Can Happiness Provide New Insights into Social Inequality? Evidence from Japan

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Can Happiness Provide New Insights into Social Inequality? Evidence from Japan[1]

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Abstract

This paper examines recent trends and determinants of happiness inequality in Japan using unique data from the "Preference Parameters Study of Osaka University" that was conducted annually in Japan during the 2003-2013 period. The data illustrate that, despite some fluctuations, Japan observed a fall in happiness inequality along with income growth during this period. By estimating Recentered Influence Function regressions, we find a negative and significant relationship between income level and happiness inequality, as found for other countries. The results also show that people's perception of their relative standing in the income spectrum matters for the level as well as the dispersion of happiness. Other key determinants of happiness inequality include the insecurity of jobs, unemployment, the fear of becoming unemployed in the near future, having health concerns, feeling a sense of loneliness, and the expected coverage of living costs by public pensions after retirement, all of which have a positive effect on happiness inequality except that the public pension variable negatively affects the dispersion of happiness. Our empirical analysis illustrates that happiness inequality is a useful addition to the set of conventional inequality indicators to monitor and better understand social inequality and to formulate measures to tackle inequality-related issues.

JEL codes: D31, D63, H55, I31, I38

Key words: Happiness, Inequality, Social Protection, Subjective Well-being

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1. Introduction

Recent years have witnessed an extensive debate on whether per capita gross domestic product (GDP) is an appropriate and/or sufficient indicator for measuring people's well-being or quality of life. Human well-being has traditionally been measured in terms of economic resources such as income, wealth and/or consumption. However, while economic resources are among the key determinants of human well-being, it has increasingly been recognized that they are an insufficient metric for assessing people's well-being (e.g., Stiglitz, Sen and Fitoussi, 2009). This has led to growing efforts at the national and international levels in recent years to construct new measures that better reflect the well-being of people.[2] In the field of economics, such a debate was ignited by the work of Easterlin (1974), who pointed out that there is no clear association between the level of economic development and the average level of happiness of its members when conducting a cross-country comparison at a given point in time or looking at long-term trends over time in a given country─the so-called Easterlin paradox.

While there is a broad consensus that GDP per capita cannot be the sole indicator for assessing people's well-being, there has been no agreement on the approaches and indicators that can be used as an alternative or supplementary metric to GDP per capita.[3] Among various approaches that have been put forward is the subjective well-being approach (e.g., Layard, 2005) based on the notion that individuals are the best judges of their own welfare. There has been growing interest in subjective well-being, such as happiness and life satisfaction, among economists in recent years, mainly due to the increasing availability of such data and recent developments in empirical methodologies.[4] To measure subjective well-being, data are typically collected in a survey by asking respondents how happy they feel or how satisfied they are with their lives. The responses

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[2] For instance, under the initiative of the former French President Sarkozy, the Commission on the Measurement of Economic Performance and Social Progress was created in 2008 to identify the limitations of GDP as an indicator of economic performance and social progress and to propose alternative measures. In the case of the United Kingdom, the Measuring National Well-being Programme was launched in 2010 to construct measures of the nation's well-being beyond GDP. A set of objective and subjective indicators have been selected and national well-being has been monitored through these indicators since then. As for the Organisation for Economic Co-operation and Development, it launched the Better Life Index Initiative in 2011, which has developed statistics to capture aspects of life that matter to people in terms of material living conditions and that shape the quality of people's lives.

[3] See, for example, Fleurbaey (2009) and Stiglitz, Sen and Fitoussi (2009) for a summary of various approaches suggested for measuring people's well-being or quality of life.

[4] As commonly done in happiness studies, the three terms─subjective well-being, happiness and life satisfaction─are used interchangeably in this paper.

are often provided on an ordinal scale ranging from 0 to 10, whereby 0 equals "very unhappy" and 10 equals "very happy."

While there is a growing literature that analyzes the level of happiness as well as its determinants, research on the distribution of happiness has so far been limited. This may be partly due to the fact that, unlike income, happiness is not transferable and cannot be redistributed across individuals (Becchetti, Massari and Naticchioni, 2014). However, some argue that social inequality should be measured by the dispersion of actual outcomes of life, such as happiness and life satisfaction, rather than by differences in the "command of resources" that are typically measured by income given that people value material possessions differently (e.g., Veenhoven, 2005). This does not imply that income inequality should be disregarded entirely but rather that the distribution of subjective well-being could be considered at least as an equally relevant and important measure to monitor social inequality, which can bring new insights into it. Moreover, understanding the determinants of happiness inequality will help policymakers to formulate appropriate measures to reduce social inequality. This could also help alleviate the social tension and unrest resulting from it (Gurr, 1994; Tullock, 1971).

Recent years have therefore observed a steadily increasing number of studies that analyze the trends and determinants of happiness inequality at the macroeconomic level through a cross-country analysis (Gandelman and Porzecanski, 2013; Ott, 2005; Ovaska and Takashima, 2010; Veenhoven, 2005) as well as at the microeconomic level (Becchetti, Massari and Naticchioni, 2014; Clark, Flèche and Senik, 2014a, 2014b; Dutta and Foster, 2013; Madden, 2011; Stevenson and Wolfers, 2008; Yamane, Yamane and Tsutsui, 2008). However, there are still only a handful of studies that examine happiness inequality at the individual level, and most of the existing studies have so far been undertaken for Australia, the United States and some European countries with the exception for Yamane, Yamane and Tsutsui (2008) who look at the regional disparity of happiness in Japan. It would therefore be interesting to see whether the observed trends of falling happiness inequality in advanced economies can also be found in Japan and whether Japan's happiness inequality is driven by similar determinants found for happiness inequality elsewhere.

To contribute to broadening our understanding of the trends and determinants of happiness inequality as well as the usefulness of subjective well-being indicators for assessing social inequality more generally, this paper aims to (i) examine trends in the

dispersion of happiness and how they differ from those in inequality assessed by more conventional measures such as income; and (ii) identify the key determinants of happiness inequality. The findings of such an analysis will help formulate measures, such as social protection measures, to enhance the subjective well-being of less happy or less satisfied people in particular, and reduce inequality in society. The empirical analysis will be undertaken using unique data from the "Preference Parameters Study of Osaka University" which was conducted annually in Japan during the 2003-2013 period. In addition to respondents' subjective well-being (e.g., happiness, life satisfaction and other emotional attributes), this survey contains unique information on, among others, how they perceive their living standard in comparison with others as well as with whom they make such comparisons. Given that it is important to take into account the referencing process when analyzing subjective well-being inequality (e.g., Van Praag, 2011), the use of such data will help us understand the determinants of happiness inequality in a more rigorous manner than previous studies.

The rest of the paper is organized as follows. Section 2 reviews the existing literature on the inequality of happiness. A description of the data is provided in Section 3. Section 4 provides a brief discussion of appropriate measures for assessing happiness inequality and describes the econometric methodology as well as the variables used for the estimation. Estimation results are presented in Section 5. Section 6 summarizes the key findings and discusses some policy implications.

2. Literature Review

The growing literature on happiness has so far focused on the level and determinants of happiness.[5] In contrast, the analysis, both theoretical and empirical, of happiness inequality, remains limited. This may be partly due to the fact that, unlike income, happiness is not transferable and cannot be redistributed across individuals (Becchetti, Massari and Naticchioni, 2014). However, there have been an increasing, though still limited, number of studies that examine the inequality of happiness in recent years. At the macroeconomic level, Veenhoven (2005) finds a trend of falling happiness inequality as measured by the standard deviation in modern societies based on a correlational analysis of the European Union countries over the 1973-2001 period. A comparison across 53 of

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[5] See Frey and Stutzer (2002) and Clark, Frijters and Shields (2008) for a comprehensive survey of the literature.

the world's nations in the 1990s also illustrates that happiness inequality is systematically lower in the most modern countries. Further, Veenhoven (2005) finds only a modest correlation between income inequality and the dispersion of life-satisfaction, which was also found in a similar analysis undertaken by Ott (2005).

Ovaska and Takashima (2010), on the other hand, conduct a cross-country analysis to identify the determinants of the inequality of subjective well-being and find that inequalities in individual income and health status are both positively associated with subjective well-being inequality while the poor quality of a country's institutions widens it.[6] In addition, their results indicate that enhanced economic and political freedoms would improve the subjective well-being of those who are less happy and less satisfied with their life more than that of the rest of the population (Ovaska and Takashima, 2010). Ott (2005) also looks at the relationship between institutional conditions and happiness inequality. According to a correlation analysis of 78 countries in 1999-2001, both the level and inequality of happiness, measured by the standard deviation, depend largely on the same institutional conditions. More specifically, all the selected institutional conditions, such as social security, government consumption, and transfers and subsidies, are found to contribute to both increasing the level of happiness and lowering the inequality of happiness (Ott, 2005).

As for the microeconomic analysis of happiness inequality, Stevenson and Wolfers (2008) examine how the level and dispersion of happiness evolved over the 1972-2006 period in the United States using data from the General Social Survey. They cardinalize ordinal happiness data by estimating a generalized ordered probit model that assumes normality.[7] According to this inequality measure, Stevenson and Wolfers (2008) find a substantial fall in happiness inequality in the 1970s and 1980s, though it subsequently rose and reversed about one-third of the initial decline. Their decomposition analysis reveals that much of the racial happiness gap has closed and the gender gap has disappeared entirely or even inverted, but differences in happiness by education have widened during this period. Stevenson and Wolfers (2008) thus consider changes in the dispersion of happiness within groups as the main drivers of declining happiness inequality in the

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[6] While Ovaska and Takashima (2010) measure the inequality of subjective well-being in terms of the standard deviation, they obtained similar regression results even when they used the coefficient of variation of the well-being measures as the dependent variable.

[7] Stevenson and Wolfers (2008) report that their simple generalization of the ordered probit, ordered logit, and ordered uniform models yields similar time-series estimates of both the average level of happiness and its dispersion.

United States. Moreover, given that the observed trends in happiness inequality differ from those in income growth and income inequality, Stevenson and Wolfers (2008) suggest that non-pecuniary factors may play an important role in shaping the distribution of happiness. Gandelman and Porzecanski (2013) also emphasize that a large part of happiness inequality is related to non-pecuniary dimensions of life by showing that happiness inequality is about half that of income inequality. They argue that this is a natural consequence of the decreasing marginal utility of income.

Patterns of happiness inequality similar to those documented by Stevenson and Wolfers (2008) are reported by Dutta and Foster (2013) who also examine the distribution of happiness in the United States over the 1972-2010 period. At the same time, they pay attention to the methodological issues of measuring happiness inequality. They question the appropriateness of assuming a cardinal scale and using standard inequality indices, such as the standard deviation, to measure happiness inequality given the ordinal nature of happiness data. To overcome these methodological problems, Dutta and Foster (2013) compute happiness inequality using median centered approaches developed by Allison and Foster (2004) and Abul Naga and Yalcin (2008) for ordinal health variables. According to the median based inequality measures, happiness inequality in the United States decreased from its highest level in the 1970s through the 1980s and 1990s, while it started to rise in the 2000s though it declined significantly again in 2010. The same methodology is employed by Madden (2011) who analyzes inequality in various domains of life satisfaction in Ireland during the economic boom of the latter part of the 1990s. His empirical results indicate that inequality fell in virtually all aspects of life satisfaction during this period of economic growth.

On the other hand, using the German Socio-Economic Panel database, Becchetti, Massari and Naticchioni (2014) analyze the increase in happiness inequality, measured as the variance or the Gini coefficient, in Germany between 1992 and 2007. Their decomposition analysis of happiness inequality based on Recentered Influence Function (RIF) regressions shows that trends in happiness inequality are mainly driven by composition effects while coefficients effects are negligible, implying that the returns to the drivers of happiness inequality are substantially invariant over time. Among the composition effects, education has an inequality-reducing effect, while higher unemployment rates increase happiness inequality. In addition, income growth is associated with lower happiness inequality, but the rise in income inequality cannot be

considered as a driver of happiness inequality trends in Germany, confirming the findings of Stevenson and Wolfers (2008) for the United States. Based on these empirical results, Becchetti, Massari and Naticchioni (2014) suggest that measures aimed at fostering education and economic performance, in terms of lower unemployment rates and higher incomes, would reduce happiness inequality as well as the social tension that could arise from it.

The finding of Becchetti, Massari and Naticchioni (2014) that the increase in average income leads to a reduction in happiness inequality is consistent with the empirical evidence provided by Clark, Flèche and Senik (2014a, 2014b). Using a wide variety of different datasets over a long time period (1970-2010),[8] Clark, Flèche and Senik (2014b) show that countries with growing GDP per capita have experienced falling happiness inequality, measured in terms of the standard deviation or the coefficient of variation, despite the associated rising income inequality and the constant level of happiness. Their RIF regression results show that happiness inequality increases with income inequality, but falls with income growth, which can be taken as evidence of two opposing forces. This may explain the rebound in happiness inequality in Germany and the United States, where rising income inequality became great enough to reverse the trend of falling happiness inequality in these two countries (Clark, Flèche and Senik, 2014b). Clark, Flèche and Senik (2014a, 2014b) thus argue that this new "augmented" Easterlin paradox offers a more promising perspective for developing countries as economic growth will, if not increase the level of happiness, at least harmonize the happiness of all as long as income inequality does not grow too much.

Clark, Flèche and Senik (2014a) document that the decline in happiness inequality has been caused by the fall in the share of individuals who are "very unhappy" and "very happy." Their cross-country regression results suggest that income growth helps reduce happiness inequality by allowing for the greater provision of public goods. In particular, the extension of public amenities may have contributed to the fall in happiness inequality by reducing the insecurity faced by the worst-off groups in the population, though it is more difficult to explain why the share of those who are "very happy" has also declined

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[8] The data used for their analysis come from the World Values Surveys, the German Socio-Economic Panel, the British Household Panel Survey, the American General Social Survey, and the Household, Income and Labour Dynamics in Australia Survey (Clark, Flèche and Senik, 2014b). While Becchetti, Massari and Naticchioni (2014) note a rise in happiness inequality in Germany between 1992 and 2007, Clark, Flèche and Senik (2014b) look at a longer period and obtain a different picture, namely that happiness inequality fell sharply in the 1980s and then fluctuated around a flat trend in the 1990s.

(Clark, Flèche and Senik, 2014a). According to Clark, Flèche and Senik (2014a), possible explanations for the latter finding include the fact that the happier people may have had to bear the cost of extending the provision of public goods in terms of paying higher taxes. Clark, Flèche and Senik (2014a) also suggest that economic growth may have enhanced opportunities for those who were previously at the top of the well-being distribution, raising their aspirations and reducing their satisfaction, and may also have made it easier to make comparisons across countries than in the past.

While most of the existing work at the microeconomic level has so far been conducted only for the United States, Australia and European countries, Yamane, Yamane and Tsutsui (2008) analyzed the regional disparity of happiness in Japan. Based on data from the "Preference Parameters Study of Osaka University" for the 2003-2006 period, which is also used in this paper, they find regional inequality as measured by happiness is smaller than that measured by per capita income. Their finding is based on results from testing differences in prefectural means (through the multiple comparison procedure) for per capita income and happiness, comparing their Gini coefficients, and regressing them on prefectural dummies.[9] Given that the observed regional disparities might be arising from differences in residents' individual attributes, Yamane, Yamane and Tsutsui (2008) also calculate happiness that is adjusted for these attributes by estimating an ordered probit model and an Ordinary Least Squares (OLS) model with a set of explanatory variables. They find that the disparity in happiness at the prefectural level almost disappears if the adjusted happiness variable is used. Moreover, Yamane, Yamane and Tsutsui (2008) find that happiness inequality declined slightly or remained stable between 2003 and 2006 even though income inequality increased during this period.

Turning to theoretical contributions, Van Praag (2011) provides a theoretical model of how the reference mechanism affects individual well-being and the well-being inequality concept. He argues that the reference effect, which depends on how frequently individuals compare themselves with others and on the degree of social transparency in society, has to be taken into account when defining the concept of well-being inequality. Becchetti, Massari and Naticchioni (2014) conduct a preliminary test of Van Praag (2011) by including relative income variables, i.e., being poor or being rich with respect to the reference group, in their regression analysis. Their results show that being relatively poor

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[9] In the case of happiness data, they employ both an ordered probit model and an ordinary least squares model for the regression analysis and find no significant differences between the two set of results (Yamane, Yamane and Tsutsui, 2008).

has a positive impact and being relatively rich has no impact on happiness inequality. On the other hand, Clark, Flèche and Senik (2014b) argue that the most prominent behavioral explanations of the Easterlin paradox, namely social comparisons and time-dependent adaptions, do not suffice to explain the two stylized facts―the stability of average happiness and the fall in happiness inequality over long periods of income growth. Instead, such observations are more consistent with adaptation of needs along the lines of Maslow's hierarchy of needs as well as rescaling, in that individuals change their interpretation of the steps of the happiness scale as their income increases (Clark, Flèche and Senik, 2014b).

The main contribution of the current paper to the literature is threefold. First, the paper aims to extend existing work on happiness inequality by analyzing the dispersion of happiness in Japan as previous studies were conducted mostly in other parts of the world. It will examine whether the observed trends of falling happiness inequality along with income growth in advanced economies can also be found in Japan and whether the determinants of happiness inequality in Japan are similar to those found for happiness inequality elsewhere. Second, the paper exploits the unique information that the survey data contain―such as that on respondents' perceived health status, whether they feel a sense of loneliness, whether they are concerned about being unemployed in the near future, or how much public pensions they expect to receive after retirement relative to their living costs―so that the findings of the empirical analysis will provide useful insights into what kinds of measures would be effective in reducing happiness inequality.

Third, this paper takes into account the referencing process when analyzing the determinants of happiness inequality. Becchetti, Massari and Naticchioni (2014) include in their regression analysis relative income variables, more specifically variables indicating respondents' being poor or being rich with respect to the reference group, to investigate the effect of the referencing process. The reference groups in their case are defined as those consisting of individuals with the same gender, age class, education and Länder as those of respondents, but there is no guarantee that people compare their living standard with such groups. In contrast, the data used for the empirical analysis in this paper contain unique information on how respondents perceive their living standard in comparison with others as well as with whom they make such comparisons. Using this information, it is possible to take into account the referencing process in the regression analysis in a more rigorous manner than previous studies.

3. Data

The empirical analysis in this paper will be based on data from the "Preference Parameters Study of Osaka University." This survey was conducted annually in Japan during the 2003-2013 period with the aim of examining whether the assumptions of conventional economics that people are rational and maximize utility are valid. The sample of individuals aged 20-69 was drawn to be nationally representative using two-phase stratified random sampling. The sample has a panel component, though fresh observations were added in 2004, 2006 and 2009 to overcome the problem of attrition. The 2013 wave, which is used in this paper to examine the determinants of happiness inequality, contains 3,260 individuals after excluding those for whom at least one variable included in the econometric analysis is missing.

Figure 1. Average Level of Happiness
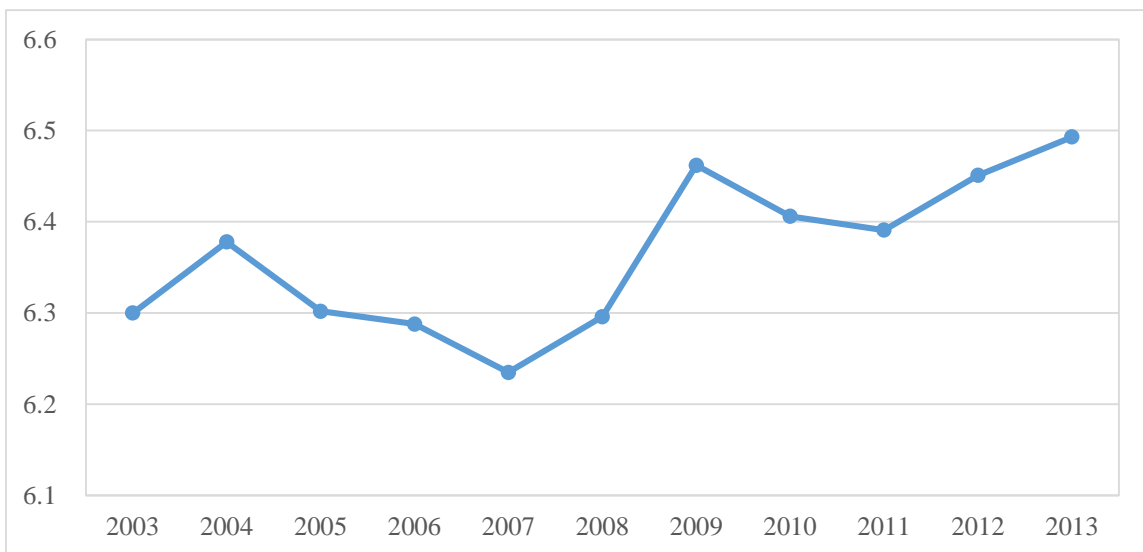
Source: Calculations based on data from the Preference Parameters Study of Osaka University (2003-2013).

In addition to basic information on respondents and their households such as household composition, consumption, income and other socioeconomic characteristics, this survey contains unique information on respondents including their subjective well-being (e.g., happiness, life satisfaction and other emotional attributes), time preference, degree of risk aversion, and habit formation. In addition, it contains data on the concerns that respondents may have about their health, employment and life after retirement as well as on how respondents perceive their living standard in comparison with others. The survey

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was also conducted, albeit for shorter periods, in China, India and the United States using an almost identical survey instrument, which allows us to conduct an international comparison of these four countries. As the first step, this paper undertakes an empirical analysis using the data on Japan for which happiness studies remain limited.

The main variable of interest in this paper is happiness and the data were collected in the survey by asking respondents how happy they feel through the following question:

Overall, how happy would you say you are currently? Using a scale from 0-10 where "10" is "very happy" and "0" is "very unhappy," how would you rate your current level of happiness?

Figure 2. Distribution of Happiness (%)

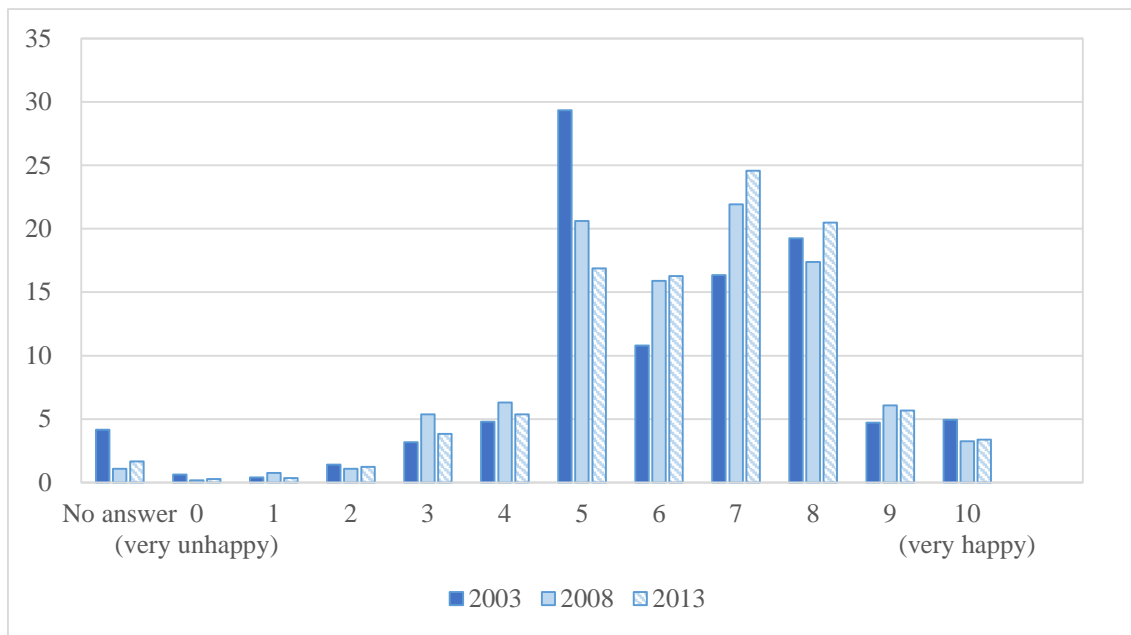Source: Calculations based on data from the Preference Parameters Study of Osaka University (2003, 2008, 2013).

Based on the answers to the above happiness question, Figure 1 illustrates trends in the average level of happiness between 2003 and 2013. Some fluctuations are observed during this period as the level of happiness first declined in the mid-2000s but has been increasing since the late 2000s. To take a closer look at the trends, Figure 2 reports the distribution of answers to the happiness question for 2003, 2008 and 2013. While the answers were more concentrated around the level 5 in 2003, the concentration seems to

have been shifting toward the levels 7-8 over time. The dispersion of happiness will be examined in more detail by calculating inequality measures in Section 5.

4. Methodology

4.1 Inequality Measure of Happiness

One of the key methodological issues that need to be considered is how to measure happiness inequality. Information on people's self-reported happiness is commonly reported as a 0-10 categorical ordered variable, and the "Preference Parameters Study of Osaka University" is no exception as noted in Section 3. The use of any standard inequality statistics implicitly assumes that the variable in question is a continuous cardinal measure with equal distance between the ratings of happiness such that interpersonal comparisons are possible. This causes a potential problem when measuring happiness inequality by standard inequality measures.

As far as the assumption of cardinality is concerned, it is not valid in the case of happiness data given its ordinal nature. However, the assumption of cardinality is often made in empirical studies. Ferrer-i-Carbonell and Frijters (2004), for instance, find that assuming the ordinality or cardinality of happiness scores makes little difference to their estimates of the determinants of happiness. Similar findings are also obtained by Frey and Stutzer (2000). Furthermore, while Dutta and Foster (2013) measure happiness inequality for the United States based on median centered approaches developed for ordinal variables as described in Section 2, Clark, Flèche and Senik (2014b) obtain similar results even though they use the standard deviation by assuming the cardinality of happiness data. For a validity check, Clark, Flèche and Senik (2014b) also use the index of ordinal variation, a measure of variation specifically designed for ordinal variables, to measure happiness inequality and obtain similar results to those based on the standard deviation. These findings seem to be consistent with Van Praag (1991) who shows that respondents tend to translate verbal evaluations to a numerical scale when they answer subjective questions.

As for the assumption of homogenous scales, previous studies find the existence of heterogeneity in the scales used by individual respondents to evaluate their happiness, but given that such heterogeneity is expected to be random, it is argued that this should not affect the regression results (e.g., Frey and Stutzer, 2002; Di Tella and McCulloch, 2006).

Beegle, Himelein and Ravallion (2012) conduct various tests for possible bias caused by heterogeneity in individual scales by adding vignettes of hypothetical households to a household survey for Tajikistan. While respondents are found to use different scales when responding to questions on their welfare, the results do not suggest that this is an important source of bias in the estimation (Beegle, Himelein and Ravallion, 2012).

Based on the findings of previous work, this paper treats happiness data as a cardinal variable and uses the standard deviation (variance) to measure the dispersion of happiness. Kalmijn and Veenhoven (2005) investigate the appropriateness of different metrics to quantify happiness inequality. They examine nine different measures of dispersion against eight evaluation criteria by assuming a cardinal scale across the categories of happiness.[10] Kalmijn and Veenhoven (2005) find that four measures, namely standard deviation, mean absolute difference, mean pair distance and interquartile range, are appropriate for measuring happiness inequality, while the remaining five metrics (coefficient of variation, Gini coefficient, Theil's entropy measure, percentage outside the mode, and range) are not suitable for this purpose. Given that there is no single metric that is superior to the others among the four measures that are found to be appropriate, Kalmijn and Veenhoven (2005) recommend the use of the standard deviation, which has been the most commonly used measure of happiness inequality so far, when quantifying happiness inequality.

4.2 Econometric Methodology

One of the main objectives of this paper is to identify the key determinants of happiness inequality using data from Japan. Following the previous work that has looked at similar issues at the microeconomic level (Becchetti, Massari and Naticchioni, 2014; Clark, Flèche and Senik, 2014b), the empirical analysis will be undertaken based on the Recentered Influence Function (RIF) regression developed by Firpo, Fortin and Lemieux (2007, 2009). A RIF regression is similar to a standard regression except that the dependent variable, in this case, the level of happiness Y, is replaced by the Recentered Influence Function, RIF($y; v$), of the distributional parameter v.

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[10] These criteria include: (1) single finite number as result, (2) interval level of measurement, (3) independence of scale range, (4) independence of sample size, (5) independence of the mean, (6) equal values for equally unequal distributions, (7) differentiation between more and less unequal distributions, and (8) sensitive to degree of inequality (Kalmijn and Veenhoven, 2005).

The RIF is obtained by adding back the distributional statistic v to the influence function IF(y; v): RIF(y; v) = v + IF(y; v). The influence function, IF(y; v), is a widely used statistical tool to measure the robustness of a distributional statistic to the presence of outliers, which detects the influence of an individual observation on that distributional statistic. The RIF is basically a linear approximation to the nonlinear function of distributional statistics of interest such as variance and captures the change in the distributional statistic of interest in response to a change in the distribution of the covariates.

One convenient feature of the RIF is that its expected value is equal to the distributional statistic v. Using the law of iterated expectations, the distributional statistic v can be expressed in terms of the conditional expectation of the RIF on the covariates X:

$$v = E[\mathrm{RIF}(Y; v)] = E_X\big[E[\mathrm{RIF}(Y; v)|X]\big]$$

The conditional expectation of the RIF(Y; v) can, in turn, be written as a linear function of the covariates, yielding the RIF regression:

$$E[\mathrm{RIF}(Y; v)|X] = X\gamma^v$$

where the coefficient γ represents the marginal effect of X on the distributional statistic and can be estimated by OLS. While RIF regressions will be estimated for the variance of happiness, we will also estimate those for the Gini coefficient as a robustness check. While the Gini coefficient may not be an appropriate indicator for measuring happiness inequality, as shown by Kalmijn and Veenhoven (2005), happiness inequality measured as the Gini coefficient exhibits similar trends to happiness inequality measured as the standard deviation in our case, and it would be useful to undertake a validity check.

This paper focuses on examining the determinants of the level, rather than the over time change, of happiness inequality using data from the 2013 wave because this wave contains some useful variables that are not available in earlier waves.[11] Since the number of studies that examine the determinants of happiness inequality remains limited, analyzing the determinants of happiness inequality itself provides useful findings. A

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[11] RIF regressions were also estimated using pooled data from the 2012 and 2013 waves. The estimation results were very close to those presented in this paper, which were obtained from RIF regressions estimated on data from the 2013 wave only.

decomposition analysis of trends in happiness inequality will therefore be left as a topic for future analysis.

4.3 Empirical Variables

RIF regressions of the variance of happiness on selected variables are estimated to identify the key determinants of happiness inequality. The empirical model used in the present study is guided by existing work on happiness.[12] Table 1 reports the explanatory variables employed in the estimation and contains selected summary statistics. A more detailed description of how the variables are constructed is provided in the Appendix.

Respondents' basic characteristics

A set of individual characteristics capturing respondents' age, gender, marital status and education as well as whether they have a child is included. As found for other countries (e.g., Becchetti, Massari and Naticchioni, 2014; Clark, Flèche and Senik, 2014b), we would expect education to have a negative effect on happiness inequality. In addition, given that utility is defined by preference parameters, it is possible that the level of individuals' happiness would also depend on their preference parameters (Tsutsui, Ohtake and Ikeda, 2009). Respondents' degree of time preference, risk aversion and altruistic behavior are therefore controlled for in the estimation as such information is available in the "Preference Parameters Study of Osaka University."

Household-level characteristics

Variables relating to information at the household level are also included in the analysis, such as those capturing household size, per capita annual household income, whether the household owns a house or an apartment, and whether the household has any loans. Following the findings of previous work, we would expect an inverse relationship between income and happiness inequality.

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[12] See Frey and Stutzer (2002) and Clark, Frijters and Shields (2008) for a comprehensive survey of the findings on the determinants of the level of happiness.

Table 1. List of Explanatory Variables

Variables	Description	Mean	S.D.
Age	Age expressed in years	52.95	12.50
Age squared	Age squared	2959.84	1306.21
Female	Dummy variable for being female	0.52	
Married	Dummy variable for being married	0.82	
No longer married	Dummy variable for no longer being married	0.08	
Education			
Secondary school	Dummy variable for having secondary school education or lower	0.09	
High school	Dummy variable for having high school education	0.48	
Junior college	Dummy variable for having a junior college degree	0.16	
University	Dummy variable for having a university degree or higher	0.27	
Child	Dummy variable for having a child/children	0.85	
Household size	Total number of household members	3.46	1.44
Household income	Log of per capita annual household income in 10,000 yen	5.11	0.63
Homeownership	Dummy variable for owning a house or an apartment	0.88	
Has loans	Dummy variable for having loans	0.46	
Employment			
Regular job	Dummy variable for having a regular job	0.40	
Irregular job	Dummy variable for having an irregular job	0.32	
Unemployed	Dummy variable for being unemployed	0.02	
Not in labor force	Dummy variable for not being in the labor force	0.26	
Altruistic	Dummy variable for having donated any money in the previous year	0.73	
Risk averse	Chance of rain (%) that will make respondents bring an umbrella with them when they go out	47.17	19.31
Time preference	Dummy variable for getting homework done right away or fairly early during school vacations when respondents were a child	0.38	
Likely unemployed	Dummy variable for perceiving a high risk of being unemployed in the next two years	0.08	
Poor health	Dummy variable for having concerns about health	0.42	
Loneliness	Dummy variable for feeling a sense of loneliness	0.13	
Public pensions	Percentage of living expenses expected to be covered by public pensions after retirement (or actual percentage in the case of retired respondents)	49.70	26.50
Relatively poor	Dummy variable for perceiving that the living standard of others is higher than their own	0.36	
Relatively rich	Dummy variable for perceiving that the living standard of others is lower than their own	0.12	
Regions			
Hokkaido	Dummy variable for residing in Hokkaido	0.04	
Tohoku	Dummy variable for residing in Tohoku	0.06	
Kanto	Dummy variable for residing in Kanto	0.30	
Koshinetsu	Dummy variable for residing in Koshinetsu	0.05	
Hokuriku	Dummy variable for residing in Hokuriku	0.03	
Tokai	Dummy variable for residing in Tokai	0.14	
Kinki	Dummy variable for residing in Kinki	0.17	
Chugoku	Dummy variable for residing in Chugoku	0.05	
Shikoku	Dummy variable for residing in Shikoku	0.04	
Kyushu	Dummy variable for residing in Kyushu	0.11	
Major city	Dummy variable for residing in a major city	0.24	

S.D. = standard deviation.
Source: Calculations based on data from the 2013 Preference Parameters Study of Osaka University.

Respondents' employment status

Given that the happiness literature has extensively examined the effect of labor market status, especially unemployment, on happiness, we control for respondents' employment status in the estimation. In addition to controlling for whether respondents are unemployed, we also take into account the security of respondents' employment by including a variable indicating whether respondents have irregular employment, i.e., whether their employment is not based on a permanent contract. We would expect both unemployment and job insecurity to increase happiness inequality.

Respondents' subjective variables

A set of variables relating to concerns, both pecuniary and non-pecuniary in nature, that respondents may have is included in the estimation given that they are likely to cause psychological stress and thus affect individuals' subjective well-being. These variables reflect whether respondents perceive a high risk of being unemployed over the next two years, whether they have any health concerns, whether they feel a sense of loneliness, and what percentage of their living expenses they expect to be covered by public pensions after retirement (or the actual percentage in the case of retired respondents). We would expect a positive effect of the fear of being unemployed, poor health and loneliness on happiness inequality, while a better provision of public pensions would be expected to have an inequality reducing effect.

Referencing process

To examine the effect of the referencing process on happiness inequality as suggested by Van Praag (2011), we include two related variables. In the case of the "Preference Parameters Study of Osaka University," respondents are asked whether they think the living standard of other people is high in comparison with their own living standard. We create a dummy variable that is one if respondents think that the living standard of others is higher than their own, and another dummy variable that is one if respondents think that the living standard of others is lower than their own. These variables in effect reflect the relative living standard of respondents. Table 1 reports that about 36% of the respondents think that the living standard of others is higher than their own while about 12% of the

respondents think the opposite. Note that this survey also asks respondents with whom they make such a comparison. Table 2 summaries the answers, which illustrates that there is a relatively large variation in the reference groups with whom respondents compare their living standard. The most common reference group by far is found to be respondents' neighbors (about 40%). If we combine the reference groups that are related to respondents' workplace, this aggregate group would be the second most common reference group (about 18%). It is interesting to find that a relatively large percentage of respondents (about 14%) compare their living standard with that of an abstract figure, that is the average Japanese person that they have in mind.

Table 2. Reference Groups of Respondents (%)

Neighbors	40.21
Respondents' classmates when they were in school	10.86
Relatives	4.72
Families of classmates of respondents' children	7.88
Colleagues who are in the same age group, have similar academic background, or who started working in the same year	6.32
Colleagues who are assigned to a similar job, regardless of their age, academic background, or year in which they joined the company	9.08
People working in another company but in the same industry who belong to the same age group, have similar academic background, or who started working in the same year	0.67
People working in another company but in the same industry who are assigned to a similar job, regardless of their age, academic background, or year in which they joined a company	1.44
Average person in Japan	13.53
Average person in the world	0.18
Other acquaintances and friends	3.77
Others	0.34
Don't know	0.98

Source: Calculations based on data from the 2013 Preference Parameters Study of Osaka University.

In addition to the above explanatory variables, regional dummies as well as a dummy for residing in a major (ordinance-designated) city are included to control for geographical variation.

5. Empirical Results

5.1 Trends in Happiness Inequality

Before discussing the determinants of happiness inequality, it would be useful to take a look at trends in the dispersion of happiness in Japan during the 2003-2013 period. Figure 3 reports happiness inequality as measured by the standard deviation. Despite some

fluctuations, there is an overall downward trend with a decline of about 7.2% between 2003 and 2013. This can be compared with the changes in real GDP per capita (see Figure 3). There was a relatively sharp decline in GDP per capita in 2009 as the Japanese economy was also affected by the global financial crisis, but GDP per capita steadily increased with an overall increase of about 8.9% between 2003 and 2013. In other words, economic growth seems to have contributed to reducing happiness inequality in Japan over the past decade. This is consistent with the finding of previous studies for other countries that income growth is associated with the declining inequality of happiness, as reviewed in Section 2. It thus supports Clark, Flèche and Senik's argument that "[T]his new "augmented" Easterlin paradox therefore offers a somewhat brighter perspective" (2014a, 17).

Figure 3. Happiness Inequality and Real GDP per capita (in chained 2005 prices)
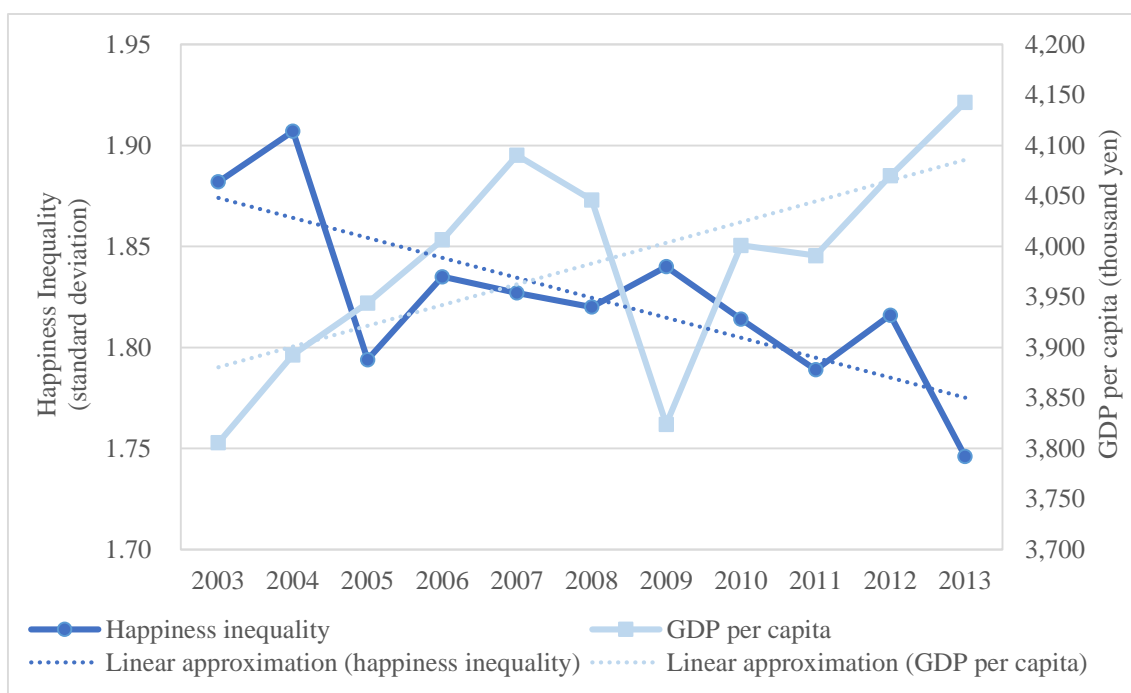
Source: Happiness inequality: Calculations based on data from the Preference Parameters Study of Osaka University (2003-2013). Real GDP per capita: Calculations based on data on real GDP from the National Accounts of Japan (Cabinet Office, http://www.esri.cao.go.jp/jp/sna/menu.html, accessed on April 14, 2015) and data on population from the Population Estimates (Statistics Bureau, Ministry of Internal Affairs and Communications, http://www.stat.go.jp/data/jinsui/2.htm, accessed on April 14, 2015).

While Japan seems to have experienced a reduction in the dispersion of happiness over the 2003-2013 period, it would be interesting to see whether similar trends are observed for income inequality, which is often used to measure the inequality of people's well-

being. In the case of Japan, income inequality is typically calculated in terms of the Gini coefficient using three datasets compiled by the Government of Japan, namely (i) the National Survey of Family Income and Expenditure (NSFIE), (ii) the Comprehensive Survey of Living Conditions (CSLC), and (iii) the Survey on the Redistribution of Income (SRI) While the NSFIE is administered by the Ministry of Internal Affairs and Communications, both the CSLC and SRI are administered by the Ministry of Health, Labor and Welfare. Figure 4 reports trends in income inequality expressed as the Gini coefficients that are calculated using the available data from these three surveys. Given that some of the surveys are not conducted annually, trends in income inequality are shown for a slightly longer period, 1999-2012.[13]

Figure 4. Income Inequality (Gini Coefficients)
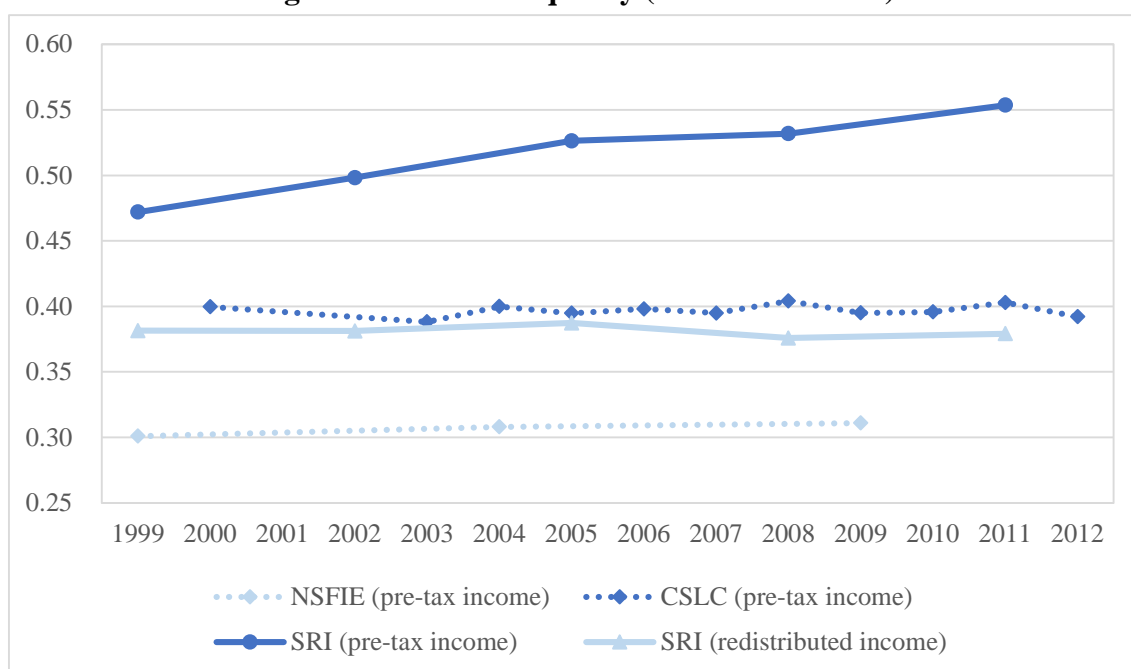
NSFIE = National Survey of Family Income and Expenditure, CSLC = Comprehensive Survey on Living Conditions, SRI = Survey on the Redistribution of Income.
Source: The Gini coefficients based on data from the NSFIE are those reported by the Statistics Bureau, the Ministry of Internal Affairs and Communications (http://www.stat.go.jp/data/zensho/2009/hutari/yoyaku. htm, accessed on April 10, 2015). The Gini coefficients based on data from the CSLC (http://www.mhlw.go.jp/toukei/list/20-21kekka.html, accessed on April 10, 2015) and SRI (http://www.e-stat.go.jp/SG1/estat/NewList.do?tid=000001024668, accessed on April 10, 2015) are those reported by the Ministry of Health, Labor and Welfare.

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[13] Refer to Ohtake *et al*. (2013) for a comprehensive review of income inequality in Japan since the 1980s.

Note that the size of the Gini coefficients differs depending on which data are used to calculate them, mainly because the composition of the samples used by these three surveys is different (Ohtake *et al*., 2013). For instance, the Gini coefficients based on data from the SRI tend to be higher partly because more aged persons are included in this survey. On the other hand, those based on the NSFIE tend to be low because single households are excluded from the sample. As for trends over time in the Gini coefficients, while the Gini coefficients based on pre-tax income from the SRI show an upward trend, those from the other surveys seem to show a relatively stable trend during this period. Note also that while the Gini coefficients calculated using data on pre-tax income from the SRI tend to be high and increasing over time, those calculated using data on redistributed income (taxes and social insurance premiums are deducted from and social security benefits are added to income) are relatively low and stable. This seems to corroborate the fact that the tax and social insurance systems are having the desired effect of redistributing income in Japan. In either case, the most striking observation we can make here is that happiness inequality does not seem to follow the movement of income inequality. This, in turn, suggests that happiness inequality could provide new insights into social inequality and that income inequality may not be a sufficient or appropriate measure to assess the dispersion of people's subjective well-being.

5.2 Estimation Results

Table 3 reports the estimation results of the RIF regressions for the variance and Gini coefficient of happiness. As described in Section 4, the coefficients of the RIF regression measure the marginal effect of the explanatory variables on happiness inequality. If we compare the results for the variance ((1)-(3)) with those for the Gini coefficient ((4)-(6)), they are very similar in terms of the sign and statistical significance of the estimated coefficients. While equations (1) and (4) include the basic explanatory variables, we add a set of subjective variables capturing the concerns that respondents may have in equations (2) and (5), and variables reflecting the referencing process in equations (3) and (6). A comparison of the results (equations (1) and (4) vs. equations (2) and (5)) suggests the important role that individual subjective conditions play in determining happiness inequality. Similarly, comparing the results for equations (3) and (6) with those for the rest of the equations underscores the importance of taking into account the referencing process when analyzing the determinants of happiness inequality. The rest of this sub-section focuses on our preferred model (3) for the discussion of the estimation results.

Table 3. RIF Regression Results

	Variance						Gini					
	(1)		(2)		(3)		(4)		(5)		(6)	
Age	0.192	***	0.155	***	0.146	***	0.007	***	0.006	***	0.006	***
	[0.056]		[0.055]		[0.055]		[0.002]		[0.002]		[0.002]	
Age squared	-0.002	***	-0.002	***	-0.001	***	-6.78E-05	***	-5.46E-05	***	-4.93E-05	***
	[0.001]		[0.001]		[0.001]		[1.53E-05]		[1.48E-05]		[1.47E-05]	
Female	-0.209		-0.223		-0.214		-0.011	*	-0.011	**	-0.011	**
	[0.199]		[0.195]		[0.194]		[0.006]		[0.005]		[0.005]	
Married	-1.981	***	-1.589	***	-1.482	***	-0.070	***	-0.055	***	-0.051	***
	[0.460]		[0.453]		[0.451]		[0.013]		[0.013]		[0.012]	
No longer married	-1.797	***	-1.682	***	-1.723	***	-0.053	***	-0.049	***	-0.051	***
	[0.542]		[0.534]		[0.531]		[0.015]		[0.015]		[0.015]	
High school	-0.380		-0.222		-0.193		-0.018	**	-0.011		-0.010	
	[0.318]		[0.313]		[0.312]		[0.009]		[0.009]		[0.009]	
Junior college	-0.399		-0.171		-0.131		-0.023	**	-0.014		-0.012	
	[0.375]		[0.369]		[0.368]		[0.011]		[0.010]		[0.010]	
University	-0.735	**	-0.661	*	-0.604	*	-0.034	***	-0.030	***	-0.027	***
	[0.352]		[0.347]		[0.346]		[0.010]		[0.010]		[0.010]	
Child	0.090		0.203		0.194		-0.006		-0.001		-0.001	
	[0.385]		[0.378]		[0.376]		[0.011]		[0.010]		[0.010]	
Household size	-0.255	***	-0.257	***	-0.235	***	-0.007	***	-0.007	***	-0.006	***
	[0.075]		[0.074]		[0.074]		[0.002]		[0.002]		[0.002]	
Household income	-0.676	***	-0.527	***	-0.433	***	-0.032	***	-0.026	***	-0.019	***
	[0.153]		[0.152]		[0.159]		[0.004]		[0.004]		[0.004]	
Homeownership	-0.810	***	-0.668	**	-0.605	**	-0.027	***	-0.022	***	-0.018	**
	[0.271]		[0.267]		[0.266]		[0.008]		[0.007]		[0.007]	
Has loans	0.709	***	0.636	***	0.564	***	0.026	***	0.023	***	0.019	***
	[0.183]		[0.180]		[0.180]		[0.005]		[0.005]		[0.005]	
Irregular job	0.759	***	0.657	***	0.631	***	0.020	***	0.016	***	0.015	**
	[0.220]		[0.217]		[0.216]		[0.006]		[0.006]		[0.006]	
Unemployed	2.754	***	2.426	***	2.296	***	0.066	***	0.054	***	0.050	***
	[0.700]		[0.690]		[0.687]		[0.020]		[0.019]		[0.019]	
Not in labor force	0.612	**	0.773	***	0.754	***	0.013	*	0.019	**	0.018	**
	[0.270]		[0.268]		[0.267]		[0.008]		[0.007]		[0.007]	

	Variance			Gini		
	(1)	(2)	(3)	(4)	(5)	(6)
Altruistic	-0.060	-0.034	-0.038	-0.007	-0.006	-0.006
	[0.192]	[0.188]	[0.187]	[0.005]	[0.005]	[0.005]
Risk averse	0.005	0.005	0.006	9.32E-05	9.96E-05	1.21E-04
	[0.004]	[0.004]	[0.004]	[1.23E-04]	[1.20E-04]	[1.18E-04]
Time preference	-0.096	-0.076	-0.067	-0.004	-0.003	-0.002
	[0.173]	[0.170]	[0.169]	[0.005]	[0.005]	[0.005]
Likely unemployed		0.982 ***	0.895 ***		0.035 ***	0.031 ***
		[0.307]	[0.306]		[0.008]	[0.008]
Poor health		0.411 **	0.384 **		0.018 ***	0.017 ***
		[0.170]	[0.169]		[0.005]	[0.005]
Lonely		2.294 ***	2.157 ***		0.082 ***	0.077 ***
		[0.250]	[0.250]		[0.007]	[0.007]
Public pensions		-0.009 **	-0.007 **		-3.80E-04 ***	-3.23E-04 ***
		[0.003]	[0.003]		[9.58E-05]	[9.52E-05]
Relatively poor			1.048 ***			0.041 ***
			[0.187]			[0.005]
Relatively rich			0.972 ***			0.018 **
			[0.262]			[0.007]
Major city	0.149	0.071	0.056	0.002	-0.001	-0.002
	[0.198]	[0.195]	[0.194]	[0.006]	[0.005]	[0.005]
Constant	4.825 ***	4.227 ***	3.146 **	0.239 ***	0.218 ***	0.163 ***
	[1.596]	[1.571]	[1.592]	[0.045]	[0.043]	[0.044]
No. of observations	3,260	3,260	3,260	3,260	3,260	3,260
R^2	0.045	0.082	0.092	0.074	0.135	0.153

Note: ***, **, * denote statistical significance at the 1%, 5% and 10% levels. Standard errors are in parentheses. The regional dummies are included in all the regressions.

Source: Estimation based on data from the 2013 Preference Parameters Study of Osaka University.

With regards to the impact of the individual and household-level characteristics on happiness inequality, a reverse U-shaped trend for the effect of age on happiness is observed, which is consistent with the finding of Becchetti, Massari and Naticchioni (2014). Gender and having a child do not seem to affect happiness inequality, but being married or no longer being married is found to reduce happiness inequality relative to being single. Although we observe a monotonically negative impact of education on the distribution of happiness as found in Becchetti, Massari and Naticchioni (2014) and Clark, Flèche and Senik (2014b), only the coefficient on the dummy variable for having a university degree is statistically significant in our case. In addition, as found in previous studies (see Section 2), the estimation results suggest a significant and inverse relationship between income and happiness inequality. While household size and homeownership seem to reduce happiness inequality, having any loans has the opposite effect.

**Figure 5. Trends in Employment Patterns**
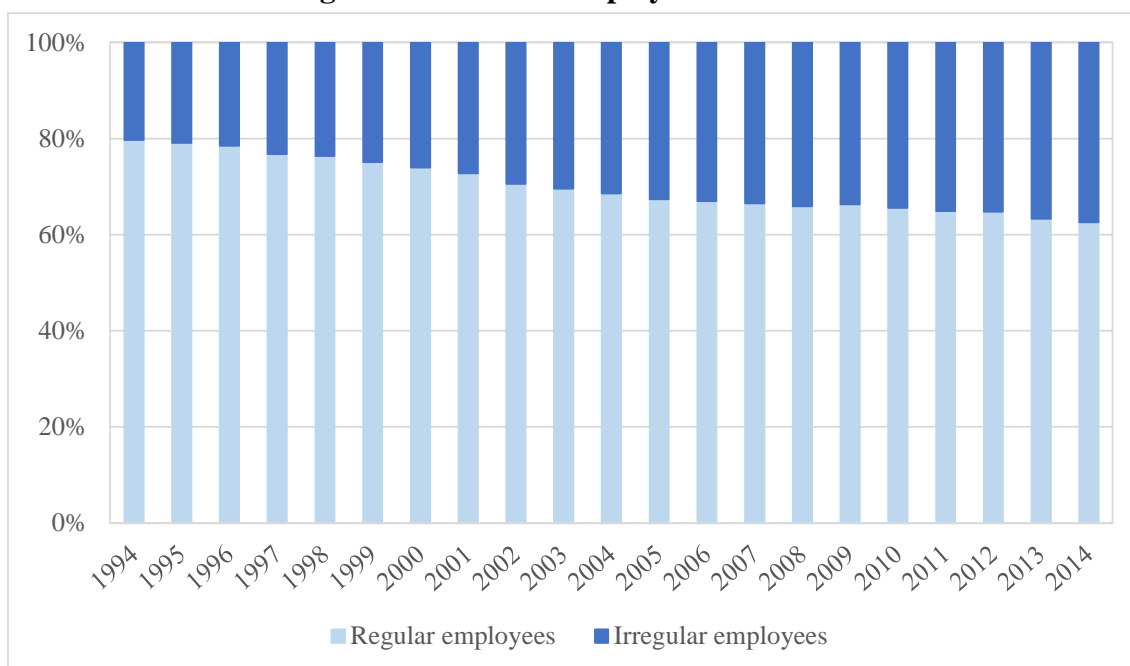
Note: Figures exclude executives of companies or corporations.
Source: The Labor Force Survey (Historical data: Tables 9 and 10), Statistics Bureau, Ministry of Internal Affairs and Communications (http://www.stat.go.jp/data/roudou/longtime/03roudou.htm, accessed on May 14, 2015).

As for employment status, being unemployed or having an irregular job increases the dispersion of happiness as expected relative to having a regular job. The positive effect of unemployment is consistent with the finding of the existing work (Becchetti, Massari

and Naticchioni, 2014; and Clark, Flèche and Senik, 2014b). Although the effect of the insecurity of jobs on happiness inequality has not been examined previously, our finding suggests its importance as a determinant of happiness inequality. The fact that the insecurity of employment enhances happiness inequality is a concern, especially if we take into account that the share of irregular employment, which tends to be low paid and insecure, has been increasing in Japan over the last two decades. Figure 5 shows that the share of irregular employees in the total number of employees was about 20% in 1994, but it has steadily increased since then, reaching about 37% in 2014. Given this trend, one of the key challenges that Japan faces is how to address the increasing insecurity of jobs that have been generated in recent decades.

Figure 6. Distribution of Happiness by Unemployment Likelihood (%)
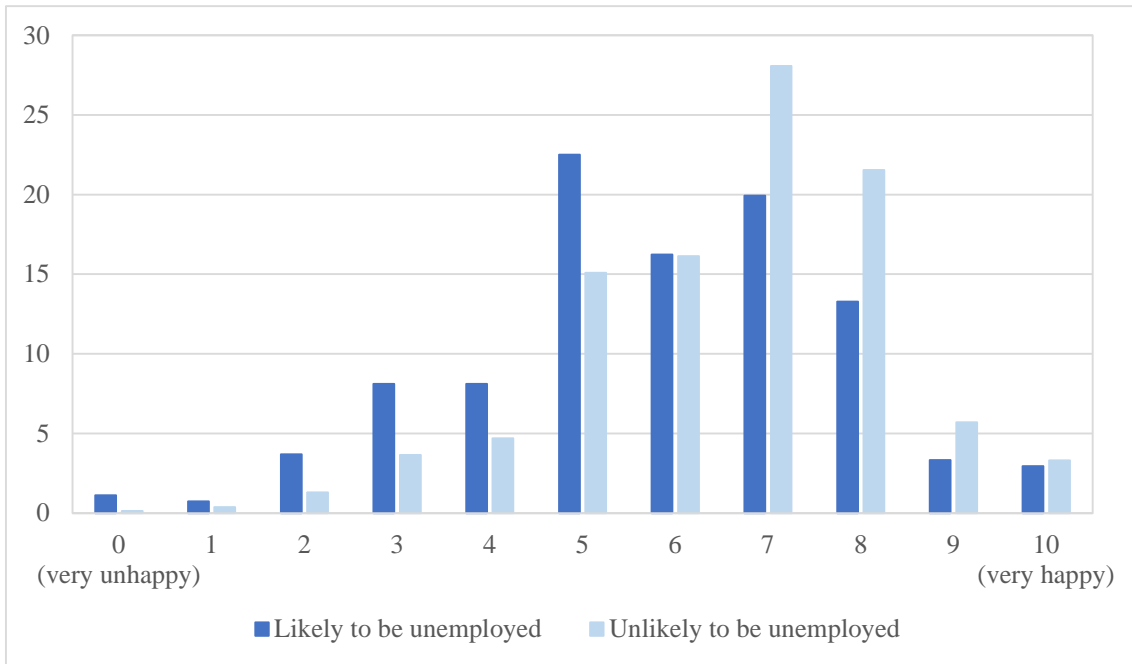
Note: "Likely to be unemployed" includes those respondents who are currently employed but perceive a high risk of being unemployed over the next two years, whereas "unlikely to be unemployed" includes those who are currently employed and do not perceive a high risk of being unemployed.
Source: Calculations based on data from the 2013 Preference Parameters Study of Osaka University.

In the case of the preference parameters, none of them seem to have any significant effect on happiness inequality. In contrast, we observe a significant relationship between happiness inequality and various subjective variables related to respondents' concerns, which previous studies have not taken into account in the regression analysis of happiness inequality. For instance, perceiving a high risk of being unemployed over the next two years is associated with an increase in happiness inequality. Figure 6 illustrates that the

distribution of happiness seems to be more widely spread, especially in the left tail, for those who have such a concern when compared with those who do not.

Similar observations can be made for those who have health concerns. Although Japan is well-known for the longevity of its people, the subjective assessment of health is relatively low. According to the Better Life Index compiled by the Organisation for Economic Co-operation and Development (OECD), Japan has the second highest life expectancy (82.7 years) after Switzerland (82.8 years). [14] However, in terms of self-reported health, only about 30% say their health is good or very good, which is the lowest figure among the OECD member countries and much lower than the OECD average (about 69%). While cultural factors may affect the responses, this still poses the question of why people's self-assessment of their health is so low in Japan and how it can be improved.

Feeling a sense of loneliness also has a negative impact on happiness inequality. A closer look at the data shows that the distribution of happiness for those who are feeling lonely is more widely spread, particularly toward the left tail (those who are feeling very unhappy) in comparison with that for those who are not. Respondents with a sense of loneliness may feel isolated in society without anyone to talk to, and this could cause psychological distress. Interestingly, we find that about 39% of respondents who do not have a sense of loneliness claim to have health concerns, but this figure is as high as 68% among those who are feeling lonely. This suggests that a feeling of isolation may partly explain poor self-rated health conditions in Japan, though a more rigorous analysis is required to confirm this given that there might be reverse causality between the two.

Another subjective variable that is included in the regression analysis is a variable that measures the percentage of their living costs that respondents expect public pensions to cover after their retirement (or the actual percentage in the case of retired respondents). The coefficient on this variable is negative and significant, implying that a larger amount of public pensions that respondents expect to receive relative to their living costs after retirement is associated with a decline in happiness inequality. This suggests that the sufficient provision of public pensions may help reduce the insecurity faced by those who are in the left tail of the distribution of happiness.

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[14] See Footnote 2 for a brief background on the Better Life index. The figures reported here are based on the 2014 edition of the Better Life Index (http://stats.oecd.org/Index.aspx?DataSetCode=BLI, accessed on May 15, 2015).

Figure 7. Happiness Inequality (Standard Deviation) by Relative Standard Living
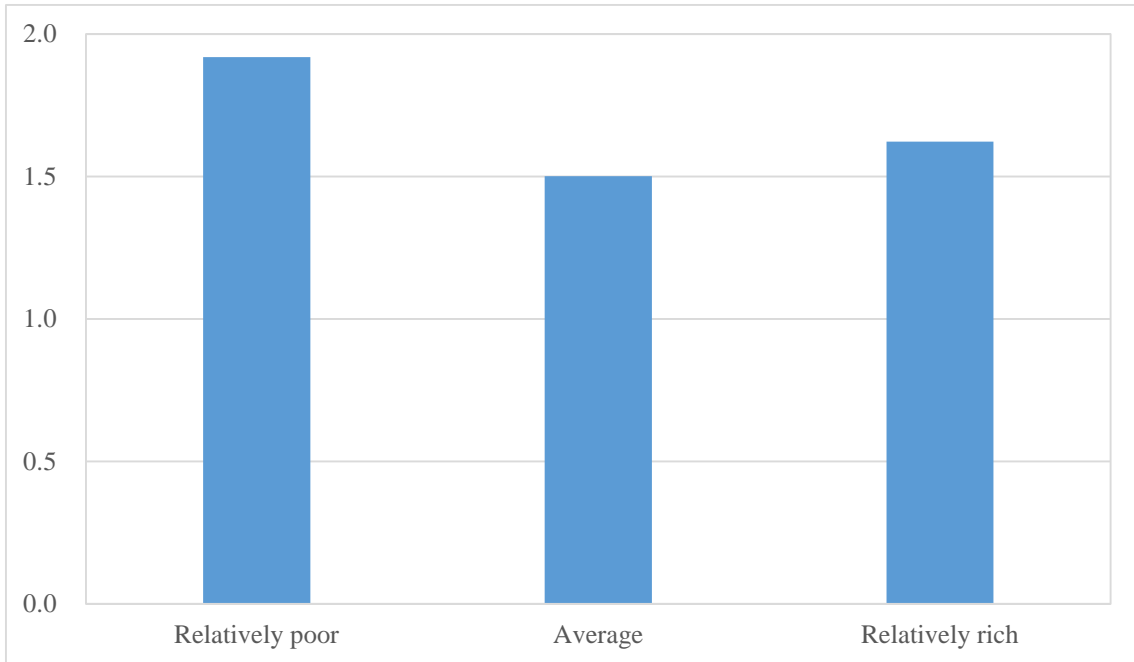
Source: Calculations based on data from the 2013 Preference Parameters Study of Osaka University.

Figure 8. Distribution of Happiness by Perceived Relative Living Standard (%)
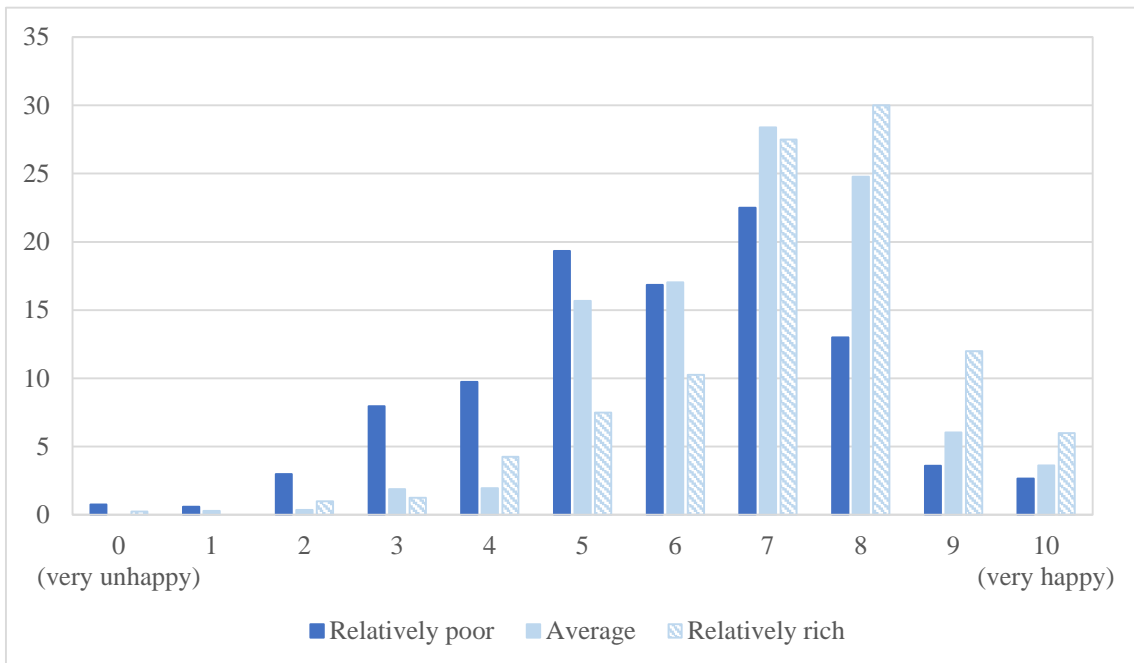
Source: Calculations based on data from the 2013 Preference Parameters Study of Osaka University.

Finally, we turn to the effect of the referencing process on happiness inequality. The significance of the coefficients on the variables capturing respondents' relative standard living in comparison with their respective reference groups underscores the importance of the referencing process in determining happiness inequality. We find that being both poor and rich relative to being average (those who consider the living standard of others to be about the same as their own), increase happiness inequality. Becchetti, Massari and Naticchioni (2014) also find the positive effect of being relatively poor on the dispersion of happiness, though they find the negative and insignificant effect of being relatively rich on happiness inequality. Figure 7 reports happiness inequality measured as the standard deviation for these three groups. It clearly shows that happiness inequality is relatively high among those who think they are relatively poor or rich, particularly the former, than those who think their living standard is more or less at the same level as that of others.

Figure 8 takes a closer look at the dispersion of happiness for these three groups separately. It shows that the happiness of those who think their living standard is relatively low is more widely dispersed with a thicker tail on the left in comparison with the happiness of those who think that their living standard is more or less the same as that of others. Given that the income level of respondents is controlled for in the estimation, these findings suggest that the perception of being relatively poor (and to a lesser extent, of being relatively rich) is as important as the level of income in determining happiness inequality.

6. Conclusions

This paper has examined recent trends and determinants of happiness inequality in Japan with the aim of extending the literature that has so far focused on happiness inequality in other parts of the world. The empirical analysis was undertaken by exploiting the unique dataset from the "Preference Parameters Study of Osaka University" conducted during the 2003-2013 period. Using this dataset, we have found that, despite some fluctuations, Japan observed a fall in happiness inequality over the 2003-2013 period along with income growth, as found in other advanced economies. This seems to support the argument of Clark, Flèche and Senik (2014a) that the finding of a positive relationship between income growth and happiness inequality provides a more positive perspective than the Easterlin paradox.

We have also shown that trends in happiness inequality do not necessary follow those in income inequality given that income inequality has been stable over the same period when measured by redistributed income (taxes and social insurance premiums are deducted from and social security benefits are added to income). This suggests that income inequality may not be a sufficient or appropriate proxy for the inequality of subjective well-being. This does not mean that income inequality should be disregarded entirely but instead that we should be aware of the fact that happiness inequality can represent an important additional dimension that policymakers may need to take into account, as argued by Becchetti, Massari and Naticchioni (2014).

Indeed, the results from the regression analysis of the determinants of happiness inequality provide a number of useful insights into what measures, such as social protection measures, would be effective in reducing happiness inequality by increasing the happiness level of unhappy people. First, as in previous studies, we have found that a higher level of income is associated with a fall in happiness inequality. Measures that would improve economic performance and generate income growth would therefore be effective in reducing happiness inequality. However, note that our results also show that the perception of being relatively poor (or rich) increases happiness inequality even when we control for the level of income and that those who think their living standard is relatively low tend to feel less happy. In other words, not only the actual level of income, but also people's perception of their relative standing in the income spectrum matters for the level as well as the dispersion of happiness.

Second, the results of the empirical analysis have shown that both being unemployed and the insecurity of jobs have a positive and significant effect on happiness inequality. Since the fear of becoming unemployed in the near future also increases happiness inequality, the generation of more stable jobs as well as the improvement of the conditions of irregular jobs are key to reducing happiness inequality. In addition, given that a higher percentage of their living costs that respondents expect public pensions to cover after retirement is associated with lower happiness inequality, assuring the receipt of sufficient public pensions will also help reduce the dispersion of happiness.

Third, we find that having health concerns or a sense of loneliness increases happiness inequality. Since Japan's longevity is one of the highest in the world, its relatively low self-rated health status is somewhat puzzling. While further analysis is needed to answer

this question, our quick observation of the data seems to indicate that a sense of isolation may be one of the causes of the relatively poor self-assessment of health in Japan. As the number of single households increases with the aging of population, measures that will prevent the isolation of people in society are vital for enhancing the self-rated health condition of the people as well as for reducing happiness inequality.

As outlined in this concluding section, our empirical analysis sheds some important light on the useful information that happiness data could provide to policymakers to enable them to address social inequality. We therefore believe that happiness inequality is a useful addition to the set of conventional inequality indicators to monitor and better understand social inequality and to formulate measures to tackle inequality-related issues.

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Appendix: Description of Variables

Variables	Description
Age	Age expressed in years
Age squared	Age squared
Female	Dummy variable that equals one if respondents are female
Married	Dummy variable that equals one if respondents have spouses or partners who are living with them
No longer married	Dummy variable that equals one if respondents are divorced, widowed or separated
Education	
Secondary school	Dummy variable that equals one if respondents have completed secondary school education or lower
High school	Dummy variable that equals one if respondents have completed high school education
Junior college	Dummy variable that equals one if respondents have completed junior college education
University	Dummy variable that equals one if respondents have obtained a university degree or higher
Child	Dummy variable that equals one if respondents have a child/children
Household size	Total number of household members
Household income	Log of per capita annual household income in thousands of yen
	Since the choices of the answers to the question on annual household income were in brackets, we created a continuous variable by assigning the following values to each answer:
	(1) Less than 1 million yen: 800,000 yen
	(2) Between 1 and 2 million yen: 1.5 million yen
	(3) Between 2 and 4 million yen: 3 million yen
	(4) Between 4 and 6 million yen: 5 million yen
	(5) Between 6 and 8 million yen: 7 million yen
	(6) Between 8 and 10 million yen: 9 million yen
	(7) Between 10 and 12 million yen: 11 million yen
	(8) Between 12 and 14 million yen: 13 million yen
	(9) Between 14 and 16 million yen: 15 million yen
	(10) Between 16 and 18 million yen: 17 million yen
	(11) Between 18 and 20 million yen: 19 million yen
	(12) 20 million yen and over: 25 million yen
	We have then divided the figure (in 10,000 yen) by the number of household members and taken its natural logarithm.
Homeownership	Dummy variable that equals one if respondents own a house or an apartment
Has loans	Dummy variable that equals one if respondents have any loans
Employment	
Regular job	Dummy variable that equals one if respondents have a regular job (i.e., working as a full-time employee)
Irregular job	Dummy variable equals one if respondents have an irregular job (i.e., working as a part-time worker, temporary worker, fixed term worker, or dispatched worker from a temporary agency)
Unemployed	Dummy variable that equals one if respondents are unemployed
Not in labor force	Dummy variable that equals one if respondents are not in the labor force (i.e., housewives/husbands, students or retired)
Altruistic	Dummy variable that equals one if respondents have donated any money in the previous year
Risk averse	Chance of rain (%) that will make respondents bring an umbrella with them when they go out
Time preference	Dummy variable that equals one if respondents used to get homework done right away or fairly early during school vacations when they were a child

Variables	Description
Likely unemployed	Dummy variable that equals one if respondents are currently employed but perceive a high risk of being unemployed in the next two years
Poor health	Dummy variable that equals one if respondents think the statement "I have concerns about my health" perfectly applies or somewhat applies to themselves
Loneliness	Dummy variable that equals one if respondents think the statement "I have been feeling lonely lately" perfectly applies or somewhat applies to them
Public pensions	Percentage of living expenses expected to be covered by public pensions after retirement (or actual percentage if respondents are already retired)

Since the choices of answers to the question on what percentage of their living costs respondents expect public pensions to cover after retirement are in brackets, we created a continuous variable by assigning the following values to each answer:

(1) Between 0 and 9%: 5%
(2) Between 10 and 19%: 15%
(3) Between 20 and 29%: 25%
(4) Between 30 and 39%: 35%
(5) Between 40 and 49%: 45%
(6) Between 50 and 59%: 55%
(7) Between 60 and 60%: 65%
(8) Between 70 and 79%: 75%
(9) Between 80 and 80%: 85%
(10) 90% and over: 95%

Variables	Description
Relatively poor	Dummy variable that equals one if respondents think that the living standard of others is much higher or somewhat higher than their own
Relatively rich	Dummy variable that equals one if respondents think that the living standard of others is much lower or somewhat lower than their own
Regions	
Hokkaido	Dummy variable that equals one if respondents reside in Hokkaido
Tohoku	Dummy variable that equals one if respondents reside in Tohoku
Kanto	Dummy variable that equals one if respondents reside in Kanto
Koshinetsu	Dummy variable that equals one if respondents reside in Koshinetsu
Hokuriku	Dummy variable that equals one if respondents reside in Hokuriku
Tokai	Dummy variable that equals one if respondents reside in Tokai
Kinki	Dummy variable that equals one if respondents reside in Kinki
Chugoku	Dummy variable that equals one if respondents reside in Chugoku
Shikoku	Dummy variable that equals one if respondents reside in Shikoku
Kyushu	Dummy variable that equals one if respondents reside in Kyushu
Major city	Dummy variable that equals one if respondents reside in a major (ordinance-designated) city

Note: Given that the question on respondents' education was not included in the 2013 survey, we obtained the relevant information from the 2011 survey data using respondents' unique ID numbers.