,979	11,979	11,979	11,979

The dependent variable is a dummy variable of life satisfaction. Life Satisfaction = 1 if the interviewee chooses "completely satisfied," "very satisfied" or "somewhat satisfied"; otherwise, life satisfaction = 0. Respondents who perceived much higher or a little higher income than the reference groups' are the omitted category. Control variables include respondents' age, age^2, gender, size of dwelling, marital status, educational levels, self-reported health status, whether he/she lives in the urban area and province fixed effects. All standard errors are clustered at city level and shown in parentheses

***$p < 0.01$; **$p < 0.05$; *$p < 0.1$

Conclusions

This paper studies the role of self-perceived relative income in determining both cognitive and affective subjective well-being. The results show a strong association between self-perceived relative income and subjective well-being. Specifically, using newly collected survey data from China, I find that having a lower income in comparison with reference groups considerably lowers individuals' SWB, and vice versa. Absolute household income and relative income affect life satisfaction and happiness differently. In general, absolute household income has a positive effect on life satisfaction but not on happiness, while relative income affects both life satisfaction and happiness. The impact of relative income on happiness is slightly larger than that on life satisfaction, however. No heterogeneity is found by gender.

Because the reference groups are predetermined, the potential endogeneity problem is mainly induced by unobservable personality traits. I employ two methods to mitigate potential endogeneity that can be caused by unobservable personalities. First, I use panel data to control for individual fixed effects so that time-invariant personalities are eliminated from the estimations. The results are unchanged after controlling for individual fixed effects. Second, as a robustness check, I include two variables that measure an individual's frequency of being depressed and of participating in social activities, respectively. Controlling for these two variables again does not change the results.

The results of this study seemingly agree with the "envy" but not the "signal" mechanism. One possible reason is that a large proportion of the respondents in our sample are rather old, and all of them are at least 45 years old. Hence, even if the "signal" does exist, it may at most have weak impacts on this specific group of people. Because elderly people concern less about their potential future income such that the "envy" effect seems significantly dominates the results.

Table 10 Life satisfaction, happiness, and self-perceived relative income (probit regressions)

	In comparison with…				
	(1) Relatives	(2) Schoolmates	(3) Colleagues	(4) Neighbors	(5) City/county average
Panel B: Probability of life satisfaction = 1					
Self-perceived relative income					
About the same	−0.025**	−0.019	−0.022	−0.041***	−0.008
	(0.012)	(0.017)	(0.019)	(0.014)	(0.020)
A little worse	−0.091***	−0.065***	−0.070***	−0.103***	−0.045**
	(0.014)	(0.017)	(0.019)	(0.014)	(0.021)
Much worse	−0.144***	−0.122***	−0.130***	−0.156***	−0.091***
	(0.013)	(0.017)	(0.020)	(0.014)	(0.021)
I don't know	−0.066**	−0.073***	−0.023	−0.082***	−0.034
	(0.027)	(0.020)	(0.032)	(0.023)	(0.024)
Not applicable		−0.056***	−0.055***		
		(0.017)	(0.020)		
N	11,979	11,979	11,979	11,979	11,979
Panel B: Probability of happiness = 1					
Self-perceived relative income					
About the same	−0.091***	−0.087***	−0.097***	−0.094***	−0.038
	(0.019)	(0.023)	(0.026)	(0.020)	(0.029)
A little worse	−0.161***	−0.133***	−0.152***	−0.167***	−0.038
	(0.023)	(0.023)	(0.028)	(0.022)	(0.029)
Much worse	−0.186***	−0.181***	−0.170***	−0.222***	−0.087***
	(0.021)	(0.022)	(0.032)	(0.024)	(0.030)
I don't know	−0.198***	−0.103***	−0.026	−0.101***	−0.052
	(0.052)	(0.031)	(0.045)	(0.037)	(0.035)
Not applicable		−0.141***	−0.123***		
		(0.024)	(0.027)		
N	11,979	11,979	11,979	11,979	11,979

The marginal effects are calculated at the mean values of all the explanatory variables. Respondents who perceived much higher or a little higher income than the reference groups' are the omitted category. Control variables include respondents' age, age^2, gender, size of dwelling, marital status, educational levels, self-reported health status, whether he/she lives in the urban area and province fixed effects. All standard errors are clustered at city level and shown in parentheses

***$p < 0.01$; **$p < 0.05$; *$p < 0.1$

Appendix

See Tables 11, 12, 13, 14, 15, 16, 17, 18, 19, 20 and 21.

Table 11 Frequencies of self-perceived relative income for males and females

	In comparison with…				
	(1) Relatives	(2) Schoolmates	(3) Colleagues	(4) Neighbors	(5) City/county average
Male					
Much better	78 (1.3%)	49 (0.8%)	36 (0.6%)	53 (0.9%)	18 (0.3%)
A little better	457 (7.9%)	360 (6.2%)	258 (4.4%)	483 (8.3%)	234 (4.0%)
About the same	3217 (55.3%)	2332 (40.1%)	2336 (40.1%)	3349 (57.6%)	1537 (26.4%)
A little worse	1059 (18.2%)	1086 (18.7%)	834 (14.3%)	1086 (18.7%)	1326 (22.8%)
Much worse	946 (16.3%)	960 (16.5%)	540 (9.3%)	721 (12.4%)	2357 (40.5%)
Don't know	62 (1.1%)	204 (3.5%)	93 (1.6%)	127 (2.2%)	347 (6.0%)
Not applicable		828 (14.2%)	1722 (29.6%)		
N	5819	5819	5819	5819	5819
Female					
Much better	99 (1.6%)	46 (0.7%)	33 (0.5%)	45 (0.7%)	20 (0.3%)
A little better	382 (6.1%)	246 (3.9%)	205 (3.3%)	381 (6.1%)	143 (2.3%)
About the same	3336 (53.2%)	2133 (34.0%)	2073 (33.1%)	3558 (56.8%)	1640 (26.2%)
A little worse	1161 (18.5%)	873 (13.9%)	723 (11.5%)	1192 (19.0%)	1365 (21.8%)
Much worse	1208 (19.3%)	856 (13.7%)	491 (7.8%)	941 (15.0%)	2664 (42.5%)
I don't know	84 (1.3%)	282 (4.5%)	87 (1.4%)	153 (2.4%)	438 (7.0%)
Not applicable		1834 (29.3%)	2658 (42.4%)		
N	6270	6270	6270	6270	6270

Five predetermined reference groups are relatives (family members)/schoolmates who have the same educational as the survey respondent/colleagues/neighbors/city or County average. In the parentheses are the percentages. The values are rounded to decimal. When asked to rate their relative standard of living against schoolmates and colleagues, survey respondents could choose "not applicable" as their answer

Table 12 Summary statistics of the panel data sample

Variables	Details	Mean	SD
Life satisfaction	Dummy variable (=1) if the respondent is "somewhat satisfied," "satisfied" or "completely satisfied" with his/her life	0.88	0.33
Happiness	Dummy variable (=1) if the respondent is happy in the preceding week for "moderate amount of the time" or "most of the time"	0.65	0.48
Overall relative income	The self-perceived overall relative standard of living whose value ranges from 1 to 5. The higher the scale, the higher the relative standard of living	2.53	0.75
Age	Age of the respondents measured as the survey year minus the student's birth year	58.95	8.71
Marital status			
Married/married but is not living with spouse temporarily	Dummy variable (=1) if the respondent is currently married (living with or temporarily not living with his/her spouse)	0.90	0.29
Divorced/widowed/separated	Dummy variable (=1) if the respondent is currently divorced, widowed or separated with his/her spouse	0.09	0.28
Never married	Dummy variable (=1) if the respondent is never married	0.01	0.09
Health status			
Very good	Dummy variable (=1) if the respondent self-reports very good health	0.09	0.29
Good	Dummy variable (=1) if the respondent self-reports good health	0.18	0.38
Fair	Dummy variable (=1) if the respondent self-reports fair health.	0.53	0.50
Poor	Dummy variable (=1) if the respondent self-reports poor health	0.17	0.38
Very poor	Dummy variable (=1) if the respondent self-reports very poor health	0.03	0.17
Household income	Real household income (in Chinese Yuan) measured using price in 2011, including living expenditure, cash and bank deposits	23,191	66,663
N		8224	

The longitudinal sample only includes respondents who respond to both the 2011 and 2013 wave of CHARLS. People who are younger than 45 years old are dropped

Table 13 Life satisfaction and self-perceived relative income, full results (OLS regressions)

Variables	In comparison with…				
	(1) Relatives	(2) Schoolmates	(3) Colleagues	(4) Neighbors	(5) City/county average
Log (household income)	0.009***	0.011***	0.011***	0.009***	0.012***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Self-perceived relative income					
About the same	−0.009	0.001	−0.003	−0.015*	0.009
	(0.007)	(0.009)	(0.011)	(0.008)	(0.012)
A little worse	−0.089***	−0.049***	−0.058***	−0.094***	−0.019
	(0.011)	(0.012)	(0.013)	(0.011)	(0.013)
Much worse	−0.207***	−0.154***	−0.179***	−0.220***	−0.094***
	(0.014)	(0.016)	(0.019)	(0.015)	(0.014)
I don't know	−0.049*	−0.053***	−0.007	−0.062***	−0.012
	(0.030)	(0.018)	(0.026)	(0.023)	(0.017)
Not applicable		−0.044***	−0.046***		
		(0.012)	(0.013)		
Female	−0.018***	−0.020***	−0.020***	−0.020***	−0.021***
	(0.006)	(0.006)	(0.007)	(0.006)	(0.006)
Age	0.012***	0.011***	0.011**	0.012***	0.012***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Age^2	−0.000**	−0.000*	−0.000	−0.000**	−0.000*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Marital status					
Divorced/widowed/separated	−0.020**	−0.025**	−0.023**	−0.020**	−0.028***
	(0.009)	(0.010)	(0.009)	(0.010)	(0.010)
Never married	−0.047	−0.051	−0.048	−0.042	−0.072
	(0.044)	(0.044)	(0.044)	(0.044)	(0.045)
Educational level					
Some primary school/Sishu[a]/ primary school	0.020**	0.024***	0.018**	0.014	0.018**
	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)
Middle school	0.028***	0.034***	0.027**	0.018*	0.025**
	(0.010)	(0.011)	(0.011)	(0.010)	(0.010)
High school or above	0.032***	0.047***	0.040***	0.023**	0.025**
	(0.011)	(0.012)	(0.012)	(0.011)	(0.011)
Health status					
Good	−0.006	−0.007	−0.003	−0.003	−0.009
	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)
Fair	−0.041***	−0.045***	−0.043***	−0.042***	−0.047***
	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
Poor	−0.150***	−0.164***	−0.164***	−0.150***	−0.168***
	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)
Very poor	−0.235***	−0.257***	−0.261***	−0.237***	−0.266***
	(0.022)	(0.021)	(0.021)	(0.021)	(0.021)
Log (size of dwelling)	0.011**	0.016***	0.019***	0.011**	0.019***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Urban	0.008	0.008	0.010	0.014**	−0.001
	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
N	12,089	12,089	12,089	12,089	12,089

This table reports the full results that are corresponding to those reported in Table 4 Panel A

[a]A form of private education in China which no longer exists. Because some of the respondents are quite old, a trivial proportion of them were educated in Sishu when they were kids

Table 14 Happiness and self-perceived relative income, full results (OLS regressions)

Variables	In comparison with…				
	(1) Relatives	(2) Schoolmates	(3) Colleagues	(4) Neighbors	(5) City/county average
Log (household income)	0.004 (0.004)	0.005 (0.003)	0.006* (0.004)	0.003 (0.004)	0.007* (0.004)
Self-perceived relative income					
About the same	−0.082*** (0.016)	−0.072*** (0.019)	−0.075*** (0.020)	−0.085*** (0.016)	−0.038 (0.025)
A little worse	−0.160*** (0.021)	−0.129*** (0.020)	−0.138*** (0.024)	−0.165*** (0.019)	−0.047* (0.025)
Much worse	−0.203*** (0.019)	−0.190*** (0.019)	−0.181*** (0.027)	−0.242*** (0.020)	−0.108*** (0.025)
I don't know	−0.176*** (0.049)	−0.099*** (0.028)	−0.024 (0.038)	−0.091*** (0.032)	−0.066** (0.030)
Not applicable		−0.142*** (0.021)	−0.119*** (0.022)		
Female	0.015 (0.010)	0.015 (0.010)	0.015 (0.010)	0.013 (0.010)	0.014 (0.010)
Age	−0.001 (0.007)	−0.001 (0.006)	−0.001 (0.006)	−0.000 (0.006)	−0.001 (0.007)
Age^2	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
Marital status					
Divorced/widowed/sepa-rated	−0.004 (0.014)	−0.006 (0.014)	−0.005 (0.014)	−0.002 (0.014)	−0.009 (0.014)
Never married	−0.082 (0.051)	−0.078 (0.052)	−0.079 (0.051)	−0.072 (0.051)	−0.095* (0.051)
Educational level					
Some primary school/ Sishu[a]/primary school	0.014 (0.013)	0.007 (0.014)	0.013 (0.014)	0.010 (0.014)	0.014 (0.013)
Middle school	0.015 (0.017)	0.006 (0.017)	0.014 (0.017)	0.006 (0.016)	0.013 (0.017)
High school or above	0.018 (0.022)	0.015 (0.023)	0.023 (0.023)	0.006 (0.022)	0.014 (0.022)
Health status					
Good	−0.038** (0.019)	−0.039** (0.018)	−0.036* (0.018)	−0.037** (0.019)	−0.042** (0.018)
Fair	−0.141*** (0.015)	−0.145*** (0.015)	−0.144*** (0.015)	−0.142*** (0.015)	−0.150*** (0.015)
Poor	−0.283*** (0.020)	−0.292*** (0.020)	−0.294*** (0.020)	−0.281*** (0.020)	−0.302*** (0.020)
Very poor	−0.344*** (0.027)	−0.354*** (0.027)	−0.360*** (0.026)	−0.337*** (0.026)	−0.368*** (0.027)
Log (size of dwelling)	0.017* (0.009)	0.019** (0.009)	0.024*** (0.009)	0.016* (0.009)	0.024*** (0.009)
Urban	0.043*** (0.011)	0.042*** (0.011)	0.043*** (0.012)	0.049*** (0.011)	0.038*** (0.011)
N	12,089	12,089	12,089	12,089	12,089

Table 14 (continued)

This table reports the full results that are corresponding to those reported in Table 4 Panel B

[a]A form of private education in China which no longer exists. Because some of the respondents are quite old, a trivial proportion of them were educated in Sishu when they were kids

Table 15 OLS regression using alternative cutoffs to build *Life Satisfaction* and *Happiness*

	In comparison with…				
	(1) Relatives	(2) Schoolmates	(3) Colleagues	(4) Neighbors	(5) City/county average
Life satisfaction					
Log (household income)	− 0.000 (0.002)	0.002 (0.003)	0.002 (0.003)	− 0.001 (0.003)	0.001 (0.003)
Self-perceived relative income					
About the same	− 0.123*** (0.018)	− 0.092*** (0.019)	− 0.102*** (0.021)	− 0.116*** (0.016)	− 0.101*** (0.024)
A little worse	− 0.192*** (0.019)	− 0.152*** (0.018)	− 0.169*** (0.022)	− 0.191*** (0.016)	− 0.150*** (0.023)
Much worse	− 0.209*** (0.019)	− 0.157*** (0.021)	− 0.199*** (0.024)	− 0.219*** (0.018)	− 0.187*** (0.023)
I don't know	− 0.123*** (0.036)	− 0.127*** (0.024)	− 0.069** (0.035)	− 0.109*** (0.029)	− 0.149*** (0.025)
Not applicable		− 0.091*** (0.022)	− 0.113*** (0.022)		
N	12,089	12,089	12,089	12,089	12,089
Happiness					
Log (household income)	0.003 (0.003)	0.005 (0.003)	0.005 (0.003)	0.003 (0.003)	0.006* (0.003)
Self-perceived relative income					
About the same	− 0.094*** (0.019)	− 0.081*** (0.018)	− 0.095*** (0.025)	− 0.091*** (0.017)	− 0.053** (0.026)
A little worse	− 0.161*** (0.022)	− 0.137*** (0.019)	− 0.151*** (0.026)	− 0.164*** (0.020)	− 0.084*** (0.027)
Much worse	− 0.168*** (0.019)	− 0.151*** (0.019)	− 0.181*** (0.031)	− 0.177*** (0.019)	− 0.106*** (0.027)
I don't know	− 0.145*** (0.053)	− 0.089*** (0.028)	− 0.022 (0.045)	− 0.076** (0.029)	− 0.063** (0.031)
Not applicable		− 0.119*** (0.022)	− 0.128*** (0.025)		
N	12,089	12,089	12,089	12,089	12,089

The dependent variables are dummies indicating life satisfaction and happiness. Life satisfaction equals to 1 if the respondent is "satisfied" or "completely satisfied" with his/her life; otherwise life satisfaction = 0. Happiness equals 1 if the respondent is happy for "most of the time" in the week before the survey interview; otherwise happiness = 0. Respondents who perceived much higher or a little higher income than the reference groups' are omitted. Control variables include respondents' age, gender, the size of dwelling, marital status, educational levels, self-reported health status, whether he/she lives in the urban area and province fixed effects. All standard errors are clustered at city level and reported in parentheses

***$p < 0.01$; **$p < 0.05$; *$p < 0.1$

Table 16 F tests of the differences between coefficients of self-perceived relative income categories

	Relatives	Schoolmates	Colleagues	Neighbors	City/county average
Panel A	For Table 4				
Life satisfaction					
About the same—a little worse	P: 0.000	P: 0.000	P: 0.001	P: 0.000	P: 0.000
A little worse—much worse	P: 0.000	P: 0.000	P: 0.000	P: 0.000	P: 0.000
Happiness					
About the same—a little worse	P: 0.000	P: 0.000	P: 0.000	P: 0.000	P: 0.535
A little worse—much worse	P: 0.009	P: 0.000	P: 0.051	P: 0.000	P: 0.000
	Family better/worse	School better/worse	Colleague better/worse	Neighbor better/worse	City/county better/worse
Panel B	For Table 6 (Life Satisfaction)				
	P: 0.00	P: 0.01	P: 0.01	P: 0.01	P: 0.05
Panel C	For Table 7 (Happiness)				
	P: 0.71	P: 0.86	P: 0.94	P: 0.93	P: 0.93

"*P*" stands for *P* value. The purpose is to test the significance of the differences in the coefficients of different levels of self-perceived relative income. For example, for Table 6, I test the hypothesis of |better than family| - |worse than family|=0

Table 17 Life satisfaction, happiness, and self-perceived relative income: ordered probit regressions the dependent variables = 1

	In comparison with…				
	(1) Relatives	(2) Schoolmates	(3) Colleagues	(4) Neighbors	(5) City/county average
Panel A: Probability of life satisfaction = 1 (not at all satisfied)					
Self-perceived relative income					
About the same	0.008***	0.005***	0.007***	0.009***	0.007***
	(0.001)	(0.002)	(0.002)	(0.001)	(0.002)
A little worse	0.016***	0.011***	0.014***	0.017***	0.012***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Much worse	0.025***	0.019***	0.023***	0.026***	0.018***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
I don't know	0.011***	0.011***	0.004	0.011***	0.011***
	(0.004)	(0.003)	(0.004)	(0.003)	(0.003)
Not applicable		0.007***	0.010***		
		(0.002)	(0.002)		
N	11,979	11,979	11,979	11,979	11,979
Panel B: Probability of Happiness = 1 (was happy < 1 day last week)					
Self-perceived relative income					
About the same	0.077***	0.064***	0.082***	0.080***	0.031
	(0.014)	(0.015)	(0.019)	(0.014)	(0.021)
A little worse	0.129***	0.097***	0.124***	0.130***	0.039*
	(0.016)	(0.016)	(0.020)	(0.016)	(0.021)
Much worse	0.142***	0.122***	0.142***	0.160***	0.069***
	(0.015)	(0.016)	(0.025)	(0.017)	(0.022)
I don't know	0.158***	0.077***	0.018	0.077***	0.035
	(0.041)	(0.022)	(0.034)	(0.026)	(0.026)
Not applicable		0.102***	0.107***		
		(0.017)	(0.020)		
N	11,979	11,979	11,979	11,979	11,979

All the coefficients reported in the table are marginal effects calculated at the mean values of the covariates. Respondents who perceived much higher or a little higher income than the reference groups' are omitted. Control variables include respondents' age, gender, size of dwelling, marital status, educational levels, self-reported health status, whether he/she lives in the urban area and province fixed effects. All standard errors are clustered at city level and shown in parentheses

***$p < 0.01$; **$p < 0.05$; *$p < 0.1$

Table 18 Life satisfaction, happiness, and self-perceived relative income: ordered probit regressions the dependent variables $=2$

	In comparison with…				
	(1) Relatives	(2) Schoolmates	(3) Colleagues	(4) Neighbors	(5) City/county average
Panel A: Probability of Life Satisfaction = 2 (not very satisfied)					
Self-perceived relative income					
About the same	0.036***	0.023***	0.030***	0.038***	0.028***
	(0.006)	(0.007)	(0.007)	(0.006)	(0.008)
A little worse	0.074***	0.047***	0.060***	0.077***	0.049***
	(0.008)	(0.007)	(0.008)	(0.007)	(0.008)
Much worse	0.113***	0.077***	0.098***	0.117***	0.076***
	(0.008)	(0.009)	(0.009)	(0.008)	(0.009)
I don't know	0.048***	0.047***	0.018	0.051***	0.044***
	(0.016)	(0.010)	(0.015)	(0.013)	(0.010)
Not applicable		0.030***	0.040***		
		(0.009)	(0.008)		
N	11,979	11,979	11,979	11,979	11,979
Panel B: Probability of Happiness = 2 (was happy 1–2 days last week)					
Self-perceived relative income					
About the same	0.015***	0.012***	0.015***	0.015***	0.006
	(0.003)	(0.003)	(0.004)	(0.003)	(0.004)
A little worse	0.024***	0.018***	0.023***	0.025***	0.007*
	(0.003)	(0.003)	(0.004)	(0.003)	(0.004)
Much worse	0.027***	0.023***	0.027***	0.030***	0.013***
	(0.003)	(0.003)	(0.005)	(0.004)	(0.004)
I don't know	0.030***	0.014***	0.003	0.015***	0.007
	(0.008)	(0.004)	(0.006)	(0.005)	(0.005)
Not applicable		0.019***	0.020***		
		(0.003)	(0.004)		
N	11,979	11,979	11,979	11,979	11,979

All the coefficients reported in the table are marginal effects calculated at the mean values of the covariates. Respondents who perceived much higher or a little higher income than the reference groups' are omitted. Control variables include respondents' age, gender, size of dwelling, marital status, educational levels, self-reported health status, whether he/she lives in the urban area and province fixed effects. All standard errors are clustered at city level and shown in parentheses

***$p<0.01$; **$p<0.05$; *$p<0.1$

Table 19 Life satisfaction, happiness, and self-perceived relative income: ordered probit regressions the dependent variables = 3

	In comparison with…				
	(1) Relatives	(2) Schoolmates	(3) Colleagues	(4) Neighbors	(5) City/county average
Panel A: Probability of life satisfaction = 3 (somewhat satisfied)					
Self-perceived relative income					
About the same	0.030***	0.018***	0.024***	0.031***	0.022***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.006)
A little worse	0.060***	0.037***	0.048***	0.063***	0.039***
	(0.006)	(0.006)	(0.007)	(0.006)	(0.006)
Much worse	0.092***	0.062***	0.078***	0.095***	0.061***
	(0.007)	(0.007)	(0.008)	(0.008)	(0.007)
I don't know	0.039***	0.037***	0.014	0.042***	0.035***
	(0.013)	(0.008)	(0.012)	(0.010)	(0.008)
Not applicable		0.024***	0.032***		
		(0.007)	(0.006)		
N	11,979	11,979	11,979	11,979	11,979
Panel B: Probability of Happiness = 3 (was happy 3–4 days last week)					
Self-perceived relative income					
About the same	− 0.007***	− 0.006***	− 0.007***	− 0.007***	− 0.003
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
A little worse	− 0.011***	− 0.009***	− 0.011***	− 0.012***	− 0.003*
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Much worse	− 0.013***	− 0.011***	− 0.013***	− 0.014***	− 0.006***
	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)
I don't know	− 0.014***	− 0.007***	− 0.002	− 0.007***	− 0.003
	(0.004)	(0.002)	(0.003)	(0.003)	(0.002)
Not applicable		− 0.009***	− 0.009***		
		(0.002)	(0.002)		
N	11,979	11,979	11,979	11,979	11,979

All the coefficients reported in the table are marginal effects calculated at the mean values of the covariates. Respondents who perceived much higher or a little higher income than the reference groups' are omitted. Control variables include respondents' age, gender, size of dwelling, marital status, educational levels, self-reported health status, whether he/she lives in the urban area and province fixed effects. All standard errors are clustered at city level and shown in parentheses

***$p<0.01$; **$p<0.05$; *$p<0.1$

Table 20 Life satisfaction, happiness, and self-perceived relative income: ordered probit regressions the dependent variables = 4

| | In comparison with… | | | | |
	(1) Relatives	(2) Schoolmates	(3) Colleagues	(4) Neighbors	(5) City/county average
Panel A: Probability of Life Satisfaction = 4 (very satisfied)					
Self-perceived relative income					
About the same	− 0.062*** (0.010)	− 0.038*** (0.011)	− 0.050*** (0.012)	− 0.065*** (0.010)	− 0.047*** (0.014)
A little worse	− 0.125*** (0.012)	− 0.079*** (0.013)	− 0.102*** (0.014)	− 0.131*** (0.011)	− 0.083*** (0.013)
Much worse	− 0.193*** (0.012)	− 0.131*** (0.014)	− 0.166*** (0.015)	− 0.200*** (0.013)	− 0.129*** (0.014)
I don't know	− 0.082*** (0.027)	− 0.079*** (0.017)	− 0.031 (0.025)	− 0.087*** (0.022)	− 0.075*** (0.016)
Not applicable		− 0.051*** (0.014)	− 0.068*** (0.013)		
N	11,979	11,979	11,979	11,979	11,979
Panel B: Probability of happiness = 4 (was happy 5–7 days last week)					
Self-perceived relative income					
About the same	− 0.085*** (0.015)	− 0.071*** (0.017)	− 0.090*** (0.021)	− 0.088*** (0.015)	− 0.034 (0.023)
A little worse	− 0.142*** (0.018)	− 0.107*** (0.017)	− 0.136*** (0.022)	− 0.143*** (0.018)	− 0.042* (0.023)
Much worse	− 0.156*** (0.016)	− 0.135*** (0.017)	− 0.156*** (0.027)	− 0.176*** (0.019)	− 0.075*** (0.024)
I don't know	− 0.174*** (0.045)	− 0.085*** (0.024)	− 0.020 (0.038)	− 0.085*** (0.029)	− 0.039 (0.028)
Not applicable		− 0.113*** (0.019)	− 0.118*** (0.022)		
N	11,979	11,979	11,979	11,979	11,979

All the coefficients reported in the table are marginal effects calculated at the mean values of the covariates. Respondents who perceived much higher or a little higher income than the reference groups' are omitted. Control variables include respondents' age, gender, size of dwelling, marital status, educational levels, self-reported health status, whether he/she lives in the urban area and province fixed effects. All standard errors are clustered at city level and shown in parentheses

***$p < 0.01$; **$p < 0.05$; *$p < 0.1$

Table 21 Life satisfaction, happiness, and self-perceived relative income: ordered probit regressions life satisfaction = 5

	In comparison with…				
	(1) Relatives	(2) Schoolmates	(3) Colleagues	(4) Neighbors	(5) City/county average
Panel A: Probability of life satisfaction = 5 (completely satisfied)					
Self-perceived relative income					
About the same	−0.012***	−0.008***	−0.010***	−0.013***	−0.009***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)
A little worse	−0.024***	−0.016***	−0.021***	−0.026***	−0.017***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Much worse	−0.037***	−0.027***	−0.034***	−0.039***	−0.026***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
I don't know	−0.016***	−0.016***	−0.006	−0.017***	−0.015***
	(0.005)	(0.003)	(0.005)	(0.004)	(0.003)
Not applicable		−0.010***	−0.014***		
		(0.003)	(0.003)		
N	11,979	11,979	11,979	11,979	11,979

All the coefficients reported in the table are marginal effects calculated at the mean values of the covariates. Respondents who perceived much higher or a little higher income than the reference groups' are omitted. Control variables include respondents' age, gender, size of dwelling, marital status, educational levels, self-reported health status, whether he/she lives in the urban area and province fixed effects. All standard errors are clustered at city level and shown in parentheses

***$p < 0.01$; **$p < 0.05$; *$p < 0.1$

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