Regional income inequality and happiness: Evidence from Japan

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Abstract

We investigated how regional income inequality is associated with the individual assessment of happiness based on micro data from nationwide surveys in Japan. Our multilevel analysis using logit and ordered logit models confirmed that individuals who live in areas of high inequality tend to report themselves as less happy, even after controlling for various individual and regional factors. Notably, the fact that happiness depends on not only income but also income inequality indicates the importance of income redistribution for individual well-being. We also find that the association between regional inequality and happiness is not uniform across the different levels of perceived happiness. Moreover, the sensitivities of happiness to regional inequality differ substantially by key individual attributes such as gender, marital status, level of education, occupational status, and political views. Among others, an important finding for social policy is that those of unstable occupational status and those with a lower level of education are more sensitive to regional inequality. Given the fact that these people tend to be less happy than the others, this result points to the risk that regional inequality additionally reduces the well-being of those under unfavorable socioeconomic conditions.

Keywords: Happiness, income inequality, multilevel analysis, Japan

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1. Introduction

In recent years, following an influential paper by Wilkinson (1992) who showed that a more uneven society has shorter life expectancy, the association between income distribution in society and individual health has been increasingly studied. It is now widely recognized that an analysis based solely on area-level data likely fails to disentangle the effects of individual factors from the pure effects of regional income inequality. To explicitly address this issue, many researchers have employed a multilevel analysis using multilevel data in the form of individual-level health outcome, set of individual-level socioeconomic predictors, and area-level income inequality measures.

In these analyses of social epidemiology, self-rated health—that is, the subjective assessment of health by an individual—has been a central variable to be focused upon in terms of its association with income inequality. This health measure, which is often reported on a 3- or 5-point scale by surveyed individuals, is considered as a reliable and pragmatic proxy of more objective health measures (Burström and Fredlund 2001; Lundberg and Manderbacka 1996).

In effect, many empirical studies have been examining whether self-rated health is negatively associated with regional income inequality. The results have been mixed in general, however, and it is difficult to identify which factors explain the differences. As comprehensively surveyed by Subramanian and Kawachi (2004) and Wilkinson and Pickett (2006), a substantial portion of the studies conducted within the United States point to an association between wide income inequality and poor health, while studies conducted outside the United States tend to have results that do not support the income inequality hypothesis.

The association with regional income inequality is potentially an important issue to be addressed for not only health but also happiness, the subjective assessment of which is often asked in social surveys and investigated by empirical analysis of happiness studies. As in the case of self-rated health, multilevel analysis is desirable when investigating the association between regional inequality and happiness. Most

of all, it is of interest to examine whether and to what extent individuals who live in areas of high inequality tend to assess themselves as less happy, even after controlling for various factors including household income.

Note that as surveyed by Frey and Stutter (2002), economists have been contributing large-scale empirical analyses of the determinants of happiness in different countries and periods since the late 1990s. For example, Blanchflower and Osward (2004) and Easterlin (2001) showed that income increases the level of happiness. Further, many economic researches—including Clark and Oswald (1994), Korpi (1997), Winkelmann and Winkelmann (1998), Di Tella, MacCulloch, and Oswald (2001)—have observed that unemployment or an unstable occupational status reduce subjective well-being even after controlling for income. Marital status and relations with family members, other acquaintances, and communities are also likely to affect happiness.

However, much is to be explored with regard to the association between regional inequality and happiness. To our knowledge, little research has followed a seminal paper by Alesina, Di Tell, and MacCulloch (2004), who observed that higher inequality in a society tends to reduce individual happiness using the micro data of the United States and European countries. Following Alesina et al. (2004), we employed a multilevel analysis based on micro data observed from large-scale nationwide surveys in Japan, a non-Western advanced country. In this study, we controlled for a richer set of individual and regional variables than Alesina et al. (2004), and examined how the results differ across the different levels of perceived happiness. In addition, we investigated how the sensitivities to regional inequality are modified by key individual attributes such as gender, age, level of education, income, occupational status, and political views, expanding Alesina et al. (2004)'s analysis, which focused only on income and political views.

An empirical analysis of the relationship between income inequality and happiness will potentially have important implications for income redistribution in Japan as well as other advanced countries. Japan is considered to be a relatively homogeneous society, with small levels of inequality. In reality,

however, its Gini coefficient is now higher than the OECD average, and the ratio of people with income below the poverty line, which is half of the mean income, ranks as among the highest in the OECD member countries (Förster and Mira d'Ecorle 2005). Indeed, many researchers raise concerns about Japan's trend of widening income inequality (Fukawa and Oshio 2007; Tachibanaki 2005). More recently, Oshio and Kobayashi (2009) and Ichida et al. (2009) found that self-rated health is negatively correlated with regional inequality or poverty in Japan. However, much is to be explored with regard to the association between regional inequality and happiness, an issue which this study explicitly addresses.

2. Data

Our analysis is based on micro data obtained from two nationwide surveys in Japan following Oshio and Kobayashi (2009): (i) the Comprehensive Survey of Living Conditions of People on Health and Welfare (CSLCPHW), which was compiled by the Ministry of Health, Labour, and Welfare, and (ii) the Japanese General Social Survey (JGSS), which was compiled and conducted by the Institute of Regional Studies at the Osaka University of Commerce in collaboration with the Institute of Social Science at the University of Tokyo.

We used the CSLCPHW to construct prefecture-level variables and the JGSS to construct individual-level variables. Japan has 47 prefectures, which are the basic units of local government and administration in the country. The CSLCPHW had sufficiently large samples to obtain reliable estimates of the Gini coefficient and the mean household income in each prefecture, but it had limited information about demographic and socioeconomic factors at the individual level. In contrast, the JGSS had rich individual-level information, but its sample size was not large enough to calculate prefecture-level variables. By matching these data from the two datasets depending on where each respondent resided, we conducted a multilevel analysis.

We collected micro data from the 2001, 2004, and 2007 CSLCPHWs, which include household income data of 2000, 2003, and 2006, respectively. The CSLCPHW randomly selected 2,000 districts from the Population Census divisions, which were stratified in each of the 47 prefectures according to the population size. Next, all the households in each district were interviewed. The original sample size was 30,386, 25,091, and 24,578 households (with a response rate of 79.5, 70.1, and 67.7 percent) in 2000, 2003, and 2006, respectively.

On the other hand, we collected data from 2000, 2003, and 2006 JGSSs to obtain detailed information about the socioeconomic background of each respondent. The JGSS divided Japan into six blocks and subdivided them according to the population size into three (in 2000 and 2003) or four (in 2006) groups. Next, the JGSS selected 300 (in 2000) or 489 (in 2003 and 2006) locations from each stratum and randomly selected 12 to 15 individuals aged between 20 and 89 from each survey location. The number of respondents was 2,893, 1,957, and 2,124 (with a response rate of 63.9, 55.0, and 59.8 percent) in 2000, 2003, and 2006, respectively.

In this empirical analysis, we eliminated the respondents aged below 25 and above 80, whose sample sizes were limited; students; and those respondents whose key variables were missing. As a result, in our estimation, a total of 4,452 individuals (aged between 25 and 80) responded (1,865 in 2000; 1,236 in 2003; and 1,351 in 2006). The summary statistics of all variables are presented in Table 1. In what follows, we briefly explain the dependent and independent variables used in our empirical analysis.

The dependent variable is happiness. It is almost impossible to exactly define happiness, which is multi-dimensional. Like many previous empirical studies of happiness, we focused on *perceived* happiness that was expressed as a single item based on the survey results of the subjective assessment of happiness. The JGSS asked the respondents to answer the question “How happy are you?” on a 5-point scale with 1 being “happy” and 5 being “not happy.” The ratio of the responses in the three-year pooled samples was 30.1, 33.2, 30.3, 5.1, and 1.3 percent, indicating that happiness is skewed towards the high end in this survey. Happiness is often scored on a 3-point scale (for example, “very happy,” “fairly

happy," and "not too happy") in social surveys outside Japan, but we did not adjust the JGSS data into three categories and used them as they were to avoid any bias due to arbitrary re-categorization. Instead, in addition to estimating an ordered logit model with the original five categories, we tried to examine how the different thresholds between "happy" and "not happy" affect the results of logit models.

Among all independent variables, the most important one is the Gini coefficient, which is one of the most widely-used inequality measures. This coefficient ranges from zero to one, with zero indicating the most equal distribution, and one indicating the most unequal distribution. We collected pre-tax household income from the CSLCPHW and, like in most previous studies, equivalized it by dividing it by the root of the number of household members. Then, we calculated the Gini coefficient for each prefecture. Individuals who reside in the same prefecture in each survey year have a common Gini coefficient.

To capture the association between happiness and regional inequality as precisely as possible, we used various control variables at both the individual and prefecture levels, most of which we collected from the JGSS. At the individual level, household income is one of the key variables. The JGSS asked respondents to choose their household annual income for the previous year from among 19 categories. We took the median value of each category, equivalized it, and evaluated it at the 2005 consumer prices. Next, we divided income groups into three classes of almost the same size: "low" (with equivalized household income below 2,449 thousand yen), "middle" (2,449 to 4,041 thousand yen), and "high" (above 4,041 thousand yen).

At the individual level, we also considered gender: males and females; age: "young" (aged 25-39), "middle" (40-59), and "old" (60-79); marital status: "married," "unmarried," and "divorced/widowed;" and level of education: "junior high school or lower," "high school," and "college or higher." In addition, we considered occupational status, which was divided into eight categories: "regular employee" (including management executives), "non-regular employee," "self-employed," "family worker," "unemployed," "retired," "homemaker," and "other." We also considered the number of children as an

explanatory variable, along with its squared value considering the possibility of its nonlinear associations with happiness.

In addition to these widely-used control variables, we collected the following four aspects of an individual's relationship with or assessment of social capital from the JGSS, reflecting the previous analysis of the association between social capital and happiness (Ram 2009 as a recent example): (i) whether he/she is satisfied with his/her relationships with his/her friends (yes = 1); (ii) whether he/she is satisfied with the place where he/she lives (yes = 1); (iii) whether he/she thinks that most people can be trusted (yes = 1); and (iv) whether he/she belongs to any hobby group or club (yes = 1). For the first two aspects, the JGSS asked respondents to choose from a 5-point scale with 1 denoting "satisfied" and 5 denoting "dissatisfied." We categorized 1 and 2 as "yes." Furthermore, we considered the size of the area where a respondent lives. The JGSS asked each respondent to choose from a 3-point scale with 3 denoting the largest area. We used these answers as three categorized variables.

As for prefecture-level predictors, we controlled for (log-transformed) prefecture mean income, per capita budget expenditure of the local government, and the proportion of people aged 65 and above. Individuals who live in areas of higher average income and those who enjoy higher levels of government spending are likely to feel happier than others; at the same time, however, the impact of the regional age structure is unknown in general. Additionally, we included indicator variables for 12 regional blocks, each of which comprised three to six prefectures (except Hokkaido) in order to control for the unspecified characteristics of a region wider than a prefecture, and the unspecified characteristics for three years to control for year-specific factors.

3. Methods

We employed five models to assess the association between regional inequality and happiness. Model 1 was an ordered logit model that used five categories of reported happiness as an ordinal

variable. Model 2 was a logit model that allocated one to categories (5, 4, 3, 2) and zero to category (1). In this model, the threshold between “happy” and “not happy” was placed at a very low level, as category one (least happy) was only 1.3 percent of the entire sample. Model 3 was a logit model that allocated one to categories (5, 4, 3) and zero to categories (2, 1). In the same way, Model 4 contrasted categories (5, 4) and categories (3, 2, 1), and Model 5 contrasted category (5) and categories (4, 3, 2, 1). The shares of the category “happy” in Models 3, 4, and 5 were 6.4, 36.7, and 69.9 percent, respectively.

Although a model of three categories is more widely used, an ordered logit model like Model 1 is often employed by empirical studies. The appropriateness of this model depends on the parallel lines (proportional odds) assumption—that is, the assumption that the coefficients are equal across categories. It is possible, however, that the association with regional inequality differs between the lower and higher levels of happiness. This is more likely to be the case especially when the observed distribution of happiness is extremely skewed like the data from the JGSS. Hence, after estimating Model 1, we conducted the approximate likelihood-ratio test of whether the coefficients are equal across categories, and compared the estimated coefficients across four logit models—Models 2 to 5—with different thresholds of happiness. In all estimations, we used JGSS-provided sampling weights and computed robust standard errors to correct for potential heteroscedasticity.

In any case, however, the estimated associations between happiness and each explanatory variable show only their averages across the different individual attributes. For certainty, we included key individual attributes in the list of explanatory variables in logit model estimations, but the assumption that the sensitivity of happiness to regional inequality is the same for all attributes may not hold. Hence, we examined how it differs by key individual attributes such as gender, age, marital status, level of education, household income, occupational status, and political views. For each attribute group, we estimated the same logit model separately by each attribute and compared how the sensitivities to regional inequality differed across the different attributes. For example, we estimated the coefficients on the Gini coefficient separately for males and females to evaluate effect modification by gender. In

addition, we compared the statistical significance of the sensitivity to inequality within each attribute group. There is no theory that tells which model we should choose from among Models 2 to 5 to compare the results, but we used Model 4 because, as discussed below, it showed the most significant association between regional inequality and health.

In this analysis, we condensed eight types of occupational status into three categories: regular employees as "stable;" non-regular employees, self-employed persons, family workers, other types of workers, and unemployed people as "unstable;" and retirees and homemakers as "out of labor force." It is questionable whether self-employment, which is 9.4 percent of the entire sample, should be categorized as unstable. We considered self-employed persons as unstable, considering that their mean income (3,869 thousand yen) was lower and its standard deviation (2,844 thousand yen) was higher than those of regular employees (4,192 thousand and 2,066 thousand yen, respectively). Even if we categorized self-employment as "stable," the results were not substantially different.[1]

With respect to political views, the JGSS asked respondents to answer the question, "Where would you place your political views on a 5-point scale?" with 1 being conservative and 5 being progressive. We categorized the answers into "conservative" (1, 2), "neutral" (3), and "progressive" (4, 5). We did not use political views as explanatory variables in the logit models, considering possible simultaneity between them and happiness.

4. Findings

Before reporting the estimation results of logit models, Table 2 compares the means and standard deviations of happiness by key individual attributes, when happiness is scored on a 5-point scale. We notice the following findings with regard to the means of happiness: there is no substantial difference between males and females; the young are happier than the middle-aged and old; married people are

[1] The results are not reported but are available upon request.

more happier than the others; higher educational attainment makes people happier; higher income makes people happier; people with unstable occupational status are less happy than the others; and the politically conservative ones are happier than the others. These findings are reasonable in general but we should be cautious in interpreting any causality from them especially for marital status, occupational status, and political views. People may remain married because they are happy, may be unemployed because they are not satisfied with their jobs, and may be politically conservative because they are satisfied with their life.

Table 3 summarizes the estimation results from Model 1 (an ordered logit model with five categories of happiness), Models 2 to 5 (logit models with different thresholds between "happy" and "not happy"). We first notice that in Model 1, the coefficient on the Gini coefficient is negative and significant at the 10 percent significance level, confirming a negative, albeit modest, association between regional inequality and happiness. This result is notable in that it is obtained even after controlling for household income, which, as expected, is found to be positively associated with happiness. We also find that young and married people are happier than the others, while the unemployed are less happy. At the prefecture level, higher spending by the local government adds to happiness. Another notable finding from Model 1 is that all the four variables that indicate the individual relationship with social capital show positive and strongly significant associations with happiness. This highlights the importance of social capital for individual well-being.

It should be noticed, however, that ordered logit models generally assume that the coefficients are equal across categories. This assumption may not hold in this case, especially given an extremely skewed distribution of perceived happiness. In fact, the approximate likelihood-ratio test of whether the coefficients are equal across categories revealed that the assumption can be rejected at the one percent significance level.[2] Hence, we estimated four logit models—Models 2 to 5—with different categorizations of "happy" and "unhappy." We also estimated a generalized ordered logit model by

[2] In fact, χ^2 (41) was 143.96, well above 74.75, the critical value at the one percent significance level, where 41 was the number of independent variables.

relaxing the parallel lines assumption, and obtained results that were not much different from those in Models 2 to 5.[3]

Three findings are noteworthy from these logit models. First, the coefficient of the Gini coefficient is negative and significant (at the five percent significance level) only for Model 4. In this model, categories (5, 4), which are 63.3 percent of the entire sample, were defined as "happy." The coefficients on the Gini coefficient are positive in Models 2 and 3 and negative in Model 5, but in all of these, the coefficients are insignificant and the absolute values are smaller than that in Model 4.

Second, the statistical significance and sizes of the estimated coefficients have almost the same patterns in Models 1 and 4, while the coefficient of the Gini coefficient is more significant and larger in Model 4. Combined with the first finding, this suggests that the assessment of happiness between categories (5, 4) and (3, 2, 1) largely determines its overall assessment across the five ordered categories.

Third, some predictors are significantly associated with happiness across all models, while others are not. For example, all four variables related to social capital are positively and significantly associated with happiness in most cases, confirming its positive and stable associations with individual well-being across the various levels of happiness. Marital status also shows stable associations with happiness; married people are happier than the others in all models. In line with expectations, household income also matters in most cases. However, age and level of education matter only in Models 3 and 4, while occupational status matters only in Models 1 and 2 and that too substantially. These findings underscore that the association between individual attributes and happiness differ substantially at the different levels of perceived happiness. In addition, the fact that occupational status is a crucial determinant of individual well-being at a lower level of perceived happiness indicates the need for enhancing job opportunities and job security.

An important problem in the estimations based on these models is that the estimated sensitivity of

[3] The result of the generalized ordered logit model is available upon request.

happiness to regional inequality, which is based on the entire sample, only shows its average across different attributes. We cannot rule out the case that only a certain portion of the respondents with certain attributes are sensitive to regional inequality. Table 4 compares the coefficients on the Gini coefficient, along with their robust standard errors and *p*-values, obtained from the separately estimated Model 4 by each category of individual attributes. The table also reports the odds ratios for reporting categories 4 and 5 in response to a one-standard deviation increase in the Gini coefficient, along with its 95 percent significance intervals.

By comparing the coefficients and odds ratios, we obtain the following findings with regard to the sensitivity to regional inequality when assessing happiness: females are more sensitive than males; there is no substantial difference across age groups; married people are less sensitive than others; those who finished education at junior high school or lower are more sensitive than others; those who belong to the highest income class are modestly more sensitive than others; unstable occupational status makes people most sensitive; and politically neutral individuals are more sensitive than others.[4]

We also find that unless there are no substantial differences across categories (that is, age and household income), regional inequality tends to be significant only for the category that is most sensitive to inequality within each category group. These results confirm that the sensitivity to regional inequality is not uniform across the individuals of different attributes.[5]

5. Discussion and conclusion

We examined how regional inequality is associated with the individual assessment of happiness

[4] Alesina et al. (2004) pointed out that the poor and left-wingers are sensitive to inequality in Europe, while in the United States, the happiness of these groups is uncorrelated with inequality.

[5] We should be cautious in interpreting these results, however, because comparisons of the estimated coefficients on the Gini coefficient do not make sense if the Gini coefficient is distributed differently between categories. To check this, we applied the Kolmogorov-Smirnov tests between each category and the remaining one or two categories in each category group. We found that the null hypothesis that the Gini coefficient is distributed differently between categories cannot be rejected at the five percent significance level for two cases: between individuals who graduated from college or higher institutions and others, and between low income-individuals and others.

based on micro data from nationwide surveys in Japan. Our multilevel analysis using logit and ordered logit models confirmed that individuals who live in areas of high inequality tend to report themselves as less happy, even after controlling for various individual and regional factors. Notably, the fact that happiness depends on not only income but also income inequality indicates the importance of income redistribution for individual well-being.

This result is parallel to that from many empirical studies of social epidemiology that observed a negative association between regional inequality and self-rated health, which is one of the key subjective outcomes of individual well-being. The observed association between regional inequality and self-rated health observed in this study is also reasonable, considering the close relationship with happiness and health.[6]

However, there is no well-established theory that explains why regional inequality is associated with individual well-being. One plausible explanation is that individuals may have a certain ideal picture of income distribution and that a deviation from it—especially in the form of wider inequality or more poverty—may reduce happiness. An ideal income distribution is, however, likely to differ among individuals of different attributes; people under unfavorable socioeconomic conditions are probably more inequality-averse. An alternative explanation is that individuals may regard observed income inequality as a proxy for the uncertainty about future income. The more they are risk-averse, the more they are sensitive to income inequality. These two views are closely related and not exclusive with each other because inequality aversion and risk aversion are identical at least to some extent. Our estimation results look modestly more consistent with the former view, but they do not reject the latter.

It should be noted, however, that any association between regional inequality and happiness is not uniform across the different levels of happiness. Our empirical analysis based on ordered logit and ordered logit models highlighted this. On the one hand, we observed a negative, albeit modest,

[6] For example, Perneger, Hudelson, and Bovier (2004) reported that healthier individuals tend to feel happier, while Pettit and Kline (2001) showed that a better assessment of happiness can lead to a higher level of self-rated health.

association between the two variables, when we estimated an ordered logit model that used five ordered categories of happiness. On the other hand, we did not find a significant association between them, when we estimated logit models that placed the threshold of happiness at relatively lower or higher levels of happiness.

The association between individual attributes and happiness also differs across the different levels of happiness. Occupational status matters at a lower level of happiness, while age and level of education matter at a higher level. In contrast, social capital shows a positive and significant association for all models, suggesting that it is potentially a powerful and reliable buffer against any negative pressure of regional inequality and other socioeconomic factors on individual well-being.

Finally, we found that the sensitivities of happiness to regional inequality differ substantially by key individual attributes such as gender, marital status, level of educational attainment, occupational status, and political views. An important finding for social policy is that those of unstable occupational status and with lower level of education are more sensitive to regional inequality. Given the fact that they tend to be less happy than others, this result points to the risk that regional inequality further reduces the well-being of those under unfavorable socioeconomic conditions.

We recognize that this analysis has various limitations. Most of all, it deals with happiness only as a single item based on the survey results of its subjective assessment. Given the multi-dimensional feature of happiness, the validity of perceived happiness observed from surveys should be addressed further. Second, as is often the case with a multilevel analysis of this type, pathways or a mediation process from regional inequality with respect to happiness at an individual level should be investigated further. Third, we disregarded the possibility that perceived happiness changes individual characteristics, which we assumed to be exogenous. These issues should be researched in the future.

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Table 1. Selected descriptive statistics (pooled data for 2000, 2003, 2006)

		Mean	S.D.	Min	Max
(1) Prefecture-level variables: *N* = 141 (47 prefectures * 3 years, not weighted)					
Gini coefficient		0.370	0.027	0.308	0.436
Mean household income (million yen)[a]		3.104	0.496	1.677	4.437
Per capita budget expenditure (million yen)[b]		0.451	0.128	0.195	0.873
Proportion of people aged 65 and above (%)		20.8	3.1	12.8	27.6
(2) Individual-level variables: *N* = 4,452 (1,865 in 2000; 1,236 in 2003; 1,351in 2006)					
Household income (thousand yen)[a]		3,681	2,543	0	32,200
Age		52.7	14.4	25	80
Number of children		1.83	1.08	0	10
Categorical variables		Percentage			
Gender	Males	49.3	(reference)[d]		
	Females	50.7			
Age group	Young (aged 25-39)	22.7	(reference)		
	Middle (aged 40-59)	41.2			
	Old (aged 60-79)	36.1			
Marital status	Married	81.1	(reference)		
	Unmarried	8.7			
	Divorced/widowed	10.2			
Level of education	Junior high school or lower	21.1	(reference)		
	High school or lower	48.5			
	College or higher	30.4			
Household income	Low	33.3	(reference)		
	Middle	33.0			
	High	33.8			
Occupational status	Regular employee[c]	32.8	(reference)		
	Non-regular employee	14.2			
	Self-employed	9.4			
	Family worker	2.9			
	Unemployed	1.3			
	Retired	9.7			
	Homemaker	19.9			
	Other	5.4			
Social capital	Belonging to hobby groups/clubs	26.2			
	Satisfied with relationships with friends	89.5			
	Satisfied with the area where he/she lives	86.3			
	Trust in people	22.4			
Size of residential area	Small	31.8	(reference)		
	Medium	40.7			
	Large	27.4			
(3) Regional blocks					
	Hokkaido, Tohoku, Kanto 1 & 2, Hokuriku, Tokai, Kinki 1 & 2, Chugoku, Shikoku, Kyushu 1&2				

Note: a. Household size adjusted, pre-tax, and evaluated at 2005 prices.

b. Evaluated at 2005 prices.

c. Includes management executives.

d. Indicates the reference group for each category group in regression models.

Table 2 Means and standard deviations of happiness (5-point scale)

Happiness (happy = 5, 4, 3, 2, 1 = unhappy)	Mean	S. D.	Number of obs.
Total	3.86	(0.95)	4,452
Gender			
Male	3.83	(0.94)	2,197
Female	3.88	(0.96)	2,255
Age			
Young	3.94	(0.94)	1,012
Middle	3.82	(0.94)	1,834
Old	3.85	(0.96)	1,606
Marital status			
Married	3.94	(0.90)	3,609
Unmarried	3.40	(1.02)	386
Divorced/widowed	3.56	(1.10)	456
Level of education			
Junior high school or lower	3.76	(1.02)	940
High school	3.84	(0.96)	2,158
College or higher	3.95	(0.87)	1,354
Household income			
Low	3.72	(1.03)	1,482
Middle	3.83	(0.91)	1,468
High	4.03	(0.88)	1,503
Occupational status			
Stable[a]	3.87	(0.90)	1,658
Unstable[b]	3.78	(1.01)	1,476
Out of labor force[c]	3.93	(0.94)	1,318
Political view			
Progressive	3.83	(0.93)	991
Neutral	3.81	(0.95)	2,168
Conservative	3.97	(0.94)	1,227

Note: a = regular employee; b = self-employed + family worker + unemployed + other; c = retired + homemaker.

Table 3. Estimated associations of independent variables with happiness

Dependent variable: happiness (happy = 5, 4, 3, 2, 1 = unhappy)		Ordered logit model			Logit models										
		Model 1			Model 2			Model 3			Model 4			Model 5		
		5, 4, 3, 2, 1			(5, 4, 3, 2) vs. (1)			(5, 4, 3) vs. (2, 1)			(5, 4) vs. (3, 2, 1)			(5) vs. (4, 3, 2, 1)		
		Coef.	Robust S.E.		Coef.	Robust S.E.		Coef.	Robust S.E.		Coef.	Robust S.E.		Coef.	Robust S.E.	
Gini coefficient		-2.89	(1.65)	*	1.15	(5.99)		0.49	(3.60)		-3.88	(1.92)	**	-2.31	(2.02)	
Gender:	Female	0.14	(0.08)	*	0.72	(0.43)	*	0.16	(0.18)		0.10	(0.09)		0.15	(0.10)	
Age group:	Middle	-0.55	(0.08)	***	-0.34	(0.45)		-0.30	(0.19)		-0.61	(0.10)	***	-0.56	(0.10)	***
	Old	-0.35	(0.10)	***	0.64	(0.60)		0.19	(0.24)		-0.48	(0.12)	***	-0.40	(0.12)	***
Marital status:	Unmarried	-1.11	(0.14)	***	-2.15	(0.65)	***	-1.35	(0.27)	***	-1.18	(0.16)	***	-0.93	(0.19)	***
	Divorced/widowed	-0.62	(0.11)	***	-2.39	(0.42)	***	-1.19	(0.20)	***	-0.54	(0.12)	***	-0.45	(0.13)	***
Level of education:	High school	-0.01	(0.09)		-0.29	(0.44)		-0.18	(0.20)		0.02	(0.10)		-0.08	(0.10)	
	College or higher	0.08	(0.10)		0.30	(0.56)		0.06	(0.24)		0.33	(0.12)	***	-0.20	(0.12)	*
Household income:	Middle	-0.01	(0.08)		0.79	(0.46)	*	0.39	(0.17)	**	0.01	(0.09)		-0.19	(0.10)	*
	High	0.44	(0.09)	***	0.56	(0.45)		0.69	(0.20)	***	0.52	(0.10)	***	0.30	(0.10)	***
Occupational status:	Non-regular employee	-0.13	(0.11)		-1.17	(0.64)	*	-0.13	(0.25)		-0.21	(0.12)	*	0.00	(0.13)	
	Self-employed	0.07	(0.11)		-1.25	(0.66)	*	-0.20	(0.27)		0.01	(0.13)		0.16	(0.13)	
	Family worker	-0.16	(0.18)		-2.30	(0.71)	***	0.04	(0.44)		-0.21	(0.22)		-0.12	(0.23)	
	Unemployed	-1.08	(0.39)	***	-3.16	(0.70)	***	-1.90	(0.35)	***	-0.37	(0.29)		-0.27	(0.36)	
	Retired	0.08	(0.13)		-1.49	(0.72)	**	-0.02	(0.31)		0.02	(0.15)		0.23	(0.15)	
	Homemaker	0.12	(0.11)		-0.82	(0.71)		-0.03	(0.25)		0.13	(0.13)		0.19	(0.13)	
	Other	0.05	(0.17)		-1.94	(0.58)	***	-0.38	(0.29)		0.03	(0.19)		0.24	(0.19)	
Social capital:	Belonging to hobby groups/clubs	0.21	(0.07)	***	-0.40	(0.38)		0.15	(0.17)		0.20	(0.08)	**	0.22	(0.08)	***
	Satisfied with relationships with friends	0.91	(0.11)	***	1.34	(0.34)	***	1.15	(0.18)	***	0.79	(0.11)	***	0.81	(0.14)	***
	Satisfied with the area where he/she lives	0.49	(0.10)	***	0.63	(0.36)	*	0.89	(0.17)	***	0.56	(0.10)	***	0.18	(0.11)	
	Trust in people	0.52	(0.07)	***	1.48	(0.67)	**	0.60	(0.21)	***	0.55	(0.09)	***	0.53	(0.08)	***
Size of residential area:	Medium	0.10	(0.09)		0.09	(0.41)		0.19	(0.19)		0.19	(0.09)	**	0.11	(0.10)	
	Large	-0.02	(0.02)		0.66	(0.46)		-0.05	(0.20)		0.18	(0.10)	*	-0.03	(0.10)	
Number of children		0.16	(0.08)	*	-0.31	(0.44)		0.31	(0.15)	**	0.06	(0.10)		0.10	(0.09)	
Number of children squared		0.06	(0.08)		0.02	(0.09)		-0.09	(0.03)	***	0.00	(0.02)		-0.01	(0.02)	

Log of mean household income	0.06	(0.51)		-1.69	(2.74)		-0.67	(1.11)		0.39	(0.57)		-0.26	(0.61)		
Per capita budget expenditure	1.04	(0.45)	**	-1.39	(2.75)		-1.20	(1.01)		1.35	(0.53)	**	1.05	(0.55)	*	
Proportion of people aged 65 and above	-0.02	(0.02)		0.19	(0.14)		0.10	(0.05)	*	-0.04	(0.03)		-0.02	(0.03)		
Number of observations	4,442			4,442			4,442			4,442			4,442			
Pseudo R^2	0.0518			0.2920			0.1708			0.0878			0.0510			
Log likelihood	-5447.01			-2040.58			-8630.98			-2648.77			-2579.21			

Note. 1. Italics denote the category. See Table 1 for the reference group for each category (except for social capital).

2. All models include indicator variables for regional blocks and survey years.

3. For the ordered logit model, the parallel line assumption was rejected at the one percent significance level: χ^2 (41) = 143.96, where 41 is the number of independent variables.

4. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 4. Comparing estimated sensitivities of happiness to regional inequality by key individual attributes

	Coef.	Robust S.E.	*p*-value	OR	95% CI
Total	-3.88	(0.94)	0.044	0.90	[0.85 - 0.95]
Gender					
Male	-0.82	(2.80)	0.770	0.98	[0.84 - 1.14]
Female	-7.56	(2.67)	0.005	0.81	[0.70 - 0.94]
Age					
Young	-5.11	(4.40)	0.246	0.87	[0.69 - 1.10]
Middle	-3.39	(2.99)	0.258	0.91	[0.78 - 1.07]
Old	-4.71	(2.98)	0.113	0.88	[0.75 - 1.03]
Marital status					
Married	-2.63	(2.15)	0.222	0.93	[0.83 - 1.04]
Unmarried	-10.95	(7.62)	0.150	0.74	[0.49 - 1.12]
Divorced/widowed	-15.75	(6.84)	0.021	0.65	[0.45 - 0.94]
Level of education					
Junior high school or lower	-10.49	(4.07)	0.010	0.75	[0.60 - 0.93]
High school	-2.30	(2.69)	0.393	0.94	[0.81 - 1.08]
College or higher*	-3.44	(3.75)	0.359	0.91	[0.74 - 1.11]
Household income					
Low*	-3.25	(2.98)	0.277	0.91	[0.78 - 1.07]
Middle	-3.40	(3.41)	0.319	0.91	[0.76 - 1.09]
High	-4.87	(3.66)	0.183	0.88	[0.72 - 1.07]
Occupational status					
Stable[a]	2.74	(3.33)	0.411	1.08	[0.90 - 1.29]
Unstable[b]	-15.13	(3.38)	0.000	0.66	[0.55 - 0.79]
Out of labor force[c]	-3.29	(3.38)	0.331	0.91	[0.76 - 1.10]
Political view					
Progressive	1.33	(4.44)	0.765	1.04	[0.83 - 1.32]
Neutral	-5.95	(2.79)	0.033	0.85	[0.73 - 0.99]
Conservative	-4.79	(3.71)	0.197	0.88	[0.72 - 1.07]

Note. 1. This table compares the estimated coefficients on the Gini coefficient in Model 4 for each category.

2. OR indicates the odds ratios for reporting 3 (against 1 and 2) in response to a one-standard -deviation increase in the Gini coefficient (0.027). 95% CI indicates its 95% confidence interval.

3. a = regular employee; b = self-employed + family worker + unemployed + other; c = retired + homemaker.

4. The null hypothesis that the distribution of the Gini coefficient differs between the category with * and the other two categories in the same category group cannot be rejected at the 5% significance level.