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Comparison income and subjective well-being: Evidence from a nationwide panel survey in Japan

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Abstract

This study conducts a social comparison of income in Japan and is the first to consider geographical distance in relation to comparison income. The results of a fixed-effects ordered logit model analysis show that comparison income is negatively correlated with life satisfaction. Therefore, our study provides evidence for the relative income hypothesis. Furthermore, income comparison is not symmetric, in line with the idea proposed by Duesenberry in 1949. Therefore, individuals may feel a sense of relative deprivation when others earn a higher income. Conversely, there is a lack of relative satisfaction when others earn a lower income. These findings indicate that policies promoting the equitable distribution of economic resources can potentially enhance the well-being of the Japanese population.

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1. Introduction

Multiple factors, including income, health, social relationships, employment, personal freedom, and peace, shape disparities in well-being within and across societies (Layard and De Neve 2023). Although economic growth has traditionally been viewed as central to improving the living standards of citizens, it is now well established that beyond a certain level, further income gains do not necessarily translate into greater subjective well-being. This underscores the need for more nuanced evidence on how economic growth can be effectively pursued and translated into well-being improvements. Since the end of World War II, the increase in per-capita income in both Western countries and Japan has not translated into an increase in average happiness or life satisfaction at the macro level. However, income and happiness within a country have a positive correlation at specific time points. This phenomenon is described as the Easterlin paradox (Easterlin 1974, 1995)[1]. Although this phenomenon contradicts the traditional economic assumption of a positive marginal utility of income, it can also be explained by the relative income concept (Duesenberry 1949; Easterlin 1974). The relative income hypothesis assumes that individuals' utilities are interdependent. Veblen (1899) proposed that satisfaction depends on others' wealth. Leibenstein (1950) divided consumer demand into functional and non-functional demands, identifying utility externalities as a key aspect of non-functional demand, which comprises the Bandwagon, Snob, and Veblen effects.

Policy implications differ depending on the specifications of the relative income variables in the utility function[2]. For example, negative externalities manifest as a decrease in others' happiness resulting from an increase in individual consumption. After including the relative income variable, the resulting differences in inefficiency may affect the optimization of progressive income and consumption tax structures. Furthermore, the inclusion of relative income is a determinant in establishing an appropriate poverty threshold. Therefore, understanding the empirical effects of relative income on happiness is imperative.

Empirical formulations of relative income in the subjective well-being equation can be classified into two approaches. One approach uses the reference group income as a comparison income (Brown *et al.* 2015; Caporale *et al.* 2009; Knies 2012; McBride 2001; Luttmer 2005; Welsch and Kühling 2015), whereas the other uses the income evaluated relative to the reference group as a relative income (Ferrer-i-Carbonell 2005; Oshio *et al.* 2011). Comparison income, rather than relative income, is preferred as an independent variable to avoid multicollinearity between relative income and own income. Theoretically, the coefficient of comparison income can be either positive or negative—through the negative comparisons or positive information effects. Comparison effects are related to jealousy. Information effects are based on information about the reference group's income, which influences an individual's future prospects. Information effects involve attributes related to Hirschman and Rothschild's (1973) "tunnel effect." The role of information depends on a rapidly changing context, in which the relative position is unstable (Senik 2004). Kingdon and Knight (2007) posit that a positive effect involves (1) altruism or fellow consciousness, (2) the share of risk within a community, and (3) proxy variables for social wages (e.g., enhancement of local public goods). These

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[1] Some studies have refuted this paradox. For example, Hagerty and Veenhoven (2003) and Stevenson and Wolfers (2008) find that, for several countries, a country's income rise increases the average happiness level.

[2] Clark *et al.* (2008) present implications for economic theory and policy design that consider the relative income from social comparison as well as adaptation issues in relation to economic growth, labor supply, wage profiles, optimal taxation and consumption, savings and investment, and migration.

authors highlight that people are altruistic toward others in close communities. Many empirical studies describe these comparative effects using microdata (Blanchflower and Oswald 2004; Clark and Oswald 1996; Ferrer-i-Carbonell 2005; Luttmer 2005; Oshio and Urakawa 2012; Oshio, Nozaki, and Kobayashi 2011; Tsurumi *et al.* 2019; Urakawa and Matsuura 2007).

Furthermore, the methods used in previous studies have various unresolved issues, including the estimation methods and definition of the reference group. Personality is a major determinant of subjective well-being (Frey and Stutzer 2002). If unobserved personal attributes and the independent variables correlate, the correlation will cause coefficient bias. Thus, an econometric approach should be adopted to control for such unobserved heterogeneity, although most previous studies have not done so (Blanchflower and Oswald 2004; Caporale *et al.* 2009; Clark and Oswald 1996; Kingdon and Knight 2007; Luttmer 2005; McBride 2001; Oshio *et al.* 2011; Oshio and Urakawa 2012; Mizuochi 2017). Some studies estimate a linear fixed effects model by implicitly assuming the cardinality of utility (Clark *et al*. 2009; Knies 2012; Senik 2008; Welsch and Kühling 2015). Prior empirical studies that do not assume cardinality have attempted to avoid the correlation between individual random effects and independent variables by using the subjective well-being data on an ordinal scale with three or more values[3]. Ferrer-i-Carbonell (2005), Senik (2004), and Urakawa and Matsuura (2007) estimate an ordered probit model that incorporates the Mundlak transformation by assuming that individual random effects depend on the mean values of the independent variables proposed by Mundlak (1978). However, in practice, the relationship between individual random effects and time-varying independent variables is not necessarily linear. In such a case, Mundlak type estimators may yield inconsistent and inefficient estimators in nonlinear models such as logit, probit, and ordered probit and logit models (Goetgeluk and Vansteelandt 2008; Brumback *et al*.2010).

Second, some studies define reference groups using attributes such as individual (Caporale *et al.* 2009; McBride 2001; Oshio *et al*. 2011; Welsch and Kühling 2015), regional (Blanchflower and Oswald 2004; Clark *et al*. 2009; Brodeur and Flèche 2019; Knies 2012; Tsurumi 2019), and occupational attributes (Clark and Oswald 1996). Other studies define reference groups using both regional and individual attributes (Ferrer-i-Carbonell 2005; Kingdon and Knight 2007; Kudrna 2023; Senik 2004; Senik 2008). Prior studies arbitrarily set geographic boundaries to estimate the reference group's income. Setting geographic boundaries introduces a modifiable areal unit problem with two effects: scale and zoning (Jelinski and Wu 1996). The scale effect may cause discrepancies in the estimation of the reference group's income, depending on whether the estimation is based on the entire nation, prefecture, or city. The zoning effect can lead to misclassification when the same household is regrouped into different zones. For example, when boundaries are applied between two households on the same street, they may be assigned to different reference groups even if they have comparable incomes.

Using Japanese panel data, this study empirically verifies whether the coefficients of income comparison correlate negatively or positively with life satisfaction. Thus, this study expands on the previous research in two ways. First, we conducted a social comparison of income by controlling for fixed effects to estimate the equations. It is important to account for the time-invariant unobserved heterogeneity including personality, given the previous finding that controlling for fixed effects influences the estimation results substantially (Ferrer-i-Carbonell and Frijters 2004). Although the relative income hypothesis has been tested in Japan (Oshio *et al*. 2011; Oshio and Urakawa 2012; Mizuochi 2017; Tsurumi 2019; Urakawa and Matsuura 2007), no studies have conducted social comparisons of income using a fixed-effects

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[3] Brown *et al.* (2015) estimate the effect of comparison income with fixed effects ordered logit model, but they do not describe the details of the estimation method.

model with panel data.

Second, this study defines reference groups by including detailed individual and regional attributes (e.g., considering geographical distance) to avoid the modifiable areal unit problem. Therefore, income of respondents with the same individual attributes is weighted by the inverse of the distance between the respondents' residential areas to compute the average income of the reference group. The income of the reference group can be calculated by increasing the weighting of the observations in relation to regional proximity.

The remainder of this paper is organized as follows: Section 2 explains the methodology, Section 3 discusses the analysis, Section 4 presents our estimation results, and Section 5 concludes the study.

2. Methods

2.1 Sample

This study analyzed data from the Japan Household Panel Survey (JHPS/KHPS), which has been conducted since 2004 for JHPS and 2009 for KHPS[4]. The respondents were selected from all over Japan using a two-stage random sampling method. We analyzed an unbalanced panel of 37,239 person-year observations from 6,164 unique individuals.

2.2 Measures

To assess individuals' subjective well-being, our study used self-rated life satisfaction ranging from 0 to 10, with higher values indicating greater life satisfaction. This variable has been surveyed in 11 rounds of the annual JHPS between 2011 and 2021, and 8 rounds of the annual KHPS between 2014 and 2021.

The independent variables include age, age squared, absolute income, comparison income, marital status (married dummy), employment status (regular employee, temporary employee, self-employed, and unemployed dummies), homeownership status (homeowner dummy), health conditions and year, as well as individual fixed effects. We calculated the equivalized household income by dividing the total annual after-tax household income by the square root of the number of household members. Real income was obtained by creating a price index that reflects the regional and intertemporal differences from the regional difference index of consumer prices (by prefecture) and annual time-series data on the consumer price index (all items, less imputed rent, 2015=100).

As a proxy for health conditions, we used two variables from the survey: (1) self-rated health (SRH) and (2) healthcare utilization. For SRH, the survey asked the following question: How is your health normally? Respondents chose to answer as (1) very bad, (2) bad, (3) fair, (4) good, or (5) very good. For healthcare utilization, we created a dummy variable to indicate whether respondents used medical services because of a disease or injury in the previous year; "yes" responses are coded as 1 and "no" responses as 0. As SRH is affected by reporting errors related to socioeconomic factors (Johnston *et al*. 2009), we retained them as independent variables.

Important factors that are controlled for by fixed effects and affect happiness include personality, gender, education, and ethnicity. The two distinct factors in an individual's personality structure that significantly affect happiness are (1) temperamental predisposition and (2) traits, and cognitive disposition (Frey and Stutzer 2002).

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[4] For detailed information, see Panel Data Research Center at Keio University (n.d.).

3. Analysis

We conducted a microeconometric analysis to measure the effects of comparison income on life satisfaction. The fixed-effects ordered logit model was estimated using the method proposed by Mukherjee *et al.* (2008) (hereafter referred to as the Blow-Up and Cluster or BUC model). In the BUC model, y^*_{it} is a latent variable that indicates the life satisfaction of individual i at time t. The observable variable has a value ranging from 0 to 10, as follows:

$$y_{it} = k(k = 0, \cdots, 10)$$
$$\text{if} \quad m_{ik-1} < y^*_{it} \leq m_{ik}$$

$\{m_{i-1}, m_{i0}, \cdots, m_{i10}\}$ is a set of individual-specific threshold parameters where $m_{i-1} = -\infty$ and $m_{i10} = \infty$. By combining the adjacent categories of y_{it}, taking values from 0 to 10, it is possible to compute ten pairs of the binary variables, $S_{j,it}$ (j = 1, 2, ... 10): $S_{j,it} = 1(y_{it} \geq j)$, where j indicate cut-off point which dichotomize ordered variable and estimate the fixed effects logit model of Chamberlain (1980) for each.

$$S^*_{j,it} = x_{it}' \theta_j + c_i + \varepsilon_{j,it}, \quad (2)$$
i=1,…,N, t=1,…,T,

where $S^*_{j,it}$ is the latent variable, and x_{it} is a vector of independent variables, including own income and comparison income. In this model, we assume that $\epsilon_{j,it}$ independently follows the logistic distribution and estimate the following conditional logit model:

$$P_i^j(S_{j,i1}, \ldots, S_{j,iT} | x_{i1}, \ldots, x_{iT}, c_i, s_{j,i}) = \frac{\prod_{t=1}^{T} \exp\left(S_{j,it} x_{it}' \theta_j\right)}{\sum_{d \in D_{j,i}} \prod_{t=1}^{T} \exp\left(d_{j,it} x_{it}' \theta_j\right)}. \quad (3)$$

Here, $s_{j,i}$ indicates the sum of $S_{j,it}$ for the *i*-th individual over *T* periods; we analyze $S_{j,i} = (S_{j,i1}, \ldots, S_{j,iT})$ conditional on the sum of T binary outcomes being $s_{j,i}$. Furthermore, defining the set $D_{j,i} = \{d_{j,i} | s_{j,i} = \sum_{t=1}^{T} d_{j,it}\}$, which contains all possible combinations of $s_{j,i}$ taking the value of one and $T - s_{j,i}$ taking the value of zero, we obtain a conditional likelihood function. However, in this model, individuals who do not take zero or one during the observation period are excluded from the analysis.

By grouping the adjacent categories, ten pairs of estimates maximize the likelihood function imposed by the constraints in which the estimated values of the respective coefficients to explain the variables $S_{j,it}$ (j = 1, 2, ... 10) are the same.

$$L^{BUC}(\theta) = \sum_{j=1}^{10} \sum_{i=0}^{N} ln\{P_i^j(S_{j,i1}, \ldots, S_{j,iT} | x_{i1}, \ldots, x_{iT}, c_i, s_{j,i})\}. \quad (4)$$

Here, P_i^j is the conditional logit model, and L^{BUC} is the score of the BUC log-likelihood function which is formulated as the sum of the scores of the Chamberlain estimators (Baetschmann *et al*. 2015). In this estimation, the restriction that $\widehat{\theta}_1 = \cdots = \hat{\theta}_{10} = \hat{\beta}$ is imposed, where $\hat{\beta}$ is the estimator of the fixed effects ordered logit model by the BUC model.

We calculated the reference group's average income based on individual attributes (gender, age, and educational level) and regional attributes as comparison income. The reference group's age range is defined as ±5 years, following McBride (2001). For example, if an individual is 45 years old, the age range of the reference group is 40–50 years. Educational level was measured using a dummy variable for university degree. To consider regional attributes, we measured the distances between respondents and calculated the weighted average of the income of people from surrounding areas, where the weights are the inverse of the distance. The comparison income was calculated as follows:

$$ci = w_g \times ai,$$

where w_g is the spatial weight matrix and the (j, k) element of the matrix is the inverse of the distance between the central point[5] of the municipality in which respondent *j* lives and that of the municipality in which respondent *k* lives. The row elements are normalized to the sum of 1. The element of this spatial matrix is zero when individual attributes such as gender, age, and educational level are different or the year of the survey is different. Because a heavier weight is assigned to observations close to the area, the reference groups also reflect regional attributes. Moreover, because the JHPS/KHPS have information on individual cities of residence, we obtained the latitude and longitude of the location of the city hall of the individual's place of residence using the CSV address matching service provided by the University of Tokyo Spatial Information Science Research Center. We then measured the distance between the respondents[6].

To test the asymmetry of income comparisons, the sample is divided into two groups: a lower income group and a higher income group.

4. Results

4.1 Descriptive statistics

Table 1 presents the descriptive statistics of the respondents in the regression model. Approximately half of the participants are men and three-quarters are married. Approximately 30% of the respondents report having undergraduate or postgraduate qualifications and 34% are full-time employees. Approximately 14% of the respondents self-report as having very good health. More than 80% of respondents own their homes. The mean life satisfaction score of the respondents is 5.98, and more than half score higher than 5. The mean equivalized household income is JPY 2,924,200.

Table 1 Descriptive statistics

Variable	Proportion or mean (standard deviation)
Life satisfaction (continuous)	5.98 (2.07)
Life satisfaction (categorical):	
0	1.35%
1	1.21%
2	2.41%
3	6.51%
4	8.19%
5	24.90%
6	12.18%
7	16.69%
8	16.68%
9	6.67%
10	3.19%
Equivalized household income [a]	2,924.2 (1916.0)
Comparison income [a]	2925.0 (692.3)

[5] The central point of the municipality is defined as the location of the city hall.

[6] According to Miura (2015), the distance between the residential areas is measured in the following manner with the latitude as φ, longitude as λ, and number of the subscript as the point: L= 6,370 arccos [sin φ_1 sin φ_2 + cos φ_1 cos φ_2 cos ($\lambda_1 - \lambda_2$)].

Age	53.97 (14.63)
Men	50.15%
University graduate	30.05%
Married	75.47%
Regular employee	34.37%
Temporary employee	22.51%
Self-employed	13.68%
Unemployed	1.69%
Homeowners	80.91%
SRH (very bad or bad)	15.96%
SRH (fair)	40.19%
SRH (good)	29.44%
SRH (very good)	14.22%
Healthcare utilization	70.31%
Number of individuals	6,164
Observations	37,239

Notes: SRH: self-rated health.
[a] The unit of currency is JPY 1,000 (≈ USD 6.4).

4.2 Regression analysis

Table 2 presents the BUC model results. The first column of Table 2 shows the results for the entire sample, using the comparison income defined by the individual and regional attributes as the benchmark model. Table 2 shows that respondents who were homeowners or had better SRH had higher life satisfaction than their counterparts. Furthermore, unemployment status had a significant negative effect on life satisfaction. Absolute household income was positively associated with life satisfaction, whereas comparative income was negatively associated, supporting the relative income hypothesis.

However, if we divide the sample by income group, comparison effects are observed only for the lower-income group. The lower-income group refers to individuals whose average absolute income is lower than the overall average absolute income, whereas the higher-income group refers to individuals whose average absolute income is equal to or higher than the overall average absolute income. This observation implies that the income comparison is not symmetric. That is, an increase in the average income of the reference group decreases the life satisfaction of the low-income group but does not affect the life satisfaction of the high-income group. This result is consistent with the model proposed by Duesenberry (1949).

By analyzing only those who did not move during the observation period, we address the issue of endogeneity in place of residence. The fourth column of Table 2 shows the result of the sample-removing mover, and the coefficients of comparison income remain negative and significant.

To assess the robustness of our main findings in the context of the COVID-19 pandemic, we conduct an analysis that excludes data from 2020 to 2021; the results remain unchanged.

Table 3 presents the correlation matrix of independent variables used to check for multicollinearity. Except for ln(age) and ln(age)², the correlation coefficients tend to be low. Many previous studies have indicated a U-shaped relationship between subjective well-being and age; therefore, both ln(age) and ln(age)² are included as independent variables in this study.

Table 2 Results of regression analyses: comparison income measured by individual and regional attributes, JHPS/KHPS 2011–2021

	Whole sample	Higher income group	Lower income group	Sample removing mover
ln (age)	-35.83153*	-3.14767	-82.40366**	-33.85762
	(20.84538)	(10.21119)	(21.19335)	(21.55686)
ln $(age)^2$	6.084726	0.4012127	14.28351**	5.776824
	(3.728684)	(1.695514)	(3.734752)	(3.843732)
ln(Absolute income)	0.1482277**	0.1619605**	0.1437463**	0.1607715**
	(0.0283671)	(0.0483133)	(0.0346677)	(0.0293932)
ln (comparison income)	-0.1201352**	-0.101733	-0.1394579**	-0.1290781**
	(0.0492975)	(0.0779714)	(0.0637463)	(0.0511144)
Married	0.1371333	0.2724141	0.0761252	0.0527144
	(0.1273102)	(0.1875115)	(0.165844)	(0.1346569)
Regular employee	0.0399286	0.2085969*	-0.0960747	0.087283
	(0.081698)	(0.1196667)	(0.1102844)	(0.0842148)
Temporary employee	0.0883442	0.2586222**	-0.018599	0.0998939
	(0.0708922)	(0.1160063)	(0.0886346)	(0.0726022)
Self-employed	-0.0048564	-0.0223856	-0.0086142	-0.0019411
	(0. 0846495)	(0.1342848)	(0.1072949)	(0.0865747)
Homeowner	0.4111708**	0.4109762**	0.438928**	0.426897**
	(0.1040056)	(0.1532242)	(0.1378664)	(0.1121359)
SRH (fair) [a]	0.7446409**	0.6771652**	0.7812495**	0.7380641**
	(0.0470438)	(0.0795003)	(0.0584022)	(0.0481766)
SRH (good) [a]	1.205277**	1.188822**	1.215993**	1.201822**
	(0.0542498)	(0.0918491)	(0.0673797)	(0.0557119)
SRH (very good) [a]	1.730683**	1.770401**	1.709978**	1.716573**
	(0.0689438)	(0.1114712)	(0.0884179)	(0.0712105)
Healthcare utilization [b]	-0.0367099	-0.0219974	-0.0466576	-0.0417204
	(0.0344022)	(0.0556706)	(0.0435492)	(0.035354)
Unemployment	-0.4247433**	-0.4954982**	-0.4322043**	-0.4276075**
	(0.1212411)	(0.2256176)	(0.1430207)	(0.1245489)
Individual fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Log likelihood	-40933.523	-15460.912	-25424.555	-38790.595
Number of observations	37,239	14,952	22,287	35438

Notes: Significance level: **p<0.01 and *p<0.05. Time dummies are present in all estimates, but are not shown. Robust standard errors clustered at the individual level are indicated in parentheses. JHPS: Japan Household Panel Survey; KHPS: Keio Household Panel Survey.

[a] The variable "SRH" (self-rated health) refers to respondents who provide the responses given in parentheses; the omitted group comprises those who answer bad or not so good.

[b] The variable "healthcare utilization" refers to those who received treatment because of a disease or injury in the previous year, with 1 meaning "yes" and 0 meaning "no."

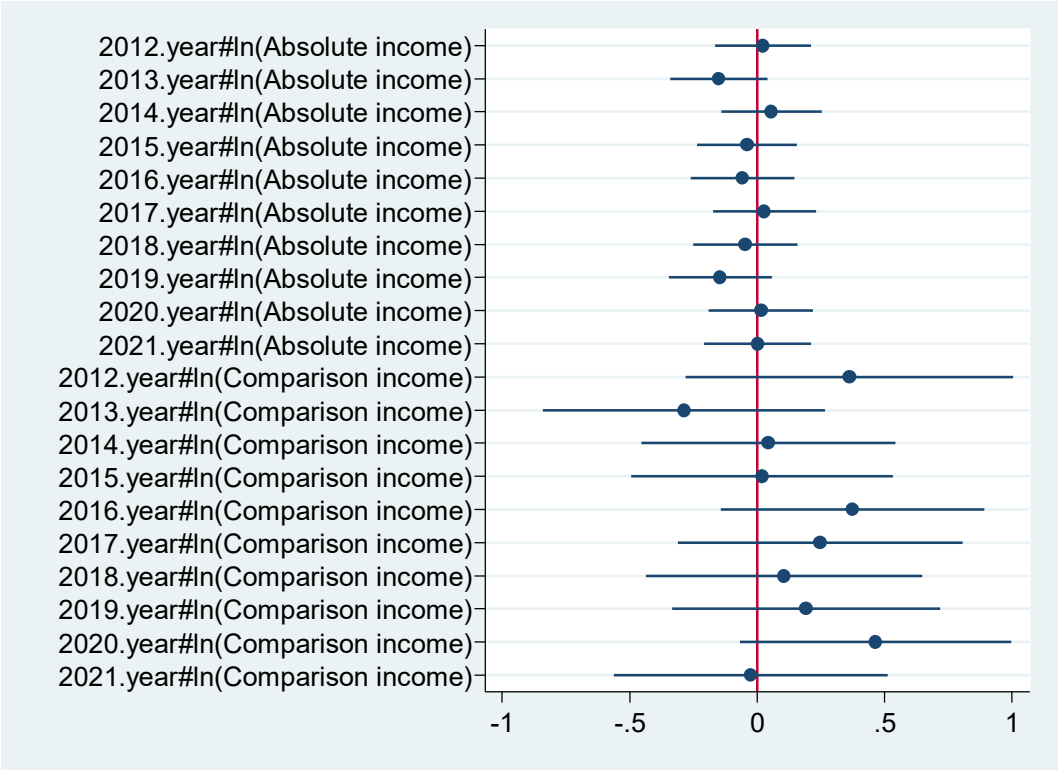
Table 3 Results of correlation analyses of independent variables

	ln (age)	ln $(age)^2$	ln(Absolute income)	ln (comparison income)	Married	Regular employee	Temporary employee	Self-employed	Homeowner	SRH (fair)	SRH (good)	SRH (very good)	Healthcare utilization
ln (age)													
ln $(age)^2$	0.988*												
ln(Absolute income)	-0.026*	-0.041*											
ln (comparison income)	0.004	0.003	0.009*										
Married	0.154*	0.108*	0.137*	0.006									
Regular employee	-0.362*	0.377*	0.188*	-0.004	-0.031*								
Temporary employee	-0.093*	-0.106*	-0.044*	0.001	-0.031*	-0.366*							
Self-employed	0.087*	0.074*	-0.029*	0.003	0.031*	-0.301*	-0.219*						
Homeowner	0.204*	0.190*	0.124*	0.003	0.153*	-0.056*	-0.035*	0.042*					
SRH (fair)	0.090*	0.082*	-0.017*	0.006	0.020*	-0.036*	-0.002	0.006	0.026*				
SRH (good)	-0.062*	-0.063*	0.054*	-0.006	0.027*	0.050*	0.025*	-0.003	0.011*	-0.312*			
SRH (very good)	-0.164*	-0.154*	0.030*	0.006	-0.015*	0.066*	0.009*	0.015*	-0.023*	-0.242*	-0.189*		
Healthcare utilization	0.216*	0.215*	0.055*	-0.002	0.075*	-0.080*	-0.020*	-0.032*	0.080*	0.023*	-0.024*	-0.138*	
Unemployment	-0.036*	-0.036*	-0.082*	-0.007	-0.070*	-0.101*	-0.074*	-0.060*	-0.024*	0.001	-0.023*	-0.005	-0.016*

Notes: Significance level: *$p<0.05$.

To test the coefficient of constancy of the regression, an analysis including the interaction terms was performed. Figure 1 presents the estimation results for the interaction terms of absolute income and the year dummy variable and the interaction terms of comparison income and the year dummy variable in the BUC model. As the coefficients are not significant for all years, the parameters can be interpreted as stable.

Figure 1 Analysis results including interaction terms



Notes: The dots represent point estimates, with lines indicating 95% confidence intervals. ln(age), ln(age-squared), ln(absolute income), ln(comparison income), marital status (married dummy), employment status (regular employee, temporary employee, self-employed, and unemployed dummies), homeownership status (homeowner dummy), SRH, healthcare utilization, and year dummies are also included as independent variables.

5. Conclusion

This study conducts an empirical analysis of relative income theory using nationally representative household panel data from Japan, yielding two important findings. First, our study provides evidence for the relative income hypothesis based on income from micro data, which is consistent with the findings of previous studies (e.g., Ferrer-i-Carbonell 2005; Oshio *et al.* 2011; Urakawa and Matsuura 2007). This has implications for the optimal income taxation and poverty thresholds. Second, the income comparison is not symmetric, which is in line with Duesenberry's (1949) idea. Therefore, people may experience feelings of relative deprivation when others earn more. However, they do not experience the corresponding feelings of relative satisfaction when others earn less, even after controlling for individual fixed effects and incorporating detailed individual and regional attributes into the definition of reference groups (Ferrer-i-Carbonell 2005). The findings suggest that policies promoting the equitable distribution of economic resources enhance the well-being of Japanese people. However, this study has several limitations that can be explored in future research. First, as this

study uses panel data, sample attrition may bias our estimates. Second, the study assumes that the city hall is the place of residence in the calculation of the reference group's average income. Future research could address this issue. Lastly, this study does not explore the potential endogeneity of absolute income, that is, the possibility of reverse causality between life satisfaction and future income. Future research should account for this potential reverse causality.

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