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On well-being of households in Japan and post-disaster reinstatement

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ADB Working Paper Series

**ON WELL-BEING OF HOUSEHOLDS
IN JAPAN AND POST-DISASTER
REINSTATEMENT**

Jyoti Shukla, Norifumi Yukutake,
and Piyush Tiwari

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Abstract

There are multidimensional short- and long-term impacts of disasters (natural and man-made) on human well-being. Despite this, restitution strategies have predominantly relied on asset-based approaches to measure disaster losses and craft such strategies. There is a growing realization that for comprehensive restitution of disaster-affected households, it would be necessary to take account of multiple dimensions of households' well-being and reconstruct all that constitutes it. When viewed from Sen's "capability approach," reconstitution of well-being equates to rebuilding households' central capabilities that are necessary for a decent quality of life, e.g., having shelter security, food security, physical and mental health, and the like. With the intention of designing a "resilient compensation mechanism" that reinstalls the "capabilities" of households recovering from losses post-disaster, this research aims to identify essential determinants of households' well-being that will be the focal point of post-disaster compensation or recovery mechanisms. The research uses Japanese household panel survey data (JHPS/KHPS) wherein households report their satisfaction with overall life and its five dimensions, namely housing, leisure, health, income, and employment. Further, this research identifies the main factors (including resources, personal characteristics and familial characteristics of households) that constitute households' satisfaction across each of the five dimensions. Findings suggest that all five dimensions make significant and positive contributions to overall well-being, with leisure and health as the most dominant contributors followed by income, housing, and employment (in that order). Based on these findings, this research argues for designing a "resilient compensation mechanism" with a combination of monetary and nonmonetary strategies that assist affected households in reconstructing capabilities across multiple dimensions of life.

Keywords: disaster resilience, resilient compensation/restitution, capability approach, subjective well-being

JEL Classification: Q54, I31, P25

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1. INTRODUCTION

Japan has suffered from loss of life and livelihood due to natural and man-made disasters. According to a report from the Cabinet Office on Disaster Management in Japan, between 1993 and 2009, 8,543 people lost their lives or were missing because of various disasters. The Great East Japan Earthquake of 2011 added 15,835 to the toll of those who lost their lives in disasters (Fukahori 2012). The impact of disasters on affected people lasts far beyond the immediate destruction and loss of life.

Disasters can influence long-term social and economic development, with the well-being of the poor affected most severely. In post-disaster contexts, the widely adopted “build-back-better” approach promotes sustainable development through integrating a wide range of vulnerability reduction measures into reconstruction and rehabilitation efforts (McCaughey et al. 2018). However, many of these efforts have resulted in unintended consequences. In Aceh, Indonesia, for example, the post-tsunami reconstruction that focused on rebuilding in place to reduce social disruptions to mass relocations did not have the desired effect as people preferred to live away from coastal areas (McCaughey et al. 2018). In fact, this resulted in social segregation as property prices in coastal locations fell, leading to these properties being occupied by the poor. In the case of areas that were affected by Hurricane Katrina in the US, the effect on poor people was severe as they faced severe barriers to returning (Fussell 2015). Analyzing the satisfaction among post-disaster resettled communities in Sri Lanka, Dias, Keraminiyage, and DeSilva (2016) find that a sustainable resettlement program is not merely a reconstruction of a set of houses. A resettlement program should re-establish the socioeconomic and cultural life of people. In this context, Sina, Chang-Richards, and Wilkinson (2019) argue that building livelihood resilience to natural disasters is important to sustain income and economic development in disaster-affected areas. This requires early recovery income support, physical and mental health, the ability to transfer to other jobs/skills, and the availability and timeliness of livelihood support, together with its cultural sensitivity and governance structure (Sina, Chang-Richards, and Wilkinson 2019). In the People’s Republic of China (PRC), post the Wolong earthquake, Yang et al. (2018) found that livelihood changes that resulted from the earthquake led to a significant reduction in “human well-being.” Some of these were due to the limitations that local context placed on the feasible portfolio of livelihood activities.

The post-disaster reconstruction and its financing, which requires immediate restoration of livelihoods and long-term reconstruction, has been challenging. The difficulties that arise include: (i) difficulty in identifying the nature of loss, whether it is private or public, and hence the responsibility to meet that loss, i.e., whether household or social; (ii) a lack of a social and economic framework for addressing long-term effects on households affected by disasters; and (iii) a lack of a mechanism for individualized compensation and reconstruction of losses in a transparent and timely manner.

With the intention of designing a “resilient compensation mechanism” that satisfactorily reinstalls the “capabilities” of households affected by disaster, this research aims to identify essential components of households’ well-being that will be restituted through such compensation mechanisms. Given that Sen’s “capability approach” informs this research, the terms “well-being” with “capability,” have been used interchangeably throughout this paper.

The rest of the paper is structured as follows. Section 2 discusses the relevant literature. This sections also summarizes alternative approaches to measuring well-being and the

problems with each. Section 3 presents the methodology for measuring well-being using a combination of “capability approach” and “subjective well-being”. Section 4 gives an overview of data and variables used to estimate well-being using appropriate indicators across five dimensions of well-being namely housing, leisure, health, income, and employment. Section 5 presents the results. Section 6 discusses implications of key determinants of well-being that would need to be restored during post-disaster reconstruction efforts, and Section 7 concludes.

2. LITERATURE

There is a growing body of literature that argues for the expansion of assessment of disaster intensity and losses beyond asset-based models to include broader dimensions of human well-being (Hallegatte et al. 2017; Walsh and Hallegatte 2019). Although the traditional measure of economic losses in terms of loss of buildings, infrastructure, equipment, and agricultural production, etc. is very useful in guiding post-disaster recovery strategies, it excludes nonmonetary well-being losses that have a significant impact on recovery. Thus, asset-based approaches have two noticeable lacunas: firstly, they overlook many aspects of human well-being, such as psychological health, social capital, etc. (Murakami et al. 2020); and secondly, they induce an implicit bias towards richer households and geographies for directing recovery investments towards them, thus excluding the poor (Walsh and Hallegatte 2019).

In an empirical research, Walsh and Hallegatte (2019) measure and compare well-being with asset losses post Typhoon Haiyan in the Philippines and find that well-being losses account for almost 3.3% of households’ annual expenditure, which is much larger than asset losses at 1.3%. Focusing on the disproportionate suffering of poor households. Hallegatte et al. (2017) and Walsh and Hallegatte (2019) raise concern over the socioeconomic imbalance in the asset-based approach of recovery policies. Their argument is that high-income households undergo large asset losses but fewer well-being losses while a reverse phenomenon is observed for the poor, who experience greater loss of well-being. Given that restitution policies mostly focus on asset-based losses, they disproportionately favor the rich, who hold majority assets. When seen through the lens of equality, restitution mechanisms are also a processes of post-disaster societal construction. Therefore, a simple asset-based approach tends to widen the gap between the rich and poor in post-disaster societies by overlooking broader aspects of well-being (Hallegatte et al. 2017; Walsh and Hallegatte 2019).

Like the traditional income-based approaches to measuring welfare, asset-based approaches to measuring disaster losses have been highly criticized for ignoring many other dimensions of human welfare and societal progress (Stiglitz 2010; Michalos 2011; Binder 2013). From the wide range of alternatives¹ to the traditional welfare economics framework, the two most prominent are the subjective well-being (SWB) approach and the capability approach, though none are without limitations (Binder 2013).

¹ Refer to Fleurbaey 2009; Michalos 2011; Binder and Witt 2011; and Bleyts 2012 for an overview of alternative approaches to measuring welfare.

2.1 Application of Subjective Well-Being Measure of Welfare and “Disaster” Research

Over the past two decades the interest in subjective well-being² in economics has grown significantly, as reviewed by Frey and Stutzer 2002; Dolan, Peasgood and White 2008; van Praag and Ferrer-i-Carbonell 2006; and MacKerron 2012. In recent years, large-scale surveys in many countries have elicited data on subjective well-being, such as the “General Social Surveys” in the US, the “British Household Panel Survey,” the “German Socioeconomic Panel,” and, more recently, the “Keio Household Panel Survey” in Japan (Rehdanz et al. 2013). There is growing interest among economists and social scientists in understanding the impact of disaster on human well-being, and most empirical works on the topic rely on self-reported indicators of well-being. For example, Rehdanz et al. (2013) analyze the effect of disaster on people’s subjective well-being by using self-reported indicators of well-being from a panel data for 5,979 individuals interviewed in Japan before and after the triple disaster in Fukushima. The main indicator of well-being used by Rehdanz et al. (2013) was households’ response to the question on “happiness with one’s life in the previous year,” and an alternative measure was the “happiness with one’s whole life up to the present” from the Keio Household Panel Survey (KHPS)³ 2011 and 2012. In a similar cross-sectional study, Murakami et al. (2020) collected primary data to assess the relationship between evacuee status and well-being in areas affected by the Fukushima disaster by using self-reported variables across five types of well-being, namely positive emotion, negative-free emotion, life satisfaction and general happiness, positive characteristics, and positive functioning. Based on multiple validation research in the past, such as by Frey and Stutzer (2002) and Diener et al. (1999), Rehdanz et al. (2013) justify self-reported well-being indicators as a reliable empirical approximation to individuals’ utility. With regard to the consistency, validity, reliability, and stability of subjective well-being measures, there is extensive validation research that has found subjective well-being measures to satisfy these conventional standards of scientific research (Diener et al. 1999; Frey and Stutzer 2002). However, the most common criticism of the SWB approach has been the problem of hedonic adaptation of individuals to their good or bad situation, which might bias their self-assessment of happiness (Sen 1987; Graham 2009).

2.2 Application of Capability Approach to Welfare and “Disaster” Research

Alongside SWB, the capability approach has been gaining increased application for analyzing disaster risks (Murphy and Gardoni 2008, 2012) and informing mitigation measures (Murphy and Gardoni 2007; Doorn 2017). A comprehensive measure of disaster risks and losses through measuring well-being underpins the design of a “resilient compensation/restitution mechanism” that can assist affected households in building back their “capability” (as defined by Sen 1987) to at least the same level as before the disaster. Amidst the many definitions of well-being, philosopher-economist Amartya Sen (1979) equates well-being to human “capability,” or the level of freedom to choose from a wide range of “functionings” or states of wellness. He defines

² Someone with an avid interest may also refer to Andrews and John (1991) for a survey of various measures of subjective well-being.

³ Since the interviews in the KHPS were conducted in January of the respective years, the answers from the 2011 survey refer to the “pre-Fukushima” period while those from the 2012 survey refer to the “post-Fukushima” period (Rehdanz et al. 2013, 3).

“functionings” as the states of being and doing, which individuals create from combining resources (including money) with their labor, skills, and personal characteristics. Through a series of publications on “capability theory,” Sen (1987, 1995, 1999) explains the definition of capability and functionings, and how these are created by individuals through combining resources (including money) with their personal, familial, social, economic, and political characteristics. When seen through Sen’s lens of “capability” theory, for a satisfactory recovery post-disaster, it would be crucial to reinstall at least the central “capabilities” and “functionings” necessary for a decent quality of life, through the combination of both monetary and nonmonetary resilience mechanisms (Murphy and Gardoni 2008). While Sen (1979, 1993) acknowledges the importance of identifying “basic capabilities” that are crucial for a decent life, he leaves the question open for discussion on what these capabilities are. In the absence of a concrete list, scholars have worked with ad hoc selection of functionings depending on data availability (Binder M. 2013). In more recent theoretical developments in the field of political science, Nussbaum (2011) builds on Sen’s discussion and identifies the following ten central capabilities: (i) life; (ii) bodily health; (iii) bodily integrity; (iv) senses, imagination, and thought; (v) emotions; (vi) practical reason; (vii) affiliation; (viii) other species; (ix) play; (x) control over one’s environment (refer to Figure 1).

However, the problem of trading off one functioning with another or understanding their relative importance through allocation of weights has thus far been ignored in the literature (Binder M. 2013). Also, even though the concept of conversion of resources to functionings is theoretically appealing, measuring conversion factors has been challenging (Brandolini and D’Alessio 2009) and little literature is available on the topic (but see, for example, Binder and Broekel 2011, 2012; Chiappero-Martinetti and Salardi 2007; Deutsch, Ramos, and Silber 2003). Binder (2013) emphasizes possible amalgamation of the SWB approach with the capability approach to partially overcome these problems.

3. DEFINING THE VALUE OF WELL-BEING/CAPABILITY AND ITS DIMENSIONS

This research is informed by Sen’s capability approach and this section explains the relationship between commodities, characteristics, and utility. Sen (1987) refers to earlier works by Lancaster (1966) and Gorman (1956) to explain how commodities are viewed in terms of their characteristics. For example, having food would give a person the opportunity to access the characteristics of food, which include satisfying hunger, yielding nutrition, facilitating social meetings, and the like (Sen 1987). However, possession of commodities does not always equate to possession of these characteristics because the ability of each individual to access these characteristics or convert them into useful functioning depends on their personal features. In the words of Sen (1987, 6), “[i]n judging the well-being of a person, it would be premature to limit the analysis to the characteristics of the goods possessed”. This section explains the logical conversion of commodities into well-being. Most discussions use the same notations as Sen (1987).

x_i = the vector of commodities possessed by person i

$c(.)$ = the function converting a commodity vector into a vector of characteristics of those commodities

$f_i(\cdot)$ = a “utilization function” of person i reflecting one pattern of use of commodities that i can make (in generating a functioning vector out of a characteristic vector of the commodities possessed).

F_i = the full set of utilization functions for person i to choose from

$h_i(\cdot)$ = the happiness function of person i related to the functionings achieved by i

Using the above notation, Sen (1987) explained functioning $f_i(\cdot)$ as a utility-generating function of commodities and their characteristics. If person i chooses the utilization function $f_i(\cdot)$, then, with i 's commodity vector x_i , we can write the achieved or chosen functions as:

$$b_i = f_i(c(x_i))$$

b_i may be interpreted as the person's “being”, for example being nourished, mobile, and so on. We can write the happiness that i would then enjoy from the functioning vector b_i as:

$$u_i = h_i(f_i(c(x_i)))$$

Sen (1987, 8) argued that function h_i is a scalar-valued function and tells us “how happy the person is with the functioning vector b_i and it does not tell us how good that way of living is” Through his “capability” theory, Sen (1987) argued that happiness is not a plausible criterion for the goodness of life and certainly not the only criterion. Thus, the exercise of measuring happiness is not the same as the exercise of measuring the value of life. In regard to the valuation of the quality of life and i 's states of being b_i , Sen (1987) asserted that the valuation function to estimate the value of the vector of functionings b_i is:

$$v_i = v_i(f_i(c(x_i)))$$

The discussions above focus on a single utilization function $f_i(\cdot)$ from a set of functions $F(\cdot)$, where $F_i(\cdot)$ is the set of feasible utilization functions given i 's personal features and command over commodities. The complete set of vectors of functionings feasible for person i with commodity vector x_i is the set $Q_i(x_i)$:

$$Q_i(x_i) = [b_i | b_i = f_i(c(x_i)), \text{ for some } f_i(\cdot) \in F_i \text{ and for some } x_i \in X_i], \text{ where } X_i \text{ is the set of commodities.}$$

Following Sen's (1987) theory, $Q_i(x_i)$ represents “capabilities” or the freedom that a person has in terms of various alternative bundles of feasible functionings given his or her personal features F_i (the conversion function of characteristics into functionings) and his or her command over commodities X_i (entitlements). Then, the set V_i gives the value of well-being that a person can achieve:

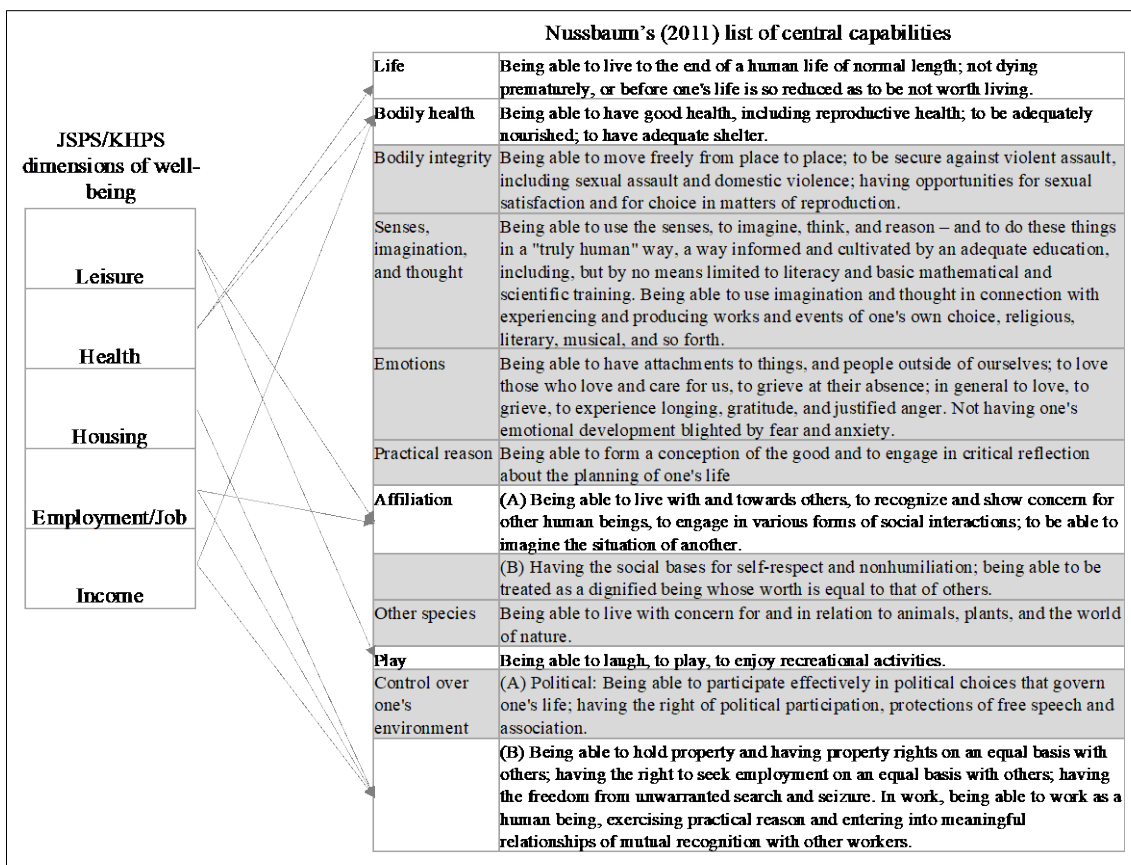
$$V_i = [v_i | v_i = f_i(b_i) \text{ for some } b_i \in Q_i]$$

In the context of this research, it is assumed that a household's overall well-being measure V would be a single value that is constituted by five different dimensions of well-being, namely income, job, leisure, health, and housing. These well-being dimensions together contribute to the following five key aspects of human development:

1. Income – being able to access basic resources and have a decent standard of living.
2. Job – having a healthy work environment that enhances productivity and motivation.
3. Leisure – being able to relax and enjoy life.
4. Health – having a healthy body and mind.
5. Housing – having a decent and secure living environment.

It is acknowledged here that overall well-being would extend beyond these five dimensions to include other aspects of well-being that are currently not covered under JSPS/KHPS data. The missing dimensions of well-being are identified by mapping five dimensions against Nussbaum’s (2011) list and the gaps are highlighted in gray in Figure 1 below. These include central capabilities of bodily integrity; senses, imagination, and thought; emotions; practical reason; other species; and control over one’s environment (explained briefly in Figure 1). It would be a useful exercise for policymakers and researchers to identify suitable indicators for each of the missing dimensions and include questions in the JSPS/KHPS questionnaire that can help construct a wholistic picture of households’ well-being.

Figure 1: JHPS/KHPS Dimensions of Well-Being Mapped Against Nussbaum’s (2011) Central Capabilities



This paper takes inspiration from Binder (2013) and amalgamates the SWB approach with the capability approach to identify determinants of household well-being, V , in the following two steps:

Step 1. Estimate well-being $\widetilde{V}_{i,t}^s$ across five dimensions s ($s = \text{income, job, leisure, health, and housing}$) as a function of a household's characteristics H_i and other determinants $Z_{i,t}^s$ that could either be static and do not change after a certain time (e.g., highest level of education attained by the household head, parental background) or change dynamically over time (e.g., income, expenditure).

$$V_{i,t}^s = f(H_i, Z_{i,t}^s) \quad (1)$$

where $V_{i,t}^s$ is a household's well-being measure equal to the self-reported satisfaction level from dimension 's' of the household.

Step 2. Estimate the overall life satisfaction (or well-being), $V_{i,t}$, of the household as a function of various dimensions of well-being, so that:

$$V_{i,t} = g(V_{i,t}^s) = g\{f(H_i, Z_{i,t}^s)\} \quad (2)$$

where $V_{i,t}$ is the self-reported satisfaction with life (overall well-being) of household i in time t .

Instead of actual self-reported values of dimensional well-being ($V_{i,t}^s$), the above function is modified as follows to use predicted values $\widetilde{V}_{i,t}^s$:

$$V_{i,t} = h(\widetilde{V}_{i,t}^s) \quad (3)$$

Using predicted values as explanatories removes outliers and reduces subjectivity to give more reliable estimated coefficients, which can be interpreted as weights that households assign to these dimensions at mean.

We use the method of ordinary least squares and fixed effect to estimate Equations 4, 5, and 6.

$$V_{i,t}^s = \alpha_{0,i}^s + \sum_{c=1}^C \alpha_{c+1}^s Z_{c,i,t}^s + \epsilon_{i,t}^s \quad (4)$$

For household i ($i = 1, \dots, I$), well-being s ($s = 1, \dots, 5$) at time t ($t = 1, \dots, T$).

$$V_{i,t} = \alpha_{0,i} + \sum_{s=1}^5 \beta_s \widetilde{V}_{i,t}^s + \vartheta_{i,t} \quad (5)$$

And

$$V_{i,t} = \varphi_{0,i} + \sum_{s=1}^5 \theta_s V_{i,t}^s + \rho_{i,t} \quad (6)$$

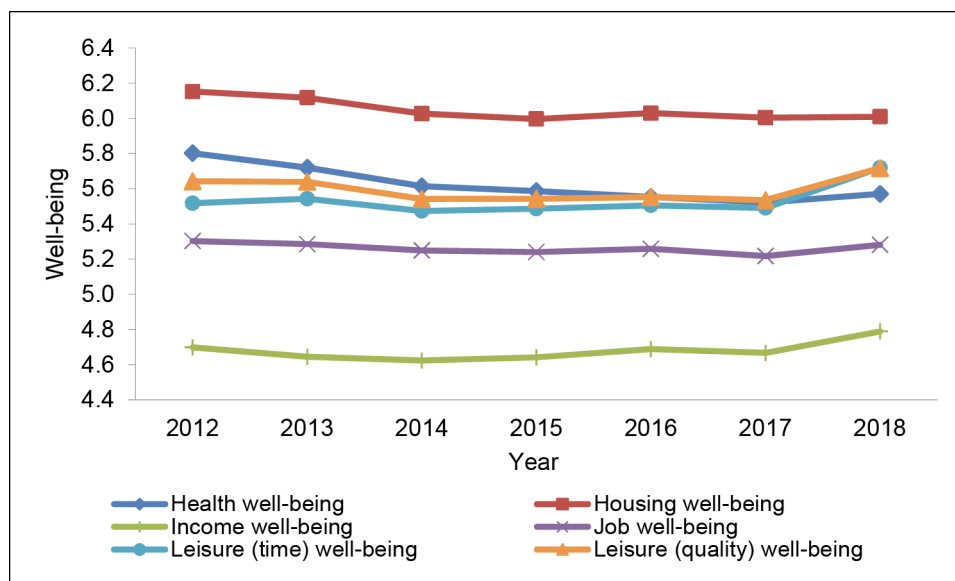
where, $\alpha, \beta, \varphi, \delta$ are coefficients for explanatory variables and $\epsilon, \vartheta, \rho$ are the error terms. \widetilde{V} is the predicted value of for 's'th well-being estimated in Equation 1.

4. DATA

The data employed in this paper are from the Keio Household Panel Survey (KHPS) from 2011 to 2018. The KHPS panel survey was launched in 2004 with a sample of 4,000 households and 7,000 individuals. Further households were added to the sample in 2007 (1,400 households and 2,500 individuals) and 2012 (1,000 households) to compensate for dropouts from the sample. In addition, a survey of 4,000 individuals was initiated in 2009 as the Japan Household Panel Survey (JHPS). The KHPS covers a wide range of topics such as employment behavior, poverty trends, and status of inter-household transfer of real assets. The JHPS, in addition to economic status and employment status, collects data focused on education and health/healthcare. From 2011 onwards, the KHPS asked respondents to indicate their overall satisfaction with life on a scale of 0 to 10. For the purpose of this research, life satisfaction has been used as a measure of households' overall well-being. They were also asked to report their satisfaction with income, job, health, housing, and leisure (quality and time) on a scale of 0 to 10. The respondents were asked about their household characteristics, education, employment, income and liabilities, habits, health, and housing through a range of repeated questions each year. In the estimation of well-being functions, well-being variables have been treated as continuous variables rather than discrete choice variables, as otherwise, in the estimation of the fixed-effect model, the information on households whose well-being does not change will be dropped from the data sample. Methods such as the multinomial logit model were found to be relatively less suitable because, due to the large number of explanatory variables and categories demanded by this research, estimation of a discrete choice model using multinomial logit does not converge. On the other hand, a linear stochastic model ensures consistency.

Figure 2 presents the mean self-reported values of well-being. The average housing and health well-being declined from 2012 to 2018. Leisure (quality and time), income, and job well-being showed improvement over this period. The highest average value of well-being is for housing and the lowest is for income.

Figure 2: Well-Being Trend Across Five Dimensions, 2012–18

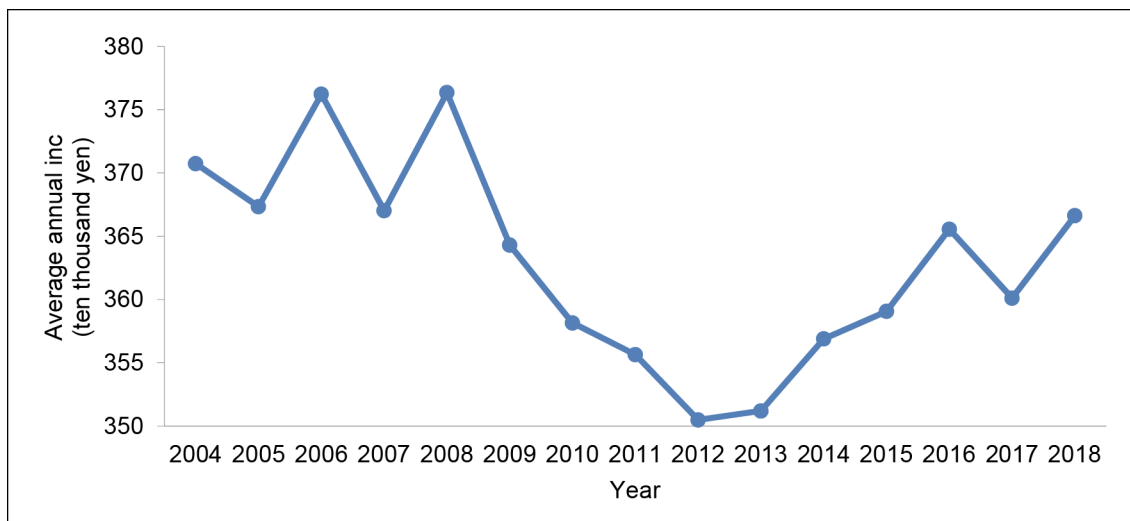


As the purpose of this paper is to analyze determinants of various dimensions of well-being and the contribution of these dimensions to overall well-being, it would be important to present the trend in respondents' key socioeconomic factors. The following discussion presents these trends. The period of analysis is 2012–2018. While the trends presented below include the full time period, the discussion largely focuses on 2012–2018.

Average Income Trend

The average nominal income trend for respondents is presented in Figure 3. It should be highlighted here for ease of interpretation of the trend that for the respondents who had been in the sample since 2004, their incomes declined between 2007 and 2012. The income post 2012 of all the samples collectively (all cohorts) and of individual cohorts (not presented in the figure) saw an upward trend. The average nominal income declined from JPY3.7 million in 2004 to JPY3.5 million in 2012 but later rose, though not to the previous level of 2004. This could also be due to the fact that some households that had been part of the sample since 2004 had reached retirement age and had left the workforce while others who were added to the sample later had not reached the same income levels of retirees before they retired. There was a dip in the average income in 2017 compared to 2016. The trend indicates that the income was volatile over the period.

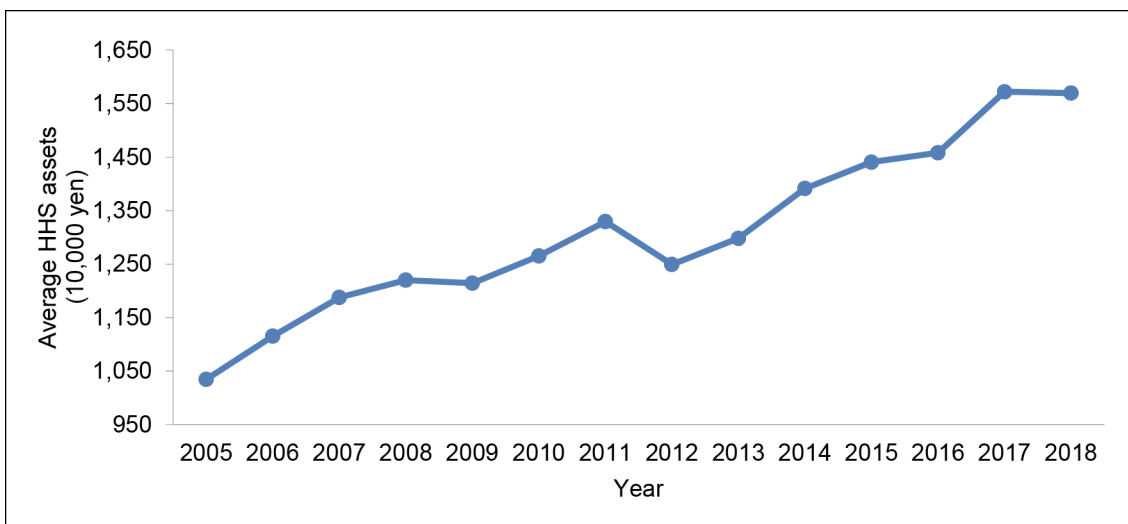
Figure 3: Average Income of Respondents



Household Asset Trend

The average household in the sample had an asset worth JPY15.7 million in 2018. The value of assets increased steadily between 2012 and 2018 from JPY12.5 million in 2012. The two major components of household assets are housing and superannuation. While the superannuation savings increased, house values remained stagnant.

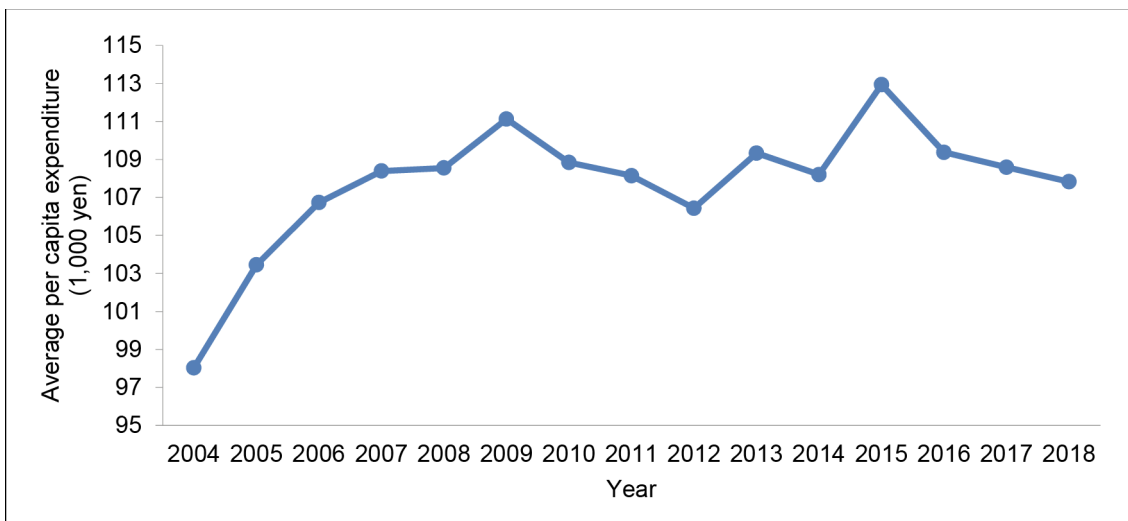
Figure 4: Household Assets



Household Expenditure Per Person Trend

The average per capita expenditure is presented in Figure 5. While the overall trend in per capita expenditure was positive, the increase was small (largely in line with low but positive inflation between 2012 and 2018). The inflation spiked in 2014 before slowing down in 2015 and this resulted in an expenditure spike in 2015 as shown in Figure 5.

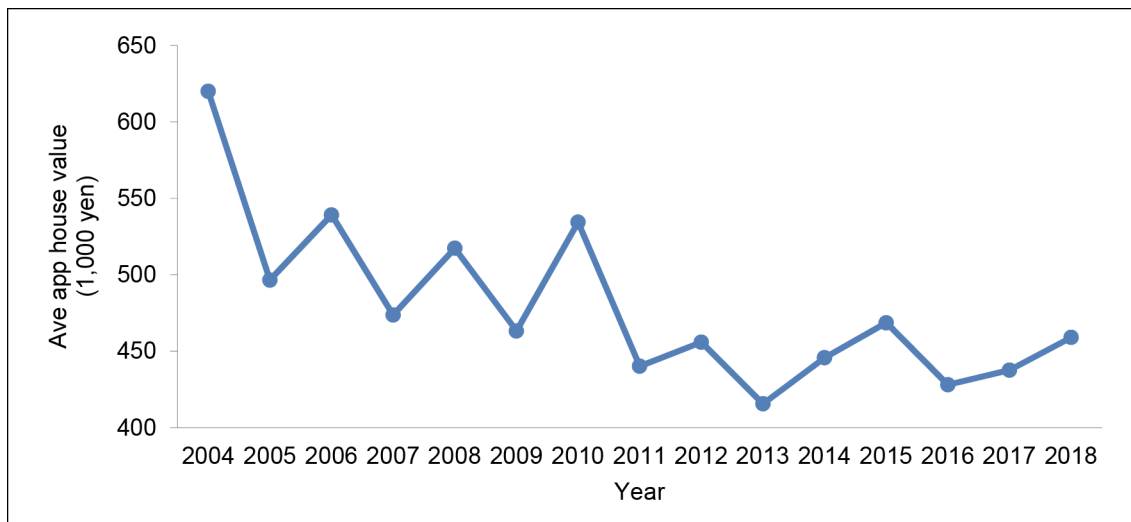
Figure 5: Average Per Capita Expenditure



House Value Trend

The appraised average house value declined from 2004 (Figure 6). However, the average house values changed very little between 2012 and 2018. There was an increase in average house value in 2015 in line with general inflation in Japan. This corroborates the earlier statement that housing asset has not been a major contributor to increases in household wealth.

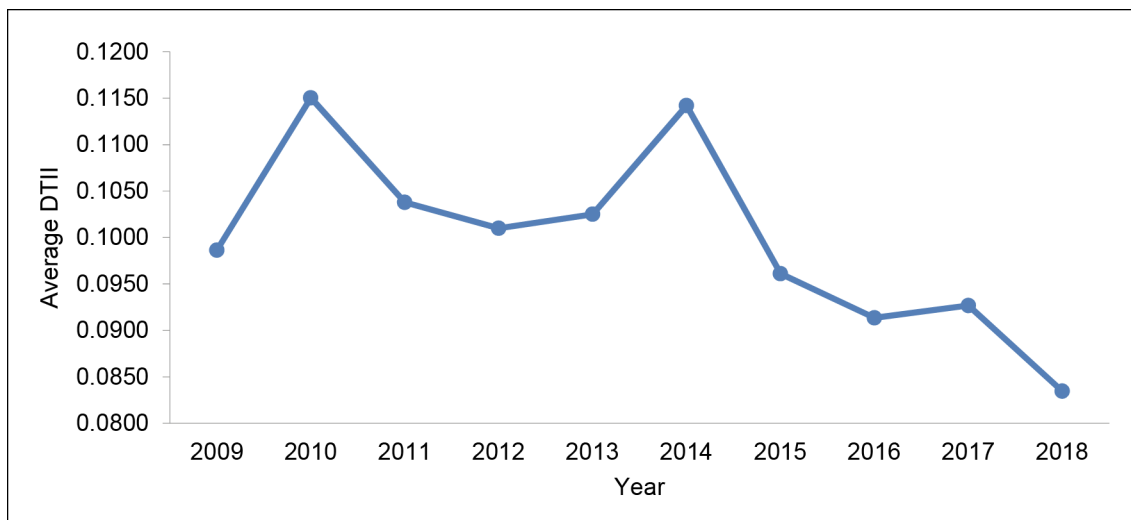
Figure 6: Appraised House Value



Debt-to-Income Ratio

The household annual debt repayment-to-income ratio declined over time as shown in Figure 7. Low mortgage interest rates, declining housing asset value, and a slight increase in income may have resulted in a declining debt repayment-to-income ratio between 2014 and 2018. Some respondents in the sample would have had paid off their mortgage debts, resulting in a fall in the average debt repayment-to-income ratio.

Figure 7: Annual Debt Repayment-to-Household Income Ratio



Hours Worked Per Week Trend

The average number of hours that respondents worked per week declined over time (Figure 8). A similar trend is observed for extra hours worked (Figure 9).

Nagamachi and Yugami (2015) discuss the changing pattern of household working hours between 1986 and 2013 and propose that there was a significant change in the labor supply structure of married women in a married household. The employment rate of married women generally increased, and the number of households with a full-time

homeworker declined during this period. An increase in the number of married women working short hours curbed an increase in their overall working hours. The authors also found a negative correlation between married men’s income levels and married women’s employment rates. Childrearing responsibilities also had a constraining effect on married women’s labor supply. The impact of the changing labor market with more workers willing to work short working hours (i) reduced opportunities for overtime work and (ii) created opportunities for a greater number of workers on short working contracts. The net effect is a decline in the average working hours and average extra work hours per week as shown in Figures 7 and 8.

Figure 8: Average Hours Worked Per Week

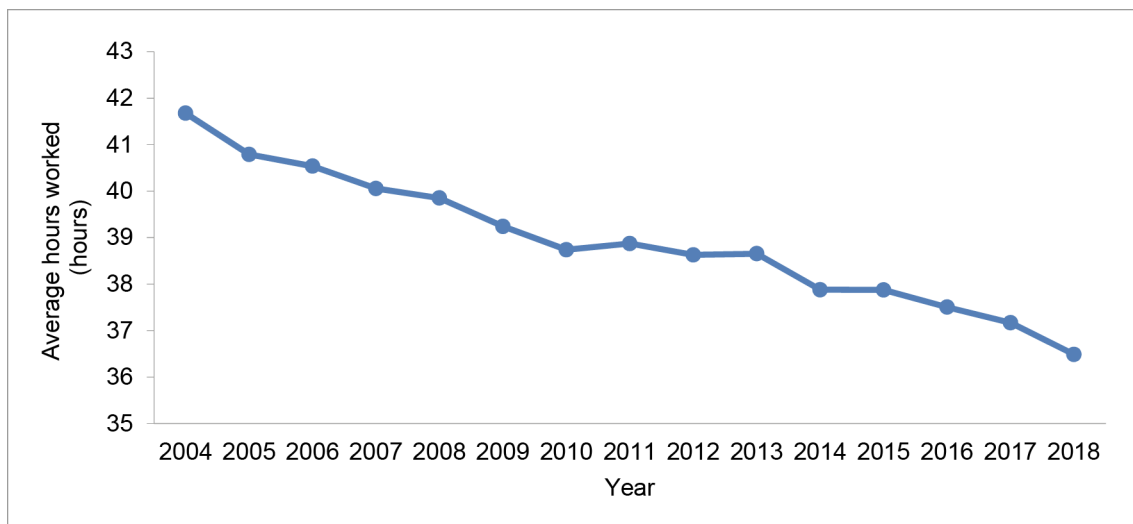
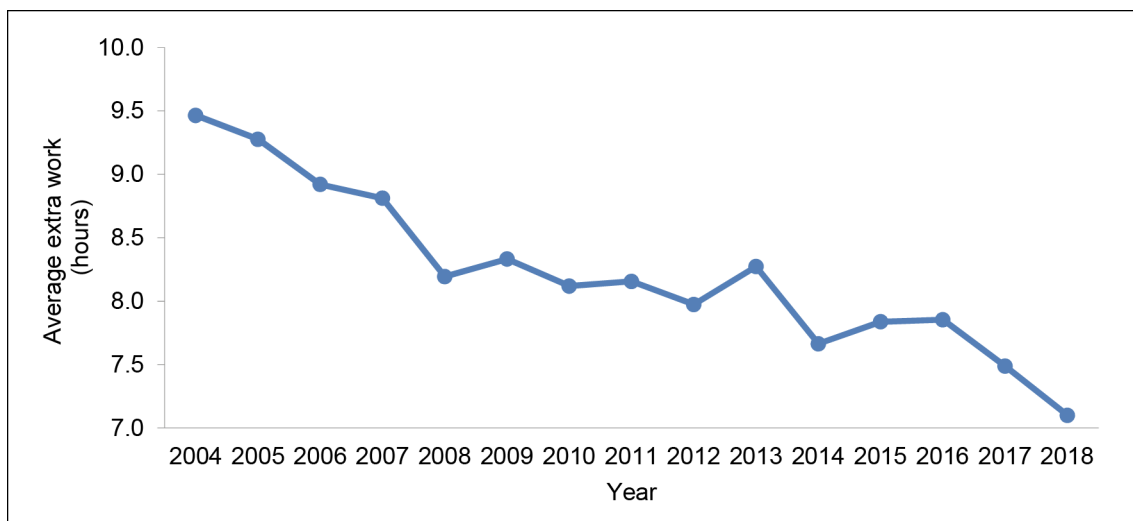


Figure 9: Average Extra Work Per Week



The variables used in the estimation of well-being functions, their mean, and standard deviation are presented in Table 1. Since the sample size is different for each well-being function (due to omitted responses), the mean and standard deviations are presented for variables used in each of the functions. The table also reports expected signs and their rationale.

Table 1: Variable Nomenclature and Descriptive Statistics

Income Well-being Obs: 16,336 Mean: 4.706966 Standard deviation: 2.574108					
Variable Name	Explanation	Expected Sign	Mean	Std Dev.	
Labor income	Annual labor income last year (10,000 yen)	+	232.9658	293.9507	Higher income reduces anxiety about livelihood and improves income well-being.
Number of kids	Number of kids (Number)	-	1.324008	1.114394	With more children, expenditure increases, putting pressure on income.
Household size	Family members living together (Number)	-	3.065683	1.38058	Larger household size increases household expenditure, putting pressure on income.
Marriage	Married or not ("Married" = 1)	-	0.7699559	0.4208737	Marriage can reduce expenditure per person and increase income if both partners work.
Age	Age-respondent dummy (i.e., if age = 32, "age_3040" = 1)	+	0.0429279	0.2026996	Income is much more stable with age.
age_2030 (base)			0.141834	0.3488905	
age_3040			0.2246572	0.4173691	
age_4050			0.1997429	0.3998193	
age_5060			0.2175563	0.4125966	
age_6070			0.1579334	0.3646897	
age_7080			0.0222209	0.1474056	
age_8090			0.0003673	0.0191618	
age_90100					
Male	Gender ("Male" = 1)	+	0.493144	0.4999683	
City size	1 = Government-designated city (No. 1 is base case) 2 = city: pop. over 50,000 3 = town, village, other	+	0.2891135	0.4533618	Large city has more employment opportunities and income growth potential.
			0.624089	0.4853	
			0.0839251	0.2772839	
Household's income	Annual employment income Other family total (10,000 yen)	+	488.7188	316.7867	Higher household income has positive effect on income well-being.
Bonus	Received bonus (10,000 yen)	+	33.78367	67.97121	Bonuses supplement income and positively impact well-being.
Overtime paid rate	Overtime rate (Payment/hours worked)	-	0.137956	0.3373152	Overtime means longer hours of work to supplement income.
University degree	Parents graduated from university or not (if graduated, "University degree" = 1, degree F = father's, M = mother's)	+	F = 0.1328355 M = 0.0299339	F = 0.3394072 M = 0.1704102	Parents' education impacts children's education and future employment.
Master's degree	Parents have master's degree or not (if have "master's degree" = 1, degree F = father's, M = mother's)		F = 0.0052644 M = 0.0011631	F = 0.0723675 M = 0.0340851	
White collar	Job profile, white collar or not	+	0.3585945	0.4796025	White-collar job is associated with relatively high income and social status.
Parents' working status	Parents' status : working or not (if working, "status" = 1 "F" = father's "M" = mother's)	+	0.0450539	0.2074287	Parents' working status affects children's economic situation positively.
House inheritance	Inherit house from parent or not	+	0.0460333	0.2095637	Inheritance removes
Future inheritance	Expectation of future inheritance of the current residence.		0.2478575	0.4317819	uncertainties related to house purchase.
Household's liabilities	Saving + deposits/securities (10,000 yen)	+	1,193.87	2,053.161	Savings have positive impact on income well-being.
Exp on food	Expenditure on food in the last month (1,000 yen)	+	62.51953	35.94804	Higher income results in higher spending on food.
Exp per person	Expenditure per person: total expenditure/household size (1,000 yen)	+	110.2345	118.1185	Ability to spend higher per person leads to higher income well-being.
House loan remaining	Total amount of the unpaid balance of the house loan (10,000 yen)	-	495.1363	1166.125	Outstanding loan is a burden and has negative impact on income well-being.
Not labor force	Working status.	-	0.3505754	0.4771648	These working statuses affect income well-being.
Absence from work	Perform any paid work (including paid work at family businesses) or not in last month.		0.0088149	0.0934758	
Unemployment			0.0228942	0.1495709	
Not office worker	Self-employed, professional, family business, consigned work or subcontractor	-	0.0708864	0.2566428	For self-employed people, income includes funds needed for business and this may cause uncertainty.

continued on next page

Table 1 *continued*

Income Well-being Obs: 16,336 Mean: 4.706966 Standard deviation: 2.574108					
Variable Name	Explanation		Expected Sign	Mean	Std Dev.
Flex time	Work system (working hours system).	+	If people choose appropriate working hours, they can work more comfortably.	0.0509305	0.2198625
Variable hour	If apply each rule, value = 1)			0.0775588	0.2674842
Discretionary hour				0.0126102	0.1115882
No management				0.0350147	0.1838226
Type Agriculture	Nature of work: Agriculture	+/-	No a priori sign expected.	0.0078967	0.0885144
Type Mining	Nature of work: Mining	+/-	No a priori sign expected.	0.0001224	0.0110644
Type Salesperson	Nature of work: Salesperson	+/-	No a priori sign expected.	0.0832517	0.2762708
Type Service worker	Nature of work: Service worker	+/-	No a priori sign expected.	0.0932297	0.2907629
Type Manager	Nature of work: Assembly member, Section chief	+/-	No a priori sign expected.	0.0330558	0.1787879
Type Transportation	Nature of work: Transportation	+/-	No a priori sign expected.	0.0285872	0.1666483
Type Manufacturing	Nature of work: Manufacturing	+/-	No a priori sign expected.	0.1217556	0.3270134
Type Information services	Nature of work: Information services	+/-	No a priori sign expected.	0.0153648	0.1230028
Type Technical worker	Nature of work: Technical worker	+/-	No a priori sign expected.	0.1024119	0.3031984
Type Public service	Nature of work: Public service	+/-	No a priori sign expected.	0.0089373	0.0941169
Type other	Nature of work: Other type	+/-	No a priori sign expected.	0.0011631	0.0340851
Length of service	Number of working years at current company	+	Long service length is associated with security.	7.867287	11.13476
Holidays used	Paid holiday used in year	+	Paid holiday used shows working environment.	36.29827	46.97252
Weekly working time	Hours worked per week (incl. overtime)	-	At the same income, long working shows underemployment.	23.64887	22.7643
Extra work hours	Hours worked overtime (average hours in a week)	-	At the same income, long working hours show work stress.	2.245593	5.181261
Length of job hunting	Length of job hunting (month)	-	Longer job search has negative effect on income well-being.	0.165891	0.100234
Have side job	Having side work or not	-	Have to supplement job means dissatisfaction with income.	0.0538075	0.2256444
Commuting	Time used for commute (hour)	-	Commuting is nonproductive time.	0.2829585	0.4049912
Have any work	Have any work or not in last month	+	Having work contributes to income.	0.6177155	0.4859604
Quantity of Education	Years of schooling	+	Higher level of income is associated with higher well-being.	0.0095938	0.2360286
Job Well-being Obs: 18,041 Mean: 5.148107 Standard deviation: 2.508635					
Variable Name	Explanation		Expected Sign	Mean	Std Dev.
Labor income	Annual labor income last year (10,000 yen)	+	Higher income is associated with job satisfaction.	247.445	295.4459
Number of kids	Number of kids (Number)	-	With more children, pressure to earn more causes dissatisfaction with job.	1.349981	1.11665
Household size	Family members living together (Number)	-	Larger household size puts pressure to earn more and causes dissatisfaction with job.	3.135192	1.398155
Marriage	Married or not ("Married" = 1)	+	Married couples can share household responsibilities and achieve work-life balance.	0.7586054	0.4279409
Age	Age-respondent dummy	+/-	No a priori sign expected.		
age_2030 (base)	(i.e., if age = 32,			0.0402417	0.196531
age_3040	"age_3040" = 1)			0.1509894	0.3580485
age_4050				0.2350202	0.4240232
age_5060				0.2122388	0.4089043
age_6070				0.208913	0.4065434
age_7080				0.1320326	0.2285356
age_8090				0.0202871	0.1409846
age_90100				0.0002771	0.0166459
Male	Gender ("Male" = 1)	+/-	No a priori sign expected.	0.4899396	0.4999126
City size	1 = Government-designated city (No. 1 is base case) 2 = city: pop. over 50,000 3 = town, village, other	+	Large city has more diversity in job opportunities.	0.2954382	0.4562521
				0.6175933	0.4859886
				0.0869686	0.2817968

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Table 1 *continued*

Job Well-being Obs: 18,041 Mean: 5.148107 Standard deviation: 2.508635					
Variable Name	Explanation		Expected Sign	Mean	Std Dev.
Not labor force	Working status.	-	These employment statuses have	0.3027548	0.4594628
Absence from work	Perform any paid work		negative impact on job well-being.	0.0093676	0.0963344
Unemployment	(including paid work at family businesses) or not in last month			0.0249432	0.1559563
Flex time	Work system (working hours system).	+	Possibility of flexible work hours is associated with higher job well-being.	0.0535447	0.2251232
Variable hour	If apply each rule, value = 1)			0.0851948	0.2791791
Discretionary hour				0.0125825	0.1114667
No management				0.381908	0.1916619
Not office worker	Self-employed, professional, family business, consigned work or subcontractor	+	Self-employment could give better job satisfaction as it allows control over one's work.	0.076437	0.2657034
Type Agriculture	Nature of work: Agriculture	+/-	No a priori sign expected.	0.0092013	0.954835
Type Mining	Nature of work: Mining	+/-	No a priori sign expected.	0.0001663	0.0128946
Type Salesperson	Nature of work: Salesperson	+/-	No a priori sign expected.	0.0902389	0.2865317
Type Service worker	Nature of work: Service worker	+/-	No a priori sign expected.	0.1007705	0.3010329
Type Manager	Nature of work: Assembly member, Section chief	+/-	No a priori sign expected.	0.0344216	0.1823145
Type Transportation	Nature of work: Transportation	+/-	No a priori sign expected.	0.030985	0.1732818
Type Manufacturing	Nature of work: Manufacturing	+/-	No a priori sign expected.	0.1311457	0.337569
Type Information services	Nature of work: Information services	+/-	No a priori sign expected.	0.0160745	0.1257656
Type Technical worker	Nature of work: Technical worker	+/-	No a priori sign expected.	0.1091403	0.3118238
Type Public service	Nature of work: Public service	+/-	No a priori sign expected.	0.0096447	0.0977354
Type other	Nature of work: Other type	+/-	No a priori sign expected.	0.0011086	0.332779
Length of service	Number of working years at current company	+	More years at same company is a reflection of job satisfaction.	8.374425	11.30242
Holidays used	Paid holiday used in year	+	Paid holiday used shows healthy working environment.	39.17568	47.68178
Weekly working time	Hours worked per week (incl. overtime)	-	At the same income, long working shows underemployment.	25.42481	22.68773
Extra work hours	Hours worked overtime (average hours in a week)	-	At the same income, long working hours indicate job stress.	2.42675	5.299759
Length of job hunting	Length of job hunting (month)	-	Longer job search has negative job well-being.	0.0181023	0.1051747
Have side job	Having side work or not	-	Additional job to supplement income indicates job dissatisfaction.	0.0580899	0.2339199
Commuting	Time used for commute (hour)	+	Longer commute time has negative job satisfaction.	0.3022135	0.4106188
Leisure Quantity Well-being Obs: 24,793 Mean: 5.662848 Standard deviation: 2.313003					
Variable Name	Explanation		Expected Sign	Mean	Std Dev.
Labor income	Annual labor income last year (10,000 yen)	+	Higher income allows more time for leisure.	221.4452	284.7395
Number of kids	Number of kids (Number)	+	More children are associated with increased opportunities for leisure.	1.267737	1.112877
Household size	Family members living together (Number)	+	A larger family has more opportunities for leisure.	3.08212	1.402454
Marriage	Married or not ("Married" = 1)	+	Married couples have more opportunities for leisure.	0.7481547	0.4340816
Age	Age respondent dummy	-	With age, due to time and health constraints, leisure quantity reduces.	0.1428629	0.34994
age_2030 (base)	(i.e., if age = 32,			0.2134877	0.4097773
age_3040	"age_3040" = 1)			0.1915863	0.3935572
age_4050				0.2122777	0.4089286
age_5060				0.1678296	0.3737225
age_6070				0.0265397	0.1607372
age_7080				0.000726	0.0269354
age_8090					
age_90100					
Male	Gender ("Male" = 1)	+	Females have more social activities.	0.4746501	0.499367
City size	1 = Government-designated city (No. 1 is base case)	+	A large city has more opportunity for leisure than towns or villages.	0.2892349	0.4534163
	2 = city: pop. over 50,000			0.6212641	0.485082
	3 = town, village, other			0.0895011	0.2854714

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Table 1 *continued*

Leisure Quantity Well-being Obs: 24,793 Mean: 5.662848 Standard deviation: 2.313003					
Variable Name	Explanation		Expected Sign	Mean	Std Dev.
Commuting	Time used for commute (hour)	-	These activities reduce leisure time.	0.2725249	0.3979026
Household work time	Time used for household			2.033081	2.284769
Childcare time	Time used for childcare			0.6802969	2.369958
Study time	Time used for study			0.1096248	0.568515
Weekly working time	Hours worked per week (incl. overtime)			23.23386	22.84945
Drinking few times	Frequency of alcohol consumption: few times/month	+/-	Drinking is social activity related to leisure but overindulgence may have negative impact on leisure.	0.2093333	0.4068409
Drinking 12 times	Frequency of alcohol consumption: 1~2 times/week			0.0979712	0.2972817
Drinking 3+ times	Frequency of alcohol consumption: 3+ times/week			0.2518856	0.4341047
Physical condition	Physical health condition. Average score about physical examination	+	Good health allows more leisure satisfaction.	1.007561	0.1108538
Psychological condition	Psychological health condition. Average score about psychological examination	+	Good psychological health allows more leisure satisfaction.	1.036667	0.9701979
Not labor force	Working status.	+/-	Unemployment may increase leisure but it can affect leisure satisfaction due to stress of unemployment.	0.3633687	0.4809794
Absence from work	Perform any paid work (including paid work at family businesses) or not in last month.			0.0086718	0.0927197
Unemployment				0.0246441	0.155049
Not office worker	Self-employed, professional, family business, consigned work or subcontractor	+	Self-employed can manage their working schedule better than office workers.	0.0697778	0.2547772
Flex time	Work system (working hours system).	+	Flexible time allows better management of leisure.	0.0492478	0.2163893
Variable hour	If apply each rule, value = 1)			0.0803453	0.2718324
Discretionary hour				0.0114548	0.1064147
No management				0.0338805	0.1809253
Type Agriculture	Nature of work: Agriculture	+/-	No a priori sign expected.	0.0079055	0.0885623
Type Mining	Nature of work: Mining	+/-	No a priori sign expected.	0.0001613	0.012701
Type Salesperson	Nature of work: Salesperson	+/-	No a priori sign expected.	0.0806276	0.2722678
Type Service worker	Nature of work: Service worker	+/-	No a priori sign expected.	0.0925261	0.2897731
Type Manager	Nature of work: Assembly member, Section chief	+/-	No a priori sign expected.	0.0290405	0.1679233
Type Transportation	Nature of work: Transportation	+/-	No a priori sign expected.	0.0278304	0.1644901
Type Manufacturing	Nature of work: Manufacturing	+/-	No a priori sign expected.	0.1156375	0.3197961
Type Information services	Nature of work: Information services	+/-	No a priori sign expected.	0.0154882	0.1234867
Type Technical worker	Nature of work: Technical worker	+/-	No a priori sign expected.	0.1051103	0.3067017
Type Public service	Nature of work: Public service	+/-	No a priori sign expected.	0.0087121	0.0929332
Type other	Nature of work: Other type	+/-	No a priori sign expected.	0.00121	0.034765
Length of service	Number of working years at current company	+	Stable employment allows more time for leisure.	7.520631	10.99124
Holidays used	Paid holiday used in year	+	Paid holiday at work allows more leisure.	35.82509	46.90796
Weekly working time	Hours worked per week (incl. overtime)	-	Longer working hours reduce leisure.	23.23386	22.84945
Extra work hour	Hours worked overtime (average hours in a week)	-	Overtime work reduces leisure.	2.219134	5.128993
Have side job	Having side work or not	-	Supplement work reduces leisure.	0.0506595	0.2193058
Leisure Quality Well-being Obs: 24,780 Mean: 5.641687 Standard deviation: 2.455952					
Variable Name	Explanation		Expected Sign	Mean	Std Dev.
Labor income	Annual labor income last year (10,000 yen)	+	Higher income has positive impact on leisure quality.	221.5856	284.7955
Number of kids	Number of kids (Number)	+	More children are associated with increased opportunities for leisure.	1.268321	1.113099
Household size	Family members living together (Number)	+	A larger family has more opportunities for leisure.	3.08297	1.402053
Marriage	Married or not ("Married" = 1)	+	Married couples have more opportunities for leisure.	0.7484262	0.4339263

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Table 1 *continued*

Leisure Quality Well-being Obs: 24,780 Mean: 5.641687 Standard deviation: 2.455952					
Variable Name	Explanation		Expected sign	Mean	Std Dev.
Age	Age-responder dummy	-	With age, due to time and health constraints, leisure quantity reduces.	0.0447135	0.2066783
age_2030 (base)	(i.e., if age = 32,			0.1429379	0.3500165
age_3040	"age_3040" = 1)			0.2137207	0.4099402
age_4050				0.1917272	0.3936675
age_5060				0.2124294	0.4090353
age_6070				0.1674334	0.3733699
age_7080				0.0263115	0.1600634
age_8090				0.0007264	0.0269424
age_90100					
Male	Gender ("Male" = 1)	+	Females have more social activities	0.4746973	0.4993694
City size	1 = Government-designated city (No. 1 is base case)	+	A large city has more opportunity for leisure than towns or villages.	0.2890638	0.4533367
	2 = city: pop. over 50,000			0.6214689	0.4850307
	3 = town, village, other			0.0894673	0.2854228
Commuting	Time used for commute (hours)	-	These activities reduce leisure time.	0.2727203	0.3979408
Household work time	Time used for household			2.034559	2.286087
Childcare time	Time used for childcare			0.6804952	2.37037
Study time	Time used for study			0.109808	0.5687985
Weekly working time	Hours worked per week (incl. overtime)			23.24354	22.84623
Drinking few times	Frequency of alcohol consumption: Few times/month	+/-	Drinking is social activity related to leisure but overindulgence may have negative impact on leisure.	0.2093624	0.4068617
Drinking 12 times	Frequency of alcohol consumption: 1~2times/week			0.0978612	0.2971329
Drinking 3+ times	Frequency of alcohol consumption: 3+ times/week			0.2520581	0.4342032
Physical condition	Physical health condition. Average score about physical examination	+	Good health allows more leisure satisfaction.	1.007559	0.1108511
Psychological condition	Psychological health condition. Average score about psychological examination	+	Good psychological health allows more leisure satisfaction.	1.036877	0.9696752
Not labor force	Working status.	+	Unemployment may increase leisure but it can affect leisure satisfaction due to stress of unemployment.	0.3630347	0.4808844
Absence from work	Perform any paid work (including paid work at family businesses) or not in last month.			0.0086764	0.0927438
Unemployment				0.024657	0.1550806
Not office worker	Self-employed, professional, family business, consigned work or subcontractor	+	Self-employed can manage their working schedule better than office workers.	0.0696126	0.2544981
Flex time	Work system (working hours system).	+	Flexible time allows better management of leisure.	0.0491929	0.2162749
Variable hours	If apply each rule, value = 1)			0.0803874	0.2718975
Discretionary hours				0.0114609	0.1064423
No management				0.0338176	0.1807631
Type Agriculture	Nature of work: Agriculture	+/-	No a priori sign expected.	0.0079096	0.0885853
Type Mining	Nature of work: Mining	+/-	No a priori sign expected.	0.0001614	0.0127044
Type Salesperson	Nature of work: Salesperson	+/-	No a priori sign expected.	0.0807103	0.2723951
Type Service worker	Nature of work: Service worker	+/-	No a priori sign expected.	0.0924536	0.289671
Type Manager	Nature of work: Assembly member, Section chief	+/-	No a priori sign expected.	0.0290557	0.1679661
Type Transportation	Nature of work: Transportation	+/-	No a priori sign expected.	0.027845	0.164532
Type Manufacturing	Nature of work: Manufacturing	+/-	No a priori sign expected.	0.1156174	0.3197721
Type Information services	Nature of work: Information services	+/-	No a priori sign expected.	0.0154964	0.1235186
Type Technical worker	Nature of work: Technical worker	+/-	No a priori sign expected.	0.1052865	0.3069284
Type Public service	Nature of work: Public service	+/-	No a priori sign expected.	0.0087167	0.0929574
Type other	Nature of work: Other type	+/-	No a priori sign expected.	0.0012107	0.0347741
Length of service	Number of working years at current company	+	Stable employment allows more time for leisure.	7.525061	10.99368
Holidays used	Paid holiday used in year	+	Paid holiday at work allows more leisure.	35.85599	46.91674
Extra work hours	Hours worked overtime (average hour in a week)	-	Longer working hours reduce leisure.	2.220299	

Have side job	Having side work or not	-	Overtime work reduces leisure.	0.0507264	0.2194429
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Table 1 *continued*

Health Well-being Obs: 31,778 Mean: 5.631852 Standard deviation: 2.337847					
Variable Name	Explanation		Expected Sign	Mean	Std Dev.
Labor income	Annual labor income last year (10,000 yen)	+	Higher income facilitates access to better healthcare.	245.1056	304.0345
Number of kids	Number of kids (Number)	-	More children may require more healthcare attention.	1.288092	1.116348
Household size	Family members living together (Number)	-	Larger household size may require more healthcare attention.	3.110643	1.1416937
Marriage	Married or not ("Married" = 1)	+/-	No a priori expected sign.	0.7513374	0.4322446
Age	Age respondent dummy	-	With age, healthcare requirements increase.	0.0414123	0.199245
age_2030 (base)	(i.e., if age = 32,			0.1372333	0.3440989
age_3040	"age_3040" = 1)			0.2142992	0.4103418
age_4050				0.2048272	0.4035817
age_5060				0.2233935	0.4165265
age_6070				0.1552332	0.3621325
age_7080				0.0229719	0.1498161
age_8090				0.0006294	0.0250797
age_90100					
Male	Gender ("Male" = 1)	+/-	No a priori expected sign.	0.4883253	0.4998715
City size	1 = Government-designated city (No. 1 is base case) 2 = city: pop. over 50,000 3 = town, village, other	+	A large city has better medical service.	0.2919315	0.4546581
				0.6183523	0.4857985
				0.0897162	0.2857792
Physical condition	Physical health condition. Average score about physical examination	+	Better score implies better health condition.	1.00731	0.1112786
Psychological condition	Psychological health condition. Average score about psychological examination	+	Better score implies better psychological condition.	1.038394	0.9702294
Take treatment	Take treatment at hospital, clinic or not	-		0.5776953	0.4939343
Was hospitalized	Receive medical treatment, hospitalized last year or not	-		0.0581849	0.2340965
Cigarettes consumed	Cigarettes consumed per day	-	Cigarette consumption has negative effect on health.	3.196992	7.411321
Drinking few times	Frequency of alcohol consumption: Few times/month	+	Appropriate drinking might be the result of social activity.	0.2053307	0.4039494
Drinking 12 times	Frequency of alcohol consumption: 1~2times/week			0.0994713	0.2992985
Drinking 3+ times	Frequency of alcohol consumption: 3+ times/week	-	Too much drinking can cause health problem.	0.2629807	0.4402589
Liver problem	Types of problems noted in the medical examination results (if have problem, value = 1)	-		0.506954	0.2193785
Blood pressure problem				0.1109887	0.3141231
Bone density problem				0.0097237	0.0981298
Heart problem				0.0284159	0.1661604
Anemia problem				0.023318	0.1509139
Kidney problem				0.0192586	0.1374347
Diabetes problem				0.0450941	0.2075138
Electrolyte problem				0.0016678	0.0408055
Prostrate problem				0.0111083	0.1048106
Metabolism problem				0.0245768	0.1548337
Obesity problem				0.0903455	0.2866806
Have any work	Have any work or not in last month	+/-	No a priori expected sign.	0.6795267	0.4666658

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Table 1 *continued*

Housing Well-being Obs: 18,480 Mean: 6.12209 Standard deviation: 2.3922195					
Variable Name	Explanation		Expected Sign	Mean	Std Dev.
Labor income	Annual labor income last year (10,000 yen)	+	Households with higher income can afford better housing.	262.5453	318.125
Number of kids	Number of kids (Number)	+/-	No a priori sign expected, though increased number of children may cause congestion.	1.311093	1.1158
Household size	Family members living together (Number)	-	Increased household size may cause congestion.	3.045779	1.357541
Marriage	Married or not ("Married" = 1)	+/-	No a priori sign expected.	0.7749459	0.4176293
Age	Age-responent dummy	+	As age increases, housing consumption improves due to better affordability.	0.0345779	0.1827132
age_2030 (base)	(i.e., if age = 32, "age_3040" = 1)			0.1414502	0.3484948
age_3040				0.2251082	0.4176649
age_4050				0.2092532	0.4067865
age_5060				0.2253788	0.4178428
age_6070				0.1452381	0.3523503
age_7080				0.0188312	0.1359322
age_8090				0.0001623	0.0127405
age_90100					
Male	Gender ("Male" = 1)	+/-	No a priori sign expected.	0.5139069	0.4998201
City size	1 = Government-designated city (No. 1 is base case) 2 = city: pop. over 50,000 3 = town, village, other	-	In large city, housing affordability is poor.	0.2952922	0.4561863
				0.621158	0.4851118
				0.0835498	0.2767189
Own house	Own house or not (have own house = 1)	+	Own house provides better security and satisfaction.	0.7970779	0.4021859
Apartment	Living in apartment (in apartment = 1)	-		0.2521645	0.4342669
Apartment story	How many storey is your apartment	-	An apartment on a higher floor is associated with less noise and environmental pollution.	0.8717532	2.133664
Value per area	(Value of house+land)/floor area	+	Higher unit price indicates better housing.	16.84746	23.01099
Age of house	How old is the building (years)	-	Quality of housing deteriorates with age.	24.7132	14.77057
Floor area per person	Floor area per person (square meter)	+	Larger space per person, implies better comfort.	45.73501	86.04732
Chattel insurance	Have earthquake insurance (household belongings) or not	+/-	No a priori sign expected.	0.2506494	0.4333987
Residence insurance	Have earthquake insurance (residence) or not	+/-	No a priori sign expected.	0.3039502	0.4599738
Future inheritance	Expectation of future inheritance of current residence	+	Possibility of inheritance, improves image for their house.	0.2358225	0.4245233
Debt to income	Amount repaid in the previous year / Household's annual take-home income (10,000 yen)	-	Higher debt to income indicates housing stress.	0.0989968	0.3716627

5. WELL-BEING FUNCTIONS

5.1 Income Well-Being

The estimated function for income well-being is presented in Table 2. The table presents the OLS estimate and the fixed-effect model. The variables in the models are estimated in levels. Income well-being is affected by factors that are related to the level of income and wealth, employment and experience, parental background, and location.

Table 2: Income Well-being
Obs: 16,336 Mean: 4.706966 Std Dev.: 2.574108

Variable	OLS:level	Fixed:level	Variable	OLS:level	Fixed:level
Labor income	0.001093*** (0.000163)	0.000972*** (0.000222)	Overtime paid rate	0.069329 (0.061785)	-0.001785 (0.068111)
Number of kids	0.000853 (0.022323)	-0.051686** (0.025274)	Type Mining	1.106902 (1.468864)	0.086321 (0.174689)
Household size	-0.141928*** (0.019963)	-0.042221 (0.034874)	Type Salesperson	-0.331138*** (0.083308)	0.033877 (0.113426)
Marriage	0.282792*** (0.052103)	0.153200 (0.195861)	Type Service worker	-0.132013 (0.086145)	-0.057050 (0.113118)
age_3040	-0.841808*** (0.122272)	-0.328223* (0.184118)	Type Manager	-0.054232 (0.121767)	0.253532** (0.128832)
age_4050	-0.949165*** (0.121723)	-0.335397 (0.215312)	Type Transportation	-0.114476 (0.122137)	0.134961 (0.191965)
age_5060	-1.261712*** (0.125105)	-0.270860 (0.242988)	Type Manufacturing	-0.323587*** (0.076989)	0.162410 (0.118388)
age_6070	-1.020235*** (0.129229)	-0.333490 (0.272709)	Type Information service	-0.250166 (0.159288)	-0.085519 (0.261365)
age_7080	-0.775799*** (0.135857)	-0.373574 (0.294480)	Type Technical worker	-0.090360 (0.078881)	0.125261 (0.122969)
age_8090	-0.542939** (0.173304)	-0.529279 (0.345171)	Type Public service	-0.018835 (0.201780)	0.054104 (0.260553)
age_90100	0.195258 (1.131822)	-3.003399 (1.897801)	Type other	-0.385725 (0.584474)	-0.124920 (0.580283)
Male	-0.402943*** (0.046366)	-	University degree (F)	-0.026513 (0.062776)	-
House loan remaining	-0.000028* (0.000016)	0.000021 (0.000016)	Master's degree (F)	-0.527254** (0.248902)	-
Not labor force	0.080031 (0.100259)	-0.034175 (0.146040)	University degree (M)	-0.113388 (0.126150)	-
Absence from work	0.545627*** (0.190068)	0.325994* (0.193902)	Master's degree (M)	2.614649*** (0.426660)	-
Unemployment	-0.762315** (0.162435)	-0.176311 (0.163453)	White collar	0.195737*** (0.040254)	-
Not office worker	0.324851*** (0.095307)	0.111265 (0.139917)	Parents' working status (F)	-0.251467*** (0.086503)	-0.027988 (0.154281)
Flex time	-0.061185 (0.091963)	0.139936 (0.102020)	Parents' working status (M)	-0.103035** (0.047132)	0.059892 (0.082662)
Variable hours	-0.168009** (0.075423)	-0.167090** (0.085089)	House inheritance	-0.133868 (0.085193)	0.005394 (0.088201)
Discretionary hours	-0.238120 (0.171213)	0.006170 (0.179406)	Future house inheritance	-0.013488 (0.047524)	-0.051183 (0.050143)
No management	-0.118088 (0.109677)	-0.075401 (0.114821)	Household's liabilities	0.000199*** (0.000013)	0.000045** (0.000021)
Type Agriculture	0.692525*** (0.218004)	0.527846 (0.612542)	Exp on Food	0.001504** (0.000605)	0.000658 (0.000685)
City_size = 2	0.170124*** (0.041420)	0.131220 (0.259704)	Exp per person	0.000585*** (0.000169)	0.000189 (0.000128)
City_size = 3	0.248011*** (0.071272)	-0.041483 (0.408617)	Length of service	0.004104* (0.002354)	-0.006384 (0.005155)

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Table 2 *continued*

Variable	OLS:level	Fixed:level	Variable	OLS:level	Fixed:level
Year2012	0.150439 (0.106262)	0.043453 (0.073304)	Paid holiday used	0.002012*** (0.000601)	0.001485** (0.000599)
Year2013	0.052332 (0.107321)	-0.024711 (0.074721)	Weekly working time	-0.016739*** (0.001872)	-0.001621 (0.001967)
Year2014	0.105214 (0.091784)	0.046046 (0.075347)	Extra work hours	0.001705 (0.005012)	-0.000827 (0.005081)
Year2015	0.122744 (0.091706)	0.080610 (0.076772)	Length of job hunting	-1.447294*** (0.205155)	-0.573261*** (0.171547)
Year2016	0.158011* (0.090701)	0.118628 (0.077668)	Have side job	-0.414394*** (0.087632)	-0.201418** (0.094785)
Year2017	0.193744** (0.093171)	0.184715** (0.081524)	Have any work	-0.216708*** (0.061464)	-0.051133 (0.080887)
Year2018	0.293972*** (0.094249)	0.317555*** (0.083041)	Quantity of education	0.263725*** (0.092177)	- -
Household's Income	0.001719*** (0.000124)	0.000408*** (0.000083)	_cons	4.637804*** (0.172824)	4.324243*** (0.355566)
Bonus	0.003283*** (0.000548)	0.002275*** (0.000661)	r2	0.186	0.025
			N	16,336	16,336

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

Income and Wealth

Annual labor income for respondents and income for the rest of the members of households have positive coefficients both in the OLS and fixed-effect models. As expected, households with a higher income and those whose incomes have increased over time reported higher income well-being. The estimated coefficient is highly significant. Bonus payments and payments associated with overtime work increase the income well-being across households (positive coefficient for these variables in OLS model) but an increase in overtime work for a household has a negative effect (negative sign of this variable in fixed-effect model). Households that hold assets in the form of savings and securities experience a positive impact of assets on their income well-being. Loan repayment liability has a negative effect on households (negative sign of coefficient in OLS model); however, its effect on a household over time is ambiguous (positive sign of coefficient in fixed-effect model but the variable is insignificant).

A respondent who has inherited a house experienced a positive impact on their income well-being over time. However, the sign of this variable in pooled OLS is negative. The characteristics of households that have already inherited their parents' house are that they are older, their incomes are lower, and they live in rural areas. This causes a negative impact on income well-being. Households that expect to inherit a house in future experience a higher well-being, as they don't have to plan for owning a house of their own. However, for a household, as the inheritance is delayed, it decreases their income well-being as their impatience builds.

The model also uses two expenditure variables – monthly expenditure on food and expenditure per person. Both these variables have positive and significant coefficients in OLS and fixed-effect models, implying that the ability to spend more on essential consumption items and per member of the household provides higher income well-being.

Employment and Experience

The employment sector has an impact on income well-being. Respondents working in mining, agriculture, and those in managerial positions have the highest income well-being, in that order. Workers in manufacturing, IT, and technical services report lower income well-being than those doing clerical work. The well-being, though, improves over time.

Respondents who have worked longer in an employment have higher income well-being, a result of higher income with longer employment tenure, but over time, the well-being does not change for a respondent (negative, small, and insignificant coefficient of this variable in fixed-effect model). While most employment contracts allow paid leave, the ability to use it depends on the workload and supportive environment at the workplace. Those who have been able to use their paid leave have reported higher income well-being and this is consistent over time. The variable is significant in determining income well-being. Workers who are required to spend long hours at work have lower income well-being, and continued long hours decrease the well-being over time. Extra work hours that involve overtime payment increase income well-being as the additional payment contributes to income, though the coefficient is insignificant in both OLS and fixed-effect models. Employment condition variables, such as unemployment stress, which is associated with length of job search, have a negative impact on income well-being for those who are in this situation, and if the job search persists over time for an individual it reduces income well-being. For those who had to take an additional job (side employment) besides their main employment to supplement their income, the income well-being was lower. The impact of additional employment for an individual over time was also negative but insignificant. If work required a longer commute, it reduced income well-being due to the stress of travel and the time and cost involved.

Parental Background

Here we also test the role that parental background plays in the success of an individual through parents' ability to provide a better education and upbringing that may result in a better income later in life for the individual. Parental variables on education and employment do not vary over time. The impact can only be observed across households through coefficients of these variables in the OLS model. What is important is that a mother's education (if she is educated to graduate level) and father's white-collar employment have a strong positive impact on respondents' income well-being. It can be postulated here that better familial circumstances would have rendered them opportunities to do better in later life.

Household and Demographic Characteristics

Marriage increases income well-being compared to those who are not married. This impact persists for an individual over time. This is because of reduced expenditure together with an increase in income if both partners are working. Households with more children have lower income well-being and for a household the decrease in well-being persists over time. Lower income well-being is largely associated with an increase in expenditure with children. A similar effect is seen for the household size variable. An increase in household size reduces income well-being. It may be argued that the variables number of children and household size are correlated and one of them may be used. However, the household size variable captures the size effect after the effect of number of children has been removed. The coefficient displays the elderly household effect.

Relative to the age cohort of less than 30 years of age, all other age cohorts have lower income well-being except those in the age cohort 90–100 years. This is a reflection of the increase in expenses in relation to income as age advances. With advancing age, household size increases, and so does expenditure on children. Among the age cohorts, the negative age effect on income well-being is largest for the age cohort 50–60 years and the effect decreases on either side of this age cohort. Respondents in the age bracket 50–60 years have the largest responsibility for meeting the expense of children who are of late school or university age. Those beyond 60 years of age, though, have less responsibility for meeting expenses on children and mortgages but a decline in income due to retirement reduces their income well-being. The negative effect on income well-being persists for a household over time as well. What is interesting is that for the age cohort 90–100, the income well-being over time has the largest negative impact.

Location

In comparison to residents of smaller cities, residents in cities with a population of 50,000 or more and towns and villages have higher income well-being. The impact for residents of location over time is insignificant.

Income well-being was higher in the period 2012–2018 than in 2011 and was highest in 2018.

The R-square for the OLS model is 0.18 and is 0.02 for the fixed-effect model. It is, however, important to note that several variables have significant coefficients in both models and these variables offer insights into the income well-being of a household.

5.2 Job Well-Being

Estimated job well-being functions using OLS and fixed-effect panel models are presented in Table 3. The dependent variable is self-reported well-being on a scale of 0 to 10 with 0 being fully unsatisfied with the job and 10 being fully satisfied. The dependent variable for job well-being is treated as a continuous variable. The explanatory variables relate to employment status and work pattern, sector of employment, working condition, and household characteristics.

Employment Status and Work Pattern

A higher annual income has a positive and significant impact on job well-being. A higher income rewards work performed and hence leads to satisfaction.

With base as those who worked in the past month, those who were unemployed (looking for work) or not in the workforce (i.e., studying or homemakers) or had taken leave of absence reported less job well-being. Those who were employed and were looking for a job had the lowest job well-being. The effect of these variables is highly significant across respondents and within panel over time.

Work pattern has an important impact on job well-being. With base as fixed working hours, those in a flexible working system or in managerial positions (which are higher-level positions but do not involve overtime payments) report higher job satisfaction. Those in a discretionary working hour system such as specialists, sales personnel, planners, and homeworkers have the lowest job well-being. Businesspersons also have lower job well-being than those in a fixed-hour work pattern as evidenced by its negative coefficient in OLS and fixed-effect models.

Table 3: Job Well-being
Obs: 18,041 Mean: 5.148107 Std Dev.: 2.508635

Variable	OLS:level	Fixed:level	Variable	OLS:level	Fixed:level
Labor income	0.001752*** (0.000114)	0.000592*** (0.000161)	Year2018	-0.185718** (0.085810)	-0.083429 (0.083369)
Number of kids	0.023259 (0.020821)	0.023825 (0.026552)	Not labor force	-1.079067*** (0.090065)	-1.655289*** (0.166833)
Household size	-0.043528*** (0.016609)	-0.002541 (0.034494)	Absence from work	-0.358872* (0.191169)	-0.468226** (0.224727)
Marriage	0.405795*** (0.049970)	-0.036975 (0.169365)	Unemployment	-2.789503*** (0.146781)	-2.280488*** (0.168241)
age_3040	-0.262321** (0.107378)	0.355178** (0.166899)	Paid holiday used	-0.000504 (0.000538)	-0.001006* (0.000572)
age_4050	-0.261239** (0.106973)	0.295090 (0.196816)	Weekly working time	-0.005806*** (0.001712)	0.002737 (0.001830)
age_5060	-0.342756*** (0.109317)	0.207386 (0.231295)	Extra work hours	-0.013512*** (0.004413)	-0.007892 (0.004815)
age_6070	0.458107*** (0.111721)	0.412428 (0.262032)	Length of job hunting	-1.405231*** (0.206943)	-0.200567 (0.199204)
age_7080	0.896372*** (0.119523)	0.372419 (0.293509)	Have side job	-0.263236*** (0.079243)	-0.064762 (0.097741)
age_8090	0.635224*** (0.173836)	0.050270 (0.350524)	Flex time	0.082850 (0.082152)	0.116181 (0.098922)
age_90100	1.636417 (1.520341)	-0.057377 (1.305532)	Variable hours	-0.179810*** (0.068318)	-0.149163 (0.092785)
Male	-0.638370*** (0.044695)	-	Discretionary hours	-0.518611*** (0.167007)	-0.139039 (0.180419)
Type Information service	-0.162221 (0.143031)	0.016024 (0.269705)	No management	-0.012391 (0.099714)	-0.011207 (0.103563)
Type Technical worker	0.248909*** (0.070192)	0.033488 (0.128008)	Not office worker	0.024068 (0.087444)	-0.447411*** (0.153218)
Type Public service	0.023898 (0.191049)	0.108367 (0.401539)	Type Agriculture	0.612812*** (0.167834)	0.526004 (0.422153)
Type other	-0.386386 (0.599386)	-0.189819 (0.475518)	Type Mining	-2.076692 (1.435844)	-1.136293 (2.126004)
Length of service	0.005180** (0.002089)	-0.017391*** (0.006115)	Type Salesperson	-0.298741*** (0.075531)	-0.163222 (0.124886)
City_size = 2	0.080721** (0.039766)	0.444208* (0.258228)	Type Service worker	-0.057382 (0.075427)	-0.147728 (0.120140)
City_size = 3	0.148399** (0.066864)	0.124967 (0.397836)	Type Manager	0.255378** (0.101131)	0.184946 (0.117342)
Year2012	-0.062572 (0.099245)	-0.110671 (0.073767)	Type Transportation	0.043438 (0.110269)	0.126403 (0.176906)
Year2013	-0.100469 (0.101214)	-0.112332 (0.076514)	Type Manufacturing	-0.445110*** (0.069399)	0.025747 (0.122232)
Year2014	-0.116752 (0.084540)	-0.134382* (0.074859)	Have any work	-0.132634** (0.054799)	-0.099052 (0.082833)
Year2015	-0.175488** (0.083942)	-0.161400** (0.075608)	Quantity of education	0.721445*** (0.083419)	-
Year2016	-0.158723* (0.083799)	-0.115132 (0.075125)	_cons	5.552956*** (0.148473)	5.319597*** (0.325717)
Year2017	-0.224549*** (0.085381)	-0.153098* (0.081456)	r2	0.126	0.049
			N	18,041	18,041

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

Sector of Employment

Agriculture sector workers have the highest job well-being, followed by those in specialized jobs (such as engineers or medicine) and in management positions. This is due to the better income and prestige associated with work in these jobs. The lowest job well-being is experienced by mining workers (though they have higher income well-being) followed by manufacturing sector workers and those in sales and the IT sector. The within-panel effect for workers in these sectors is also negative.

Working Condition

The positive and significant coefficient of the “length of service” variable in OLS indicates that those who have been employed for longer have higher job well-being. However, the within-panel effect is negative, suggesting that over time job satisfaction declines. The reason could be that incomes in Japan have not increased over time and the monotonicity of the same job reduces satisfaction over time. Surprisingly, those who used paid holidays reported less job satisfaction and this effect is significant in within-panel estimates. The reason could be that taking holidays, even though it is a work right, does not reduce the work responsibility. In fact, the work accumulates during holidays and causes dissatisfaction. More hours worked per week reduces job well-being compared to those who work fewer hours per week. The effect, however, is positive but insignificant for a worker over time. The positive coefficient may be due to the extra income that additional work brings, but this is insignificant.

Overtime work has a negative coefficient in OLS and fixed-effect models, implying reduced job well-being, though it increased income well-being across respondents but not over time for an individual respondent. Those who undertook a supplementary job in addition to their primary job had less job well-being. This is due to the need to take side work to supplement income rather than out of choice. The stress of being unemployed had a significant negative impact on job well-being.

Household Characteristics

Household size has a negative impact on job well-being as those who must support large families have to stretch their working hours in order to earn more. The effect is significant in OLS. The within-panel effect, though negative, is insignificant. For a married person, job well-being is positive and significant. As observed for income well-being as well, this may be due to a reduced burden to earn if their partner is also working or because of shared responsibility at home, which reduces the cost of food and other household expenses. The within effect is also positive but insignificant.

The age effect on job well-being is negative until the age of 60, but after that it increases. This may be due to reduced or no work commitment after the age of 60 but assurance or income either in the form of a pension or income from investment and savings. The positive effect could also be due to reduced expenditure as the responsibility to meet the expenditure requirements of children reduces.

Location

Those who live in large cities or towns and villages have reported higher job well-being. This could be related to the available employment opportunities. Large cities have diverse opportunities in service sector and in managerial roles for suitable persons, and towns and villages have agriculture employment, with both of these being valued by workers. However, the coefficient is small and insignificant.

The year dummies indicate that over time, job well-being has reduced.

5.3 Leisure Well-Being

The dependent variable is self-reported leisure well-being on a scale of 0 to 10, with 0 being the least satisfied with leisure and 10 being the most satisfied. Two questions related to leisure well-being were asked – one that relates to well-being associated with leisure quality while the other is related to well-being associated with the amount of leisure time. The models are estimated for leisure quality and leisure time separately. Results are presented in Tables 4a and 4b.

The explanatory variables relate to use of time, nature of leisure activity, health condition, work status and pattern, sector of employment, income, and demographic characteristics.

Use of Time

For those who spend longer hours commuting, the leisure quality well-being is lower. The within effect is also negative and significant. For each hour of increased commute time, the quality well-being is lower by 0.17 and an increased one hour of commute time for an individual over time results in a lower well-being of 0.19. The effect of commuting on leisure time well-being (Table 4a) is much larger than on leisure quality well-being (Table 4b). Time spent on household work reduces leisure quality and leisure time well-being, though the effect is smaller than the effect of commuting but is significant across households in OLS estimates. For the within effect model these coefficients are positive but insignificant. Time spent on childcare reduces leisure quality and leisure time well-being. This is significant in OLS and fixed-effect models.

Increased hours at work reduces leisure quality and leisure time well-being. The effect, though, is small but significant.

Nature of Leisure Activity

Drinking in Japan is also a social activity, and drinking with work colleagues, friends, or even relatives are common forms of socialization. The drinking variables have positive and significant coefficients in leisure quality well-being. The variable for drinking is positive in leisure time well-being as well. What is important, however, is that drinking more than three times per week has negative leisure well-being, possibly because health effects start to dominate.

Leisure well-being is valued if it is part of daily life. If, however, individuals need to take holidays, it reduces well-being in line with the increasing number of days of holiday taken, as taking holidays does not necessarily reduce the work, as discussed earlier. The coefficient for holidays used in leisure quality well-being is negative in OLS and fixed-effect models and is significant.

Table 4a: Leisure Quality Well-being
Obs: 24,793 Mean: 5.662848 Std Dev.: 2.313003

Variable	OLS:level	Fixed:level	Variable	OLS:level	Fixed:level
Labor income	0.000445*** (0.000088)	-0.000073 (0.000152)	Commuting	-0.171682*** (0.045929)	-0.190460** (0.076747)
Number of kids	-0.002874 (0.015993)	-0.008208 (0.020914)	Household work time	-0.069872*** (0.008737)	-0.015765 (0.011178)
Household size	-0.097215*** (0.012624)	-0.073123** (0.028706)	Childcare time	-0.059811*** (0.007646)	-0.033690*** (0.011356)
Marriage	0.082996** (0.037798)	-0.258884** (0.129999)	Type Manager	0.029039 (0.089039)	-0.060994 (0.116890)
age_3040	-0.381969*** (0.083977)	-0.098874 (0.145310)	Type Transportation	-0.160484* (0.093113)	0.010408 (0.160096)
age_4050	-0.547173*** (0.083919)	0.140855 (0.172967)	Type Manufacturing	-0.285888*** (0.056912)	-0.118158 (0.099638)
age_5060	-0.596318*** (0.086753)	0.213942 (0.199334)	Type Information service	-0.072830 (0.116410)	-0.451945 (0.308299)
age_6070	-0.323783*** (0.088283)	0.249942 (0.228147)	Type Technical worker	0.081335 (0.058311)	0.060218 (0.102888)
age_7080	-0.197393** (0.091915)	0.122258 (0.246607)	Type Public service	-0.236906 (0.153573)	-0.430381 (0.343009)
age_8090	-0.092696 (0.119028)	0.153417 (0.276282)	Type other	0.184484 (0.423716)	-0.177861 (0.316372)
age_90100	0.287073 (0.669664)	0.356828 (0.703917)	Study time	0.026459 (0.025848)	-0.006011 (0.030279)
Male	-0.165646*** (0.040161)	-	Weekly working time	-0.010850*** (0.001448)	-0.003127** (0.001591)
Variable hours	-0.056589 (0.055575)	-0.040582 (0.072539)	Drinking few times	0.102178*** (0.036553)	-0.001791 (0.048640)
Discretionary hours	-0.146367 (0.142996)	0.196493 (0.146122)	Drinking 1–2 times	0.121389** (0.047673)	0.030590 (0.058846)
No management	-0.200725** (0.084266)	-0.028344 (0.097098)	Drinking 3+ times	0.106759*** (0.036917)	-0.031186 (0.055795)
Type Agriculture	-0.091471 (0.162692)	-0.176309 (0.277212)	Physical condition	0.461619** (0.212785)	-0.048227 (0.199453)
Type Mining	0.107181 (0.842774)	0.560614 (0.635223)	Psychological condition	0.740548*** (0.022619)	0.224679*** (0.024327)
Type Salesperson	-0.109783* (0.063941)	-0.083727 (0.099457)	Not labor force	-0.070897 (0.074958)	-0.175917 (0.113190)
Type Service worker	-0.168015*** (0.062963)	-0.104275 (0.091668)	Absence from work	0.190934 (0.151099)	0.058150 (0.155068)
City_size = 2	0.008753 (0.030673)	0.102002 (0.209701)	Unemployment	-0.552565*** (0.116377)	-0.147352 (0.135249)
City_size = 3	0.073033 (0.052171)	0.401027 (0.348140)	Not office worker	-0.125542* (0.069754)	-0.073355 (0.113956)
Year2012	-0.057315 (0.067818)	-0.089042* (0.051032)	Flex time	0.129735* (0.066382)	0.033892 (0.088600)
Year2013	-0.074139 (0.069516)	-0.116473** (0.054428)	Length of service	0.003307* (0.001736)	0.000622 (0.004135)
Year2014	-0.048752 (0.058741)	-0.132590** (0.053214)	Paid holiday used	-0.001696*** (0.000447)	-0.001004** (0.000507)
Year2015	-0.058894 (0.058765)	-0.121632** (0.055643)	Extra work hours	-0.023356*** (0.003884)	-0.016131*** (0.004158)
Year2016	-0.046577 (0.059166)	-0.131934** (0.056177)	Have side job	-0.166067** (0.067774)	-0.073862 (0.090196)
Year2017	-0.076256 (0.061538)	-0.144829** (0.060780)	_cons	5.687602*** (0.245540)	6.152522*** (0.355630)
Year2018	0.086487 (0.061928)	0.014110 (0.063031)	r2	0.168	0.019
			N	24,793	24,793

Table 4b: Leisure Time Well-being
Obs: 24,762 Mean: 5.641305 Std Dev.: 2.45583

Variable	OLS:level	Fixed:level	Variable	OLS:level	Fixed:level
Labor income	0.000353*** (0.000093)	-0.000464*** (0.000171)	Commuting	-0.335809*** (0.048067)	-0.256967*** (0.085804)
Number of kids	-0.007591 (0.016463)	-0.037437* (0.021687)	Household work time	-0.086668*** (0.008981)	-0.011929 (0.012060)
Household size	-0.100992*** (0.013288)	-0.072664** (0.030204)	Childcare time	-0.084178*** (0.007979)	-0.055816*** (0.012123)
Marriage	0.111665*** (0.039591)	-0.318117** (0.148137)	Type Manager	0.268588*** (0.094167)	0.094200 (0.124841)
age_3040	-0.236859*** (0.089327)	-0.123896 (0.167649)	Type Transportation	-0.229648** (0.101216)	-0.084960 (0.170605)
age_4050	-0.229958*** (0.089094)	0.064523 (0.193415)	Type Manufacturing	-0.365552*** (0.059157)	-0.078507 (0.106666)
age_5060	-0.131267 (0.092097)	0.163350 (0.218628)	Type Information service	-0.240190* (0.127962)	-0.400448 (0.308386)
age_6070	0.054603 (0.093635)	0.197067 (0.250011)	Type Technical worker	0.014033 (0.060545)	-0.076800 (0.111284)
age_7080	0.047911 (0.097356)	-0.009252 (0.270084)	Type Public service	-0.177828 (0.156045)	-0.457040 (0.354908)
age_8090	0.025684 (0.124747)	-0.141699 (0.305188)	Type other	0.014290 (0.454409)	-0.731907*** (0.254597)
age_90100	0.308842 (0.650374)	-0.061711 (0.678849)	Study time	-0.033733 (0.028585)	-0.051219 (0.031262)
Male	0.078828* (0.041828)	-	Weekly working time	-0.023341*** (0.001553)	-0.008312*** (0.001675)
Variable hours	0.079374 (0.058025)	0.057624 (0.081637)	Drinking few times	0.047807 (0.038450)	-0.055566 (0.049919)
Discretionary hours	-0.211930 (0.147114)	-0.077968 (0.163247)	Drinking 1-2 times	0.075862 (0.049876)	0.017338 (0.065518)
No management	-0.172210** (0.087724)	0.061880 (0.103201)	Drinking 3+ times	0.064011* (0.038425)	-0.037761 (0.059155)
Type Agriculture	-0.173256 (0.170261)	-0.116979 (0.347648)	Physical condition	0.909590*** (0.204277)	0.278631 (0.213450)
Type Mining	-0.433835 (0.516203)	0.004775 (0.629106)	Psychological condition	0.573045*** (0.022417)	0.152319*** (0.025463)
Type Salesperson	-0.181957*** (0.066752)	-0.150799 (0.108759)	Not labor force	-0.054670 (0.078236)	0.034168 (0.125764)
Type Service worker	-0.240716*** (0.065847)	-0.106612 (0.103263)	Absence from work	0.388432** (0.153581)	0.356916* (0.184193)
City_size = 2	0.062876* (0.032276)	-0.149659 (0.185477)	Unemployment	-0.324660** (0.128246)	0.194104 (0.153611)
City_size = 3	0.059553 (0.053374)	0.378970 (0.342533)	Not office worker	0.004726 (0.073153)	0.026598 (0.128935)
Year2012	-0.010863 (0.070187)	-0.038459 (0.052705)	Flex time	0.236105*** (0.069599)	0.091352 (0.089618)
Year2013	0.030283 (0.072168)	0.012882 (0.056848)	Length of service	0.000441 (0.001819)	-0.005020 (0.004381)
Year2014	0.038450 (0.060429)	0.003267 (0.057063)	Paid holiday used	-0.000515 (0.000471)	-0.000394 (0.000521)
Year2015	0.030626 (0.060647)	0.031560 (0.059759)	Extra work hours	-0.043092*** (0.003988)	-0.026079*** (0.004821)
Year2016	0.029225 (0.060847)	0.019896 (0.061276)	Have side job	-0.199898*** (0.069337)	0.017051 (0.092972)
Year2017	-0.023168 (0.063563)	0.015363 (0.066341)	_cons	5.312703*** (0.236926)	6.248237*** (0.361251)
Year2018	0.197509*** (0.063585)	0.247080*** (0.068165)	r2	0.194	0.029
			N	24,780	24,780

Work Status and Working Pattern

Those not in the labor force but engaged in household work or studying at school report lower leisure time and quality well-being. The effect persists across respondents and for an individual respondent. The coefficient is insignificant, though. This brings out an important aspect of Japanese society where most of the leisure opportunities are utilized by those in the workforce with colleagues after work. Those who have taken leave of absence report higher leisure quality and time well-being. The coefficient is significant in leisure time well-being OLS and fixed-effect models. Those who are unemployed have lower leisure quality and time well-being. Being unemployed reduces the leisure quality well-being by 0.56 from the mean and by 0.34 from the mean for leisure time well-being. Businesspersons have low leisure quality well-being but higher leisure time well-being than their counterparts, but the effect is insignificant.

Flexible work time allows accommodation of leisure and those in flexible work time jobs reported higher and significant leisure quality and time well-being. The within effect is positive but insignificant. Those having variable and discretionary work hours, and where work hour management is poor have negative leisure quality and time well-being. The negative effect is strong and significant for those for whom work hour management is poor.

Those who spend extra work hours have lower leisure quality and time well-being. This effect is significant both in OLS and fixed-effect models. Engaging in “supplement” jobs also reduced leisure quality and time well-being. A supplement job may be due to a compulsion to complement income, which reduces time for leisure activities.

Sector of Employment

The sector of employment is also reflected in the opportunity that it leaves for leisure. Those in sales, services, and manufacturing sector employment have lower and significant leisure quality and time well-being, a result similar to income and job well-being. The lowest leisure well-being is reported for those in manufacturing jobs. For workers in mining (surprisingly), IT, and other jobs, the leisure well-being is positive but insignificant.

Those who have been in service longer have higher leisure quality and time well-being. This may be because they have formed longer associations with colleagues and are able to spend better leisure time and enjoy enhanced job security, which allows better leisure opportunities.

Income

Higher annual labor income increases leisure quality and time well-being and is significant in the OLS model. The effect, however, is negative but insignificant in the fixed-effect model, largely because of low income growth in Japan.

Demographic Characteristics

Those with a larger household size and an increase in the number of children report decreasing leisure time and quality well-being. The negative effect is significant for household size in both OLS and fixed-effect models. Being married has a positive impact on leisure quality and time well-being as responsibility for income and household work is shared, but the within effect is negative. The coefficient of marriage variable in the fixed-effect model is quite large.

With age, the leisure quality and time well-being decrease, but the negative effect reduces after the age of 60, possibly because of the availability of more time and income in the later stage of life (post retirement) to pursue leisure interests.

Location

Those living in large cities and towns and villages have higher leisure quality and time well-being than those living in smaller cities. The effect, though, is insignificant.

The leisure well-being declined over time relative to 2011 except in the year 2018.

5.4 Health Well-Being

Table 5 presents the estimated health well-being function using OLS and fixed-effect models. Three sets of variables have been used in the model. These relate to health condition, habits, income, and demographics-related factors. Health well-being is a self-reported categorical variable on a scale of 0 to 10, 0 being the lowest and 10 being the highest well-being. Two types of health condition variables have been included – self-reported physical and psychological indexes and health condition based on a recent examination.

Self-perceived and Actual Health Condition

Respondents who perceive that they are in better physical and psychological health also report high health well-being. Respondents who are undergoing treatment at hospital and those who had been hospitalized have lower health well-being. This effect is strong between and within the panel. Respondents who were diagnosed with blood pressure-, heart-, anemia-, diabetes-, prostate-, metabolism-, and obesity-related problems during a medical examination indicated lower health well-being. The negative effect of prostate- and anemia-related problems on health well-being is significant over time for a household. The effect on well-being for those with liver, kidney, and electrolyte disorders was insignificant.

Habits

Smokers have lower health well-being than nonsmokers, as reflected in the negative and significant coefficient for this variable in OLS. The impact on well-being for a smoker over time is positive but insignificant, possibly due to recreational value rather than health effect. Drinking has positive and significant coefficients for those who drink. The effect is persistent with the level of drinking. The drinking variables are also positive and significant over time for a household. However, for those who have liver-related disorders and who drink heavily there is a negative impact on health well-being. However, the within effect of drinking is insignificant.

Income and Demographics

Respondents who are in paid employment have higher health well-being. Paid employment over time also has a positive effect on health well-being. Higher income is associated with higher health well-being across households. The effect for a household over time is insignificant as the incomes in Japan have not changed over time.

Table 5: Health Well-being
Obs: 31,778 Mean: 5.631852 Std Dev.: 2.337847

Variable	OLS:level	Fixed:level	Variable	OLS:level	Fixed:level
Labor income	0.000374*** (0.000051)	-0.000045 (0.000085)	Year2018	0.196844*** (0.053306)	-0.154826*** (0.053557)
Number of kids	-0.008064 (0.013389)	-0.029498* (0.017823)	Physical condition	4.927028*** (0.236531)	1.832488*** (0.195939)
Household size	-0.041342*** (0.010568)	-0.031428 (0.022253)	Psychological condition	0.522974*** (0.019929)	0.118972*** (0.020311)
Marriage	0.185861*** (0.031994)	-0.234776** (0.097014)	Take treatment	-0.662333*** (0.026212)	-0.262347*** (0.026293)
age_3040	-0.381578*** (0.070329)	-0.143751 (0.115027)	Metabolism problem	-0.178518** (0.074282)	-0.116342 (0.077326)
age_4050	-0.502345*** (0.069466)	-0.119603 (0.138727)	Obesity problem	-0.271055*** (0.040740)	-0.069780 (0.044491)
age_5060	-0.554762*** (0.070328)	-0.089381 (0.156018)	Was hospitalized	-0.999947*** (0.055682)	-0.507208*** (0.048305)
age_6070	-0.282319*** (0.070190)	-0.033801 (0.176117)	Cigarettes consumed	-0.012875*** (0.001642)	0.001888 (0.003840)
age_7080	0.030631 (0.074411)	-0.060028 (0.195930)	Drinking few times	0.163723*** (0.032570)	0.053926 (0.042449)
age_8090	-0.009692 (0.108300)	-0.058414 (0.227578)	Drinking 1–2 times	0.269808*** (0.040997)	0.110812** (0.053181)
age_90100	0.360004 (0.515506)	-0.352703 (0.793226)	Drinking 3+ times	0.304215*** (0.031449)	0.120472** (0.046992)
Male	-0.427950*** (0.029246)	– –	Liver problem	-0.082259 (0.094314)	-0.136064 (0.095030)
Electrolyte problem	0.634550* (0.348755)	0.368657* (0.202677)	Blood pressure problem	-0.128514*** (0.037868)	-0.055199 (0.040790)
Prostrate problem	-0.202815* (0.104456)	-0.202815* (0.103012)	Bone density problem	-0.063818 (0.117477)	-0.007622 (0.114893)
City_size = 2	0.009669 (0.025856)	0.019878 (0.145908)	Heart problem	-0.211766*** (0.073895)	-0.089867 (0.064104)
City_size = 3	-0.038752 (0.044161)	0.181689 (0.258505)	Anemia problem	-0.214932*** (0.076121)	-0.233310*** (0.071198)
Year2012	-0.034803 (0.059006)	-0.058346 (0.040026)	Kidney problem	0.089401 (0.090318)	0.039959 (0.079436)
Year2013	-0.120752** (0.060664)	-0.150133*** (0.043392)	Diabetes problem	-0.380954*** (0.054142)	0.000169 (0.059461)
Year2014	0.075358 (0.050674)	-0.157420*** (0.044708)	Have any work	0.288650*** (0.032387)	0.116749** (0.052025)
Year2015	0.044350 (0.050907)	-0.192597*** (0.046239)	_cons	0.766693*** (0.262800)	4.279776*** (0.283042)
Year2016	0.031927 (0.051216)	-0.234673*** (0.047982)	r2	0.242	0.041
Year2017	-0.030269 (0.052921)	-0.260309*** (0.050801)	N	31778	31778

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

Respondents who are married have higher health well-being and this variable is highly significant. The within-panel effect of this variable is also strong and positive. However, with an increase in the number of children and household size, the health well-being declines. With age, health well-being declines. The negative effect starts to slow down in the later part of life, possibly because of good healthcare for older individuals in Japan or due to sample self-selection as older respondents in the sample are those who are in good health, but this effect is insignificant. The within effect of age is negative, but insignificant.

Location

The effect of location on health well-being is insignificant, though dwellers in large cities report higher well-being than those who live in small cities or towns and villages. This could be attributed to better healthcare facilities in large cities.

The within effect of time on health well-being is negative, increasing over time, and significant.

The R-square for OLS is 0.25 and within R-square is 0.04. Limited within R-square is probably due to a limited within-panel variation of time-varying predictors.

5.5 Housing Well-Being

Table 6 presents the results of the fixed-effect model for household housing well-being. The dependent variable is self-reported well-being and explanatory variables are household housing conditions, self-appraised house values, status of earthquake insurance, household characteristics, and mortgage situation. The model includes explanatory variables that vary across households and over time and variables that vary with households but do not change over time. The model is estimated in levels. The signs of variables are as expected.

Satisfaction with Housing Characteristics

Housing well-being is lower for households that live in rental housing. At means the housing well-being for tenants is 1.81. Households living in an apartment have lower satisfaction than those living in detached houses, as indicated by the negative coefficient. However, an apartment on a higher floor level gives greater satisfaction. This may be due to the reduced noise level that is experienced on lower floor levels and the better view. Perceived increase in the value of houses or apartments has a positive effect on housing well-being. Older dwellings have a negative impact on well-being due largely to the obsolescence factor associated with them. Floor area per person is a measure of the degree of congestion and privacy available to members of the household in the house. A larger area per person increases the well-being. Two variables have been used to depict the earthquake insurance that households have. The first relates to content insurance and the second is building insurance. Both insurance variables have had a negative impact on housing well-being.

Table 6: Housing Well-being
Obs: 18,480 Mean: 6.12209 Std Dev.: 2.3922195

Variable	OLS:level	Fixed:level	Variable	OLS:level	Fixed:level
Labor income	0.000695*** (0.000065)	0.000047 (0.000115)	Year2015	-0.207532*** (0.072845)	-0.138658** (0.067324)
Number of kids	-0.067760*** (0.019458)	-0.023439 (0.023050)	Year2016	-0.163651** (0.072987)	-0.104882 (0.070498)
Household size	-0.071988*** (0.017226)	-0.125875*** (0.036752)	Year2017	-0.149424** (0.075768)	-0.092420 (0.076470)
Marriage	0.055404 (0.047243)	-0.233483 (0.166616)	Year2018	-0.171596** (0.075254)	-0.122873 (0.080070)
age_3040	-0.344758*** (0.107501)	0.076002 (0.178189)	Own house	1.152552*** (0.068040)	2.133818*** (0.248527)
age_4050	-0.567441*** (0.105820)	0.077864 (0.200519)	Apartment	-0.217323*** (0.068161)	-0.303970 (0.290263)
age_5060	-0.584223*** (0.107744)	0.079061 (0.220655)	Apartment story	0.055287*** (0.010451)	0.089425** (0.041134)
age_6070	-0.018729 (0.108443)	0.179128 (0.243027)	Value per area	0.006794*** (0.001460)	-0.001286 (0.001659)
age_7080	0.370761*** (0.113195)	0.199777 (0.262271)	Age of house	-0.036507*** (0.001362)	-0.050314*** (0.005682)
age_8090	0.465696*** (0.162761)	0.229668 (0.303666)	Floor area per person	0.000895*** (0.000275)	0.000066 (0.000095)
age_90100	-0.796597 (1.918153)	-2.781995 (1.715678)	Chattel insurance	-0.315975*** (0.041603)	-0.020111 (0.060662)
Male	-0.183445*** (0.037894)	-	Residence insurance	-0.033988 (0.041526)	-0.055412 (0.066646)
City_size = 2	0.173631*** (0.038957)	-0.250031 (0.292412)	Future house inheritance	0.081625* (0.042894)	-0.020118 (0.046149)
City_size = 3	-0.058723 (0.068651)	-0.361764 (0.539218)	Debt to Income	-0.157784*** (0.037994)	-0.065483* (0.035497)
Year2012	-0.025527 (0.084524)	-0.041438 (0.057305)	_cons	6.513028*** (0.143246)	6.480136*** (0.421200)
Year2013	-0.097377 (0.084956)	-0.121883** (0.060287)	R2	0.140	0.066
Year2014	-0.155533** (0.072239)	-0.105138* (0.063613)			

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

Satisfaction with Household Characteristics

Other than gender variable, all other variables included in the model vary with time for different households. The estimated coefficients indicate that as the future inheritance of a current residence continues to be delayed, it reduces household well-being. Debt-to-income ratio has a negative impact on housing well-being, as expected. Increased repayment burden associated with high debt relative to income reduces well-being for a household. Income has a positive sign, as expected. The coefficients of two household variables, number of children and household size, have a negative sign. Given the dwelling unit, change in household status either through an increase in household size or the number of children reduces housing well-being as these changes alter the expectations from the dwelling. Respondents who are married have positive housing well-being as this allows them to share the cost associated with housing. Age of household head is categorized in nine cohorts. Dummies for this variable have been

used in the model (omitted age cohort is 0–29 years of age). Each age cohort has a positive coefficient except for the age cohort 90–100 years. This implies that relative to the omitted age cohort of 0–29 years, the housing well-being with age and over time has increased. This may be due to an increase in household wealth and their ability to adjust the housing condition with age and over time. The age cohort 90–100 years faces challenges associated with age, and a lack of age-friendly amenities in the house makes them less satisfied.

The third set of variables is related to the city where a household resides. The data classify cities into three categories: cities with a population of less than 50,000; cities with a population of more than 50,000; and towns and villages. Two dummy variables (one for cities with a population of more than 50,000 and the other for towns and villages) have been used in the model. The omitted category is cities with a population of less than 50,000. The coefficients for the two dummy variables are negative, implying that relative to smaller cities, housing well-being for households is lower in large cities as well as in towns and villages. The negative externalities of large cities and the lack of amenities in towns and villages that are associated with the location of a house may lead to less satisfaction with housing.

The model also includes year variables. These are dummy variables with the base year as 2011. The estimated coefficients indicate that compared to the base year, the housing well-being declined with time. The lowest was in 2015, followed by 2018.

Table 7 also includes estimated results for OLS, as a comparison.

Table 7: Overall Well-Being Function

Well-being	(1) OLS	(2) OLS_pred	(3) FE	(4) FE_pred
Income well-being	0.176742*** (0.004106)	0.221459*** (0.02523)	0.134605*** (0.005787)	0.121525* (0.06628)
Job well-being	0.132744*** (0.004547)	0.06655** (0.02958)	0.101136*** (0.005737)	0.142825*** (0.04253)
Housing well-being	0.161342*** (0.004568)	0.193355*** (0.03031)	0.135812*** (0.006743)	0.198214*** (0.04562)
Leisure quality well-being	0.201090*** (0.004841)	0.558885*** (0.03601)	0.172845*** (0.006447)	0.672822*** (0.08701)
Health well-being	0.308188*** (0.004744)	0.377873*** (0.02786)	0.293896*** (0.006602)	0.246027*** (0.06639)
_cons	5.842612*** (0.006467)	5.966828*** (0.03431)	5.842612*** (0.000000)	5.966828*** (0.03431)
R2	0.710	0.261	0.445	0.031
N	30,663	11,365	30,663	11,365

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

Standard errors of prediction-based variables are obtained by 500 times bootstrap.

5.6 Overall Well-Being Function

Besides reporting well-being for different dimensions, respondents also reported their overall well-being on a scale of 0–10, 0 being least satisfied and 10 being fully satisfied with life. The survey asked the overall well-being question separately from satisfaction with housing, leisure, job, income, and health. It may be inferred that the overall well-being comprises housing, leisure, job, income, and health dimensions.

The purpose of the well-being function is to estimate the contribution of these individual well-being dimensions to overall well-being. An OLS and fixed-effect panel model was estimated. Results are presented in Table 7. Four functions were estimated. Models 1 and 3 estimate overall well-being as a function of self-reported well-being dimensions for housing, leisure, job, income, and health indexes. Models 2 and 4 estimate overall well-being as a function of predicted well-being estimates for housing, leisure, job, income, and health using the estimated fixed-effect models presented in Tables 2 to 6.

Housing, leisure, job, income, and health well-being variables in all models are significant and contribute positively to the overall well-being. What is important is the relative contribution of these dimensions to overall well-being and their contributions are robust.

The largest contributor to overall well-being is the predicted well-being associated with leisure quality. This may appear surprising, but given that many of the determinants of this dimension are related to the job quality and health status of respondents, it is understandable that this dimension becomes an important determinant of overall well-being. Predicted leisure quality well-being is the highest contributor for “between” and “within” differences among subjects in overall well-being. The second-largest contributor to overall well-being variations between subjects is the predicted health well-being. The contribution of predicted health well-being in explaining within-subject variation in overall well-being is also the second largest. Predicted income and housing well-being are next in the hierarchy of contributors to overall well-being. Predicted job well-being makes a small but significant contribution to between-subject variations in overall well-being but a large contribution to within-subject variation in overall well-being.

The overall significance level of the model with self-reported dimensions is better than with predicted well-being dimensions.

6. DISCUSSION

Income well-being is directly derived from income, savings, securities, and property, which are all severely affected during natural disasters. Carefully crafted insurance for financial assets (particularly securities) and property (land and housing) may help wealthier households restore their financial well-being sooner. Long-term plans for guaranteeing income security would require restitution of jobs and employment (discussed later). The loss of life of an earning member takes a toll on both the emotional and income well-being of the household. Again, insurance policies for the loss of life due to disaster may speed up the recovery process. Special financial models (insurance packages or compensation packages) can be designed for household heads in the 50–60 age bracket, who have the largest financial burdens, including a mortgage; education expenses for children who are of late school or university age; and medical expenses of parents of older age.

Employment restitution is essential to a household’s well-being post-disaster in the long run because it enables the household to rebuild many basic capabilities, e.g., having income security, food security, shelter security, access to health and education, and

other necessities for a decent life. According to our findings, loss of employment (e.g., due to disaster) would have the strongest negative impact on full-time employees, particularly those who are more experienced in the job. Another important determinant of a person's well-being has been the sector of employment. Findings suggest that agriculturists and specialized professionals (such as engineers and medical practitioners) reported greater well-being from employment. Therefore, employment restitution policies for experienced full-time employees, agriculturists, and specialized professionals would have to be carefully designed to minimize skill diversification. At the household level, employment compensation strategies may include priority appointment of affected household members in new job openings in the market (corresponding to the skills and experience of the person); priority appointment of a family member of a deceased employee (particularly full-time employees with greater experience); and similar other welfare approaches.

According to Nussbaum's (2011) list of central capabilities (refer to Figure 1), recreation and social interaction are crucial to a decent quality of life. While in the short term, government's main focus is to ensure food, shelter, and health security, long-term restitution strategies may consider building back infrastructure for sports and entertainment, and creating opportunities for social interactions. Even in the short run, having opportunities for social bonding may prove beneficial in many ways, e.g., families with children may share childcare responsibilities; social interaction may help some people in overcoming the mental trauma caused by a disaster; socialization is a part of the daily life of people in Japan and thus crucial to reinventing a sense of normality. In Japan's busy work culture, leisure opportunities are mostly utilized by employees in the form of extended dinner meetings with colleagues. Special attention is required to improve leisure opportunities for unemployed members of the family who are often overly engaged in household work, particularly female members of households and women with children who have reported significantly lower satisfaction with their time spent on leisure and also the quality of leisure.

For obvious reasons, health well-being is most strongly affected by a disaster. In addition to physical health injuries, many households also experience mental and emotional health problems post-disaster – for example, due to the loss of life of a family member. According to our findings, married people perceive greater satisfaction with health, thus indicating the importance of companionship that may implicitly induce a healthy lifestyle. As regards restitution of health well-being at the household and societal level, governments take quick measures for the restitution of health infrastructure and target the expansion of services in the affected regions. There could be increased involvement of social groups and nongovernment organizations in improving mental and emotional health, which is a long-term person-centered approach, often not covered under health insurance.

There is ample theoretical and empirical literature that emphasizes the importance of homeownership in households' well-being. This research digs deeper to unveil what constitutes satisfaction with housing and finds that greater satisfaction is derived from owned (as opposed to rented), landed houses (as opposed to an apartment), for which values are appreciating over time. Household satisfaction increases with age, probably due to an increase in household wealth and income, and a diminishing loan value. However, at older ages (after 90 years) households report a reduction in their satisfaction with housing, probably due to a lack of age-friendly amenities and the effort required to maintain the house. Greater satisfaction from having earthquake insurance indicates its positive impact on a household's ability to rebuild the house and associated well-being to how they were before the disaster. Strategic intervention is required to improve the

penetration of earthquake insurance and make it more affordable and contextual to households' needs post-disaster.

7. CONCLUSION

This research takes motivation from longstanding problems of inadequacy and bias in contemporary restitution mechanisms guided by the asset-based approach to measuring disaster losses and argues for a comprehensive measure of well-being using the "capability approach." The research aims to identify the key determinants of households' well-being that should be the focus of post-disaster compensation/recovery mechanisms.

Asset-based approaches to measuring disaster intensity and losses have long been criticized for the exclusion of nonasset losses such as psychological well-being and social capital, which otherwise are crucial contributors to people's well-being and thus require satisfactory reconstruction post-disaster (Hallegatte et al. 2017; Walsh and Hallegatte 2019). Further criticism of asset-based models is for directing recovery investments toward richer households and regions, and the implicit bias against poor households that otherwise experience larger well-being losses (Walsh and Hallegatte 2019). Along with other scholars favoring the well-being approach over the traditional asset-based approach to welfare economics, Walsh and Hallegatte (2019) justify its use for painting the complete picture of losses and overcoming inbuilt inequality in the asset-based model.

Through an overview of multiple alternative approaches to welfare economics, Binder (2013) finds subjective well-being (SWB) and the capability approach to be the two most prominent, though neither is without limitations. Binder (2013) proposes a new model by combining SWB and "capability," which overcomes the most challenging problem of hedonic adaptation in the SWB approach and ordering functionings and capabilities. This research takes inspiration from Binder (2013) and amalgamates SWB and the capability approach to identify crucial determinants of well-being using the KHPS/JHPS data from Japan. Alongside assessing the contribution of five basic capabilities (related to income, job, leisure, health, and housing) to the overall well-being of a household, this research also identifies key factors (such as resources, personal characteristics, and household and societal characteristics) that impact these five capabilities.

Findings from this research suggest that the well-being of a household is constituted by their well-being across multiple dimensions, of which housing, leisure, job, income, and health are the dominant contributors. In the Japanese context, households' satisfaction with the quality of leisure is the largest contributor to their overall well-being. The second-largest contributor to overall well-being is health. The contributions of income, housing, and job are lower in the hierarchy. These findings emphasize the importance of nonasset dimensions of well-being and challenge the traditional asset-based approaches to measuring well-being and disaster losses. It is acknowledged that overall well-being would extend beyond the five capabilities identified in this research to include other aspects of well-being that are currently not a part of JSPS/KHPS data, such as bodily integrity; senses, imagination, and thought; emotions; practical reason; other species; and control over one's environment. There is scope for future work on designing suitable indicators of these key dimensions of well-being or central capabilities as per Nussbaum (2011).

The above discussions add to the ongoing discussions on building resilient communities and contribute to the bigger objective of designing a resilient compensation or restitution

mechanism that can satisfactorily reinstall or reconstruct the basic capabilities of affected households and consequentially facilitate the self-recovery process in a wholistic manner.

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