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【要旨】

本稿は、日本家計パネル調査を用いて、新型コロナウイルス感染症が所得格差とウェルビーイング格差にもたらした中期的な影響について分析をした。複数の統計によりコロナ禍前後の世帯所得のジニ係数を計算したところ、コロナ禍において所得格差の拡大傾向は確認されなかった。これについて、世帯の所得動態を確認したところ、コロナ禍においても累進的な所得増加が見られ、こうした動態が不平等の拡大を妨げたと考えられる。一方、メンタルヘルス、睡眠時間、生活満足度、健康満足度、仕事満足度、ワークエンゲイジメントの多側面からコロナ禍におけるウェルビーイングの変動と格差の動向を確認したところ、コロナ禍で特に低所得層ほどウェルビーイングが悪化していることが分かった。さらに、高所得層ではコロナ禍で在宅勤務といった柔軟な働き方の恩恵を受けたことでウェルビーイングが改善傾向にあり、総じて、所得格差に関連した形でウェルビーイング格差が拡大したことが明らかになった。

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# Trends in income and well-being inequality during the COVID-19 pandemic in Japan

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Abstract

Although the COVID-19 pandemic could have caused distributional changes, existing studies only investigated its immediate monetary impacts. This study examines the medium-term impacts on income and well-being inequality using individual longitudinal data from the Japan Household Panel Survey. Gini coefficients before and after the pandemic are calculated to analyze income inequality. Various well-being measures such as mental health, life satisfaction, sleeping hours, and work engagement are used to analyze well-being inequality. The findings reveal no increase in income inequality. Progressive income growth ensured stable inequality throughout the pandemic. Conversely, well-being worsened, particularly among the low-income group, and well-being inequality increased. Furthermore, people in the high-income group benefited from flexible work arrangements, contributing to improved well-being, suggesting that the increase in well-being inequality was associated with income inequality during the pandemic. Thus, although income inequality did not change, overall inequality, including subjective well-being, increased during the pandemic.

JEL classification: D31 Personal Income, Wealth, and Their Distribution, I31 General Welfare, Well-Being, I14 Health and Inequality

## 1. Introduction

Owing to the enormous economic and social damage caused by the COVID-19 pandemic, several studies have investigated its distributional impact in many countries. Although some studies have shown an increase in income inequality even after considering regressive policy interventions (Crossely *et al.*, 2021; Angelov and Waldenstrom, 2023), most indicate that income inequality after redistribution did not significantly increase (O'Donoghue *et al.*, 2020; Almeida *et al.*, 2021; Clark *et al.*, 2021; Blundell *et al.*, 2022; Stantcheva, 2022). As Clark *et al*. (2021) and Tanaka (2022) indicate, regressive policies using existing redistributive mechanisms and special intervention schemes fully offset the severe negative impact for lower-income households, suggesting that income inequality based on disposable income did not increase significantly, at least at the beginning of the pandemic. However, subsequent changes or the medium- and long-term impacts of the pandemic are not known from the existing studies.

Furthermore, few studies have focused on the distributional impact of the pandemic on nonmonetary aspects, such as subjective well-being. Even if income inequality did not change during the pandemic, well-being inequality could increase. For instance, the negative impact of the pandemic may have been greater among individuals with poor well-being before the pandemic than those with better well-being. As infectious diseases such as COVID-19 could have a greater psychological than economic impact, several studies have investigated the heterogeneous impact of the COVID-19 pandemic on well-being variables such as mental health, anxiety, general health, happiness, and satisfaction (Banks and Xu, 2020; Nagasu *et al.*, 2021; Yamamura and Tsutsui, 2022; Adam-Prassl *et al.*, 2022). For example, Banks and Xu (2020) and Nagasu *et al.* (2021) show that the pandemic had severe consequences for individuals with poor well-being before the pandemic, such as young people, women, and low-income households. This suggests a possibility that well-being inequalities increased during the pandemic. However, few studies have measured the distributional changes in these variables during the pandemic. Among existing studies, Delhey *et al.* (2023) find that the COVID-19 pandemic did not increase inequality in life satisfaction in Germany and the United Kingdom from 2020 to 2021. However, Sudo (2022) reports

that inequality in life satisfaction increased during the COVID-19 pandemic in Japan in 2020. However, little is known about the medium- and long-term distributional changes in subjective well-being during the pandemic.

In addition, no existing studies have investigated an association between the distributional changes in subjective well-being and those in income. There is a possibility that richer people had better access to healthcare and infection-preventive workstyles, such as remote work, which may have enhanced their well-being. In this case, even if income inequality does not change, overall inequality, including subjective well-being, is widening. This suggests the importance of investigating an association between income and well-being inequality.

Considering these research gaps in the existing literature, this study examines the medium-term changes in overall monetary (income) and non-monetary (subjective well-being) inequalities and their association during the COVID-19 pandemic in Japan. Representative longitudinal data from Japan, the collection of which started before the COVID-19 pandemic, allows us to analyze these impacts on income and well-being inequality considering pre-pandemic economic positions. As the well-being variables included in the data are self-reported, the use of a longitudinal survey that started before the pandemic is important to exclude retrospective biases. Unlike previous studies that have investigated the immediate impacts on income distribution, we attempt to understand the medium- and long-term impacts on inequality by using data until 2022. This is based on concerns that the COVID-19 pandemic has changed the existing structure and trends of income and well-being inequality.

In the analysis, we first examine the changes in income inequality using three descriptive approaches: observing fluctuations of the Gini coefficients, income fluctuations, and dynamic transitions or mobility among income groups. Second, we conduct a similar descriptive analysis for well-being inequality, observing changes in the mean and variation of well-being variables. Third, we examine an association between income and well-being inequality by focusing on workstyle, such as remote work as potential factors that cause the association. After observing a descriptive relationship, we estimate fixed-effects models for well-being variables such as mental health and work engagement, in which we include pre-pandemic income quintile dummies as well as their cross-terms with the after-the-outbreak dummy. We focus on

the estimates of the coefficients of the cross-terms because they indicate how the pre-pandemic income level is associated with the changes in well-being after the outbreak. We also conduct mediation analysis by adding a remote work dummy as an explanatory variable. If the coefficients of the cross-terms become insignificant after adding a remote work dummy, we can indicate that the association between income and well-being inequality during the pandemic may have been caused by the changes in workstyle during the pandemic.

This study is related to three strands of the literature. First, it contributes to the literature on the monetary distributional impact of the COVID-19 pandemic. Owing to the lack of timely available official data, early studies assessing the immediate impact of the pandemic and government interventions on inequality have used either microsimulation (O'Donoghue *et al*., 2020; Palomino *et al*., 2020; Almeida *et al.*, 2021), rapidly collected survey data (Clark *et al.*, 2021; Gambau *et al.*, 2022), or alternative data such as bank records (Aspachs *et al.*, 2020) and high-frequency transaction data (Hacıoğlu-Hoke *et al.*, 2021). These studies reveal that although the pandemic had a severe impact on low-wage and low-income households, the policy response offset the regressive effect in the early stages of the pandemic. Studies using official statistics or representative data are limited, and most of them also focus on the immediate impact of the pandemic (e.g., Angelov and Waldenstrom, 2023; Aina *et al.*, 2023). Thus, little is known about the medium- and long-term impacts on income inequality.

Second, this study contributes to the literature on the impact of the pandemic on individual well-being. Several studies have investigated the heterogeneous impact of the COVID-19 pandemic on well-being in many countries (e.g., in the UK: Banks and Xu, 2020; Bu *et al.*, 2020; Etheridge and Spantig, 2022; in the US: Adam-Prassl *et al.*, 2022; in Germany: Schmidtke *et al*., 2021; Huebener et al., 2021; in Canada: Beland *et al.*, 2022; and in Japan: Nagasu *et al.*, 2021; Yamamura and Tsutsui, 2022). However, most of these studies do not examine the distributional changes in well-being during the pandemic.

Third, this study contributes to the literature on well-being inequality. With the pioneering study of Veenhoven (1990), subsequent studies have been conducted to clarify the negative association between well-being inequality and individual well-being within various sizes of groups (Delhey and Kohler, 2011; Okulicz-Kozaryn and Mazelis,

2017; Goff *et al*., 2018; Dickinson and Morrison, 2022; Grimes *et al*., 2023). However, little is known about the changes in well-being inequality during the COVID-19 pandemic, except Delhey *et al.* (2023) and Sudo (2022), who focus on the short-term impact of the pandemic. Therefore, the challenge of this study is to identify the medium-term changes in overall income and subjective well-being inequalities and their associations during the COVID-19 pandemic in Japan.

The remainder of this paper is structured as follows. Section 2 explains the data and variables used in the analysis. Section 3 examines changes in income inequality. Section 4 examines changes in well-being inequality and their association with income inequality. Finally, Section 5 presents the conclusions of this study.

## 2. Data and Variables

### *2.1 Data*

This study uses data from the Japan Household Panel Survey (JHPS). The JHPS is a representative longitudinal survey in Japan that follows the same individuals to track changes in various aspects, such as working conditions, time use, health, well-being, and income. The JHPS began in February 2004. In the first year of the survey, the respondents were approximately 4,000 men and women as well as their spouses. The samples were selected using two-stage stratified random sampling methods to minimize selection bias. Since February 2004, surveys have been conducted every February. To compensate for attrition of the sample, new samples were added in 2007, 2009, 2012, and 2018. In April 2020, to capture the impact of the COVID-19 pandemic on households, the JHPS Special Survey for COVID-19 (JHPS-COVID19) was conducted, which targeted the respondents of the JHPS 2020. The JHPS-COVID19 was conducted six times in spring and autumn from 2020 to 2022. This study partially uses the JHPS-COVID19.

To correct for the bias caused by the attrition in the JHPS and the JHPS-COVID19, we utilize a sampling weight for all calculations. The sampling weights are created by an iterative proportional fitting or raking method to match the distributions of gender, age groups, working conditions, and the number of people living together in each wave of the JHPS with those of the Japanese population. Population data are

obtained from the *Labour Force Survey* (Ministry of Internal Affairs and Communications) for the same period. We fully match the distributions of these variables to those from the *Labour Force Survey* using weights.

### *2.2 Variables*

To analyze income inequality, we focus on household income. The JHPS questionnaire includes several questionnaire items on household income: household gross income, household disposable income, and amount of household income by each income source. The first two questions directly ask for the total amount of household income, whereas in the other questions, the total amount is obtained by adding each source of income. We use one of these variables depending on the purpose of the analysis.[1]

To analyze well-being, we measure mental health, sleeping hours, life satisfaction, job satisfaction, health satisfaction, and work engagement. These six indices can capture wide range of well-being. For the mental health variable, we use the Kessler Psychological Distress Scale (K6), which comprises six questions measuring mental health, such as "Did you feel excessively nervous?" Responses are rated on a five-point Likert scale. The total score of the K6 ranges from 0 to 24 points, with higher scores indicating more severe mental problems. Sleeping hours are defined as average weekday sleeping hours. Life, job, and health satisfaction range from 0 to 10, with higher scores indicating higher levels of satisfaction. The work engagement variable is measured using the Utrecht Work Engagement Scale (UWES-3), which is a short version of the Utrecht Work Engagement Scale (UWES) created by Shimazu *et al.* (2008). Work engagement is positive work-related mental health characterized by vigor, dedication, and absorption, with higher scores indicating higher work engagement.

For the analysis of workstyle, we use a remote work dummy variable that takes the value of 1 if the respondent worked from home at least once in the fourth week of February. In addition, we use an overtime work dummy that takes the value of 1 if the respondent worked more than 60 hours per week. Furthermore, we use an abstract task index that measures the number of atypical and complex problems that must be solved in a job. The JHPS 2020 contains information on the types of tasks based on Autor and Handel (2013), who use the Princeton Data Improvement Initiative survey from Princeton University. We combine the answers to the questionnaire items regarding

abstract tasks, extract the first principal component, and standardize the task score for the abstract tasks.[2]

## 3. Income inequality during the COVID-19 pandemic

### *3.1 Trends in the Gini coefficient*

First, we examine the trends in income inequality before and during the COVID-19 pandemic based on the Gini coefficient. The Gini coefficient is the most commonly used inequality measure. It ranges between 0 for perfect equality and 1 for perfect inequality. We calculate the Gini coefficients using JHPS data and several official statistics to compare the results.

Figure 1 shows the Gini coefficients from 2019 to 2021, based on the JHPS. Income is defined as the equivalized annual household gross income, before tax and social security contribution deductions, as well as the equivalized annual household disposable income, after tax and social security contribution deductions. Data for both variables are obtained directly from respondents. Household income is equivalized by the squared number of household members to reflect the differences in the needs of households of different sizes.

As shown in Figure 1, the Gini coefficients are mainly stable for both gross and disposable income before and two years after the pandemic outbreak. The Gini coefficient based on gross income is approximately 0.315. The coefficients based on disposable income are naturally smaller than those based on gross income, ranging from 0.280 to 0.285. Figure 1 also shows the Gini coefficients based on the equivalized monthly household gross income using data from the JHPS-COVID19. The findings indicate a slight decrease in inequality in April 2020. Except for this, the Gini coefficients are mainly the same as those of the JHPS main survey.

[Figure 1. Gini coefficient from 2019 to 2021 by the JHPS]

Figure 2 compares the Gini coefficients of the JHPS with those of the government statistics standardized to 2019 levels. *Family Income and Expenditure* (Ministry of Internal Affairs and Communications) and the *Comprehensive Survey of*

*Living Conditions* (Ministry of Health, Labour and Welfare) are used for government statistics. These two government statistics were the only surveys that examined income distribution during the COVID-19 pandemic in Japan. In Figure 2, income is defined as annual household gross income and is not equivalized by the number of household members.

As shown in Figure 2, although the observed inequality trends differ depending on the surveys, the changes in each Gini coefficient are small, within ±2%. This corresponds to the changes from 0.304 to 0.301 in the levels of the Gini coefficient in the JHPS, those from 0.330 to 0.335 in *Family Income and Expenditure*, and those from 0.382 to 0.388 in the *Comprehensive Survey of Living Conditions*.

In summary, the results indicate that increases or decreases in the Gini coefficients are negligible during the pandemic. Thus, the COVID-19 pandemic did not impact income inequality in Japan.

[Figure 2. Relative Gini Coefficients from 2019 to 2021 by three surveys (2019=100)]

### *3.2 Income fluctuation during the COVID-19 pandemic*

While no overall increasing trend is observed in income inequality during the pandemic, significant changes may have occurred in income for a particular household or income group. Thus, following Tanaka (2022), we examine income fluctuations by income group during the pandemic.

Using aggregated data on *Family Income and Expenditure*, Tanaka (2022) calculates the changes in disposable income across income quintiles from 2019 to 2021 among the working population in Japan. Rows 1 and 2 in Table 1 present the changes calculated using the same methods as Tanaka (2022), and Row 3 presents an extension to 2022. Current income (regular or replicable income that significantly affects households' consumption behavior, such as earnings, business income, asset income, and regular social security benefits) declined among the low- and middle-income groups from 2019 to 2020, whereas disposable income increased for all income groups. This is due to the increase in noncurrent income (irregular income, such as gifts) caused by the Special Cash Payment, which is government support that provided a fixed amount of 100,000 yen to all registered persons in 2020.

[Table 1. Changes in household disposable income by income group among the working population from 2019 to 2022]

Current income continued to decrease from 2020 to 2021 in the low-income group, and the amount of income decrease since 2019 was the largest in the low-income group. Therefore, the negative impact of the pandemic was more pronounced in the low-income group. However, as shown in Figure 2, this did not result in a large increase in overall income inequality. Based on the same statistics, the Gini coefficients among the working population were 0.227 in 2019, 0.232 in 2020, and 0.236 in 2021, indicating an increase of only 4% from 2019 to 2021.[3]

The changes in both the current and disposable income of the middle-income group declined from 2021 to 2022, whereas those of the other income groups increased. The Gini coefficient among the working population was 0.220 in 2022, which was the same as that in 2019. These findings imply that income inequality increased slightly in the first two years of the pandemic; however, this increase was temporary, and the pandemic did not have a long-term impact on income inequality.

This tendency is confirmed by three additional aggregations. First, we conduct the same aggregation as Tanaka (2022) using the JHPS data in Table 2. In contrast to Table 1 and Tanaka's (2022) study, this table focuses on the total population (rather than the working population) and uses annual gross income (not averaged monthly disposable income).[4] Significant increases were observed in noncurrent income in all income groups from 2019 to 2020, which prevented a decline in total income, except in the second and fifth quintiles. However, a decrease in income was observed in almost all income groups from 2020 to 2021, except in the second quintile. Among all groups, the high-income group experienced the largest income decline since 2019. The Gini coefficients were 0.281 in 2019, 0.277 in 2020, and 0.276 in 2021, indicating a 2% decrease in the relative term. Therefore, the JHPS data confirm that the COVID-19 pandemic did not affect income inequality from 2019 to 2021.

[Table 2. Changes in household gross income by income group]

Second, taking advantage of the characteristics of the longitudinal data from the JHPS, we examine the dynamics of income fluctuations depending on the pre-pandemic income level, which is not confirmed by cross-sectional analysis. Figure 3 shows violin plots[5] of the distribution of income changes from 2019 to 2020 and from 2019 to 2021 among the pre-pandemic income group, based on Crossley et al. (2021). The income is equivalized annual household gross income, as shown in Figure 1.

As shown in Figure 3 (a), in all income groups, the modes and medians are located at almost zero, indicating that most households experienced no changes in income. However, we also find that more households experienced income growth in the lowest quintile, whereas more households experienced income declines in the highest quintile from 2019 to 2020. By extending the observations from 2019 to 2021, as shown in Figure 3 (b), we find clearer tendencies. These findings indicate that although income of the households categorized into the low-income group at each point in time slightly declined during the pandemic, as shown in Tables 1 and 2, households that were in the low-income group before the pandemic experienced more income growth during the pandemic. This provides evidence of stable income inequality through higher income mobility across income groups during the pandemic.

[Figure 3. Violin plot of the percentage of income change by income groups from 2019 to 2020 and 2019 to 2021 using the JHPS]

Third, income growth and mobility are confirmed following the method presented by Jenkins and Van Kerm (2006). Jenkins and Van Kerm (2006) decompose the change in inequality from time $t$ to $t+1$ into the progressivity of income growth and mobility in the form of re-ranking. Progressivity is expressed as the difference between the Lorenz curve at time $t$ and the concentration curve of income at time $t+1$ by income rank at time $t$, which indicates how much the poor at time $t$ grew their income share at time $t+1$. Re-ranking is expressed as the difference between the concentration curve of income at time $t+1$ by income rank at time $t$ and the Lorenz curve at time $t+1$. This is a comparison between the current income shares of those who were previously poor and who are currently poor. Arranging this decomposition, we examine the changes in the

income shares of each quintile directly, as shown in Figure 4, instead of drawing a Lorenz curve and a concentration curve, which show the cumulative income share.

[Figure 4. Changes in income share by income groups before and after COVID-19 using the JHPS]

The income share is calculated in three ways: income share at time *t* by quintile at time *t*, income share at time *t+1* by quintile at time *t*, and income share at time *t+1* by quintile at time *t+1*. Comparing the first and second quintiles reveals how much the income share of households in each quintile in the first year changed in the next year. Likewise, by comparing the first and third quintiles, we find how much the income share of each quintile at each time point has changed. As shown in Figure 4, in both periods, the households in the low- and middle-income groups in the first year increased their income share in the next year. Their income shares were greater than the income shares of those in the same position in the next year. Conversely, the households in the high-income group in the first year clearly experienced a decline in their income share in the next year.[6] These changes in the income share provide additional evidence of mobility across income groups during the pandemic.

## 4. Well-being inequality after the COVID-19 pandemic

### *4.1 Trends in well-being inequality*

To examine the change in inequality in terms of well-being, we first show the mean and coefficient of variation (CV) of each well-being variable before (February 2019 and 2020) and after (February 2021 and 2022) the pandemic.[7] As shown in Figure 5, the mean values of the K6 score, in which higher scores indicate worse mental health, increased in 2021 during the COVID-19 pandemic and stayed high in 2022. As for variance, the CVs of the K6 exhibited an increasing trend, which was observed even before the pandemic. Therefore, inequality in mental health increased with average mental health deterioration during the pandemic.

Similar changes in the averages and variances of well-being are found for job satisfaction and work engagement. Figure 5 shows a decrease in the mean values for

both measures from 2021 to 2022, which indicates lower well-being, as well as an increase in the CVs, which indicates growing inequality during the pandemic.

Regarding life-related satisfaction measures, as shown in Figure 5, both the mean and CV of life and health satisfaction declined. This indicates that the average satisfaction with life and health decreased, whereas the inequality in those well-being measures shrank during the pandemic. By contrast, both the mean and CV of sleeping hours increased during the COVID-19 pandemic, indicating that people tended to sleep longer on average; however, the differences in sleeping hours among people became more pronounced.

[Figure 5. Means and coefficient of variation of well-being measures]

In summary, among the measures representing well-being, work engagement, life satisfaction, and health satisfaction worsened after the outbreak, and only sleeping hours improved on average. The variance or inequality in mental health, job satisfaction, work engagement, and sleeping hours increased. Thus, differences between individuals in terms of well-being measures increased during the pandemic.

### *4.2 Well-being inequality associated with income inequality*

To examine the association between well-being and income inequality, the mean deviations of each well-being measure from the total mean for each pre-pandemic income quintile group in February 2020, 2021, and 2022 are shown in Figure 6.

Inequalities existed in pre-pandemic income levels in most well-being measures. Higher income level was associated with better well-being. In addition, individuals in the high-income group before the pandemic experienced improvements in well-being, except for work engagement, while those in the low-income group experienced a decline in well-being. For instance, we find a large decrease in the K6 score (better mental health) for the high-income group and a large increase (worse mental health) for the low-income group in 2022. Increases in overall inequality measured by the CV are not seen for life and health satisfaction in Figure 5; however, an increase in the inequality associated with income inequality is observed in Figure 6.

[Figure 6. Mean deviations of each well-being measure from the total mean for each pre-pandemic income quintile group in February 2020, 2021, and 2022]

### *4.3 Workstyle inequality associated with income inequality*

To examine the potential factors that lead to an association between income and well-being inequality, the ratio of remote and overtime work, as well as abstract task scores across pre-pandemic income groups and years, are examined in Table 3.

[Table 3. Workstyle and tasks before and after the pandemic]

The ratios of remote work were low in all income groups in 2020 before the pandemic but sharply increased in 2021 and 2022. These increases were more evident in the high-income group, particularly in 2021.[8] However, the ratio of workers with more than 60 hours of work per week decreased more in 2021 and 2022 for the high-income group, whereas it increased for the low-income group. In addition, we find an increase in abstract task scores in 2021 for the high-income group.

Thus, the association between income and well-being inequality may have been caused by these changes in workstyle and tasks.

### *4.4 Regression analysis for the association between income and well-being inequality*

Table 4 shows the estimation results of the fixed-effects model, which identifies the association between income and well-being inequality by controlling for individual heterogeneity. We use data from 2020 and 2022 to examine changes from the pre-pandemic period to 2022. We use six well-being variables as dependent variables: mental health score (K6), sleeping hours, life satisfaction, health satisfaction, job satisfaction, and work engagement score (UWES3).[9] As independent variables, we use dummy variables indicating the pre-pandemic income quintiles and their cross terms with the year 2022 dummy.

The coefficients of the dummy variables for the pre-pandemic income quintile indicate the inequality in each well-being variable in relation to the income level before the pandemic, as shown in Figure 6. The coefficients of the cross terms with the year

2022 dummy indicate whether well-being inequality in relation to income level changed during the pandemic. As shown in Table 4, we estimate the fixed-effects models by adding a dummy variable for remote work as an independent variable.[10] This is to determine whether the changes in well-being inequality in relation to income levels after the outbreak became smaller or insignificant by controlling for changes in workstyle. If the coefficients of the cross terms become smaller or insignificant, the association between well-being and income inequality after the outbreak was due to changes in workstyle.

Column [1] and [2] in Table 4 shows the results for mental health. The coefficients of the fourth and fifth quintile income group dummies are significantly negative, indicating better mental health for people in the high-income group. Thus, an association existed between mental health and income inequality before the pandemic. Furthermore, the cross terms of the fifth quintile with the year 2022 dummy are significantly negative, which indicates that the mental health of people in the high-income group improved more during the pandemic than that of those in the low- and middle-income groups. Therefore, mental health inequality associated with income inequality increased during the pandemic.

However, as shown in Column [2], the significant coefficient of the cross term disappears after we control for the remote work dummy. As the coefficient of the remote work dummy is significant and negative, people in the high-income group were better off in terms of mental health because they worked remotely more compared with those in the low-income group during the pandemic.

Similar results are seen for life satisfaction, as shown in Columns [5] and [6]. Life satisfaction was relatively higher for people in the fourth and fifth quintile income groups before the pandemic, and the difference increased for those in the fifth income group during the pandemic.

Sleeping hours are shown in Columns [3] and [4]. Opposite associations with income inequality are observed before the pandemic. In other words, the coefficients of the fourth and fifth quintile income group dummies are significantly negative, indicating that richer people tended to have shorter sleeping hours in 2020. However, regarding the changes in sleeping hours during the pandemic, we find a positive association with income, as the coefficient of the cross term of the fifth income group with the 2022

dummy is significantly positive. In addition, we find insignificant coefficients of the cross terms after controlling for the remote work dummy, as shown in Column [4]. Thus, richer people tended to have better sleeping hours during the pandemic.

Health satisfaction is shown in Columns [7] and [8]. The coefficient of the cross terms for the high-income group is significantly positive and becomes slightly smaller after we control for the remote work dummy. These results indicate that part of the increase in health satisfaction for the high-income group during the pandemic was due to the adoption of remote work.

Regarding job satisfaction and work engagement, we find significant and positive coefficients for the high-income group dummies, indicating inequality in relation to income before the pandemic. However, we find no significant coefficients for the cross terms, indicating that the inequality of these two variables did not change during the pandemic.

[Table 4. Determinant of well-being from 2020 to 2022: fixed model estimation results]

In summary, inequality in well-being variables, such as mental health, life satisfaction, and health satisfaction, increased in relation to income level, and one of the main drivers of this increase was the availability of remote work. As such, the COVID-19 pandemic increased the association between well-being and income inequality through the inequality of workstyles and remote work.

## 5. Conclusion

This study investigated the distributional changes in income and subjective well-being over three years before and during the COVID-19 pandemic to explore whether the pandemic changed the existing structure and trends of inequality. Moreover, we examined the association between income and subjective well-being inequality. The results revealed that income inequality did not increase and indicated that progressive income growth ensured the stability of income inequality throughout the pandemic. Well-being inequality increased during the pandemic and was associated with income inequality. That is, the well-being of the high-income group tended to improve, whereas

that of the low-income group tended to deteriorate. Flexible work arrangements, such as remote work, affected this association. Remote work became more prevalent during the pandemic, especially among workers in the high-income group, which contributed to an improvement in their well-being and an increase in well-being inequality.

The findings of this study broadly align with those of previous studies investigating the immediate impact of the COVID-19 pandemic on income inequality. Previous studies, such as Crossley *et al.* (2021), indicate negative impacts on income among low-income households in the early stages of the pandemic; however, overall inequality did not increase, partly owing to short-term policy intervention (Clark *et al.*, 2021). Moreover, our findings demonstrated that the stability of income inequality continued for at least two years after the outbreak of the pandemic. According to Stantcheva (2022), income inequality in the medium and long term might increase owing to the regressive impacts of the pandemic; nonetheless, this was not observed in our study in Japan.

However, our analyses revealed an increase in inequality in non-monetary aspects, particularly subjective well-being. Inequality in non-monetary aspects has received less attention than monetary inequality in the literature on inequality. Similarly, Sudo (2022) measures the impact of the pandemic on subjective well-being in Japan and finds positive impacts for socially advantaged groups and negative impacts for socially disadvantaged groups, which increased well-being inequality. Moreover, other studies have reported that the increase in well-being inequality was associated with existing income inequality. For instance, Okulicz-Kozaryn and Mazelis (2017) demonstrate an increasing gap in happiness between income groups in the US.

Beginning with the pioneering work of Veenhoven (1990), a growing body of literature has investigated the development and distribution of non-monetary aspects, such as happiness, satisfaction, and health. Well-being is an outcome of life, and Veenhoven (2005) proposes that inequality can be measured using well-being rather than income. Our findings showed that the COVID-19 pandemic impacted non-monetary aspects more than monetary ones, suggesting the need to pay more attention to distributional changes in subjective well-being, particularly when a society is hit by economic and non-economic shocks. Furthermore, our finding that the increase in well-being inequality is associated with existing income inequality suggests that even if

rising inequality is not observed on the surface, overall inequality, including that in non-monetary aspects such as happiness, satisfaction, and health, could be increasing. Therefore, more progressive distribution policies may be required. In addition, flexible workstyles, such as remote work, should be promoted to increase people's well-being in low-income or low-well-being households.

Although this study is one of the first to examine the medium-term impacts of the COVID-19 pandemic on income and well-being inequality in Japan, limitations exist. First, the sample size in our analysis is not necessarily large. Although we use representative longitudinal data from JHPS and apply the sampling weight to recover the population, the sample size is at most approximately 5,000, which is smaller than that of the surveys used by previous studies in other countries. Second, although we examined medium-term distributional changes with the data until 2021, the pandemic was such a devastating shock that it may have long-term effects on income and well-being. Further investigation should be conducted in future research.

## References


Adam-Prassl, Abi, Teodora Boneva, Marta Golin, and Christopher Rauh (2022). 'The impact of the coronavirus lockdown on mental health: evidence from the United States', *Economic Policy*, 37(109), 139–155.

Aina, Carmen, Irene Brunetti, Chiara Mussida, and Sergio Scicchitano (2023). 'Distributional effects of the COVID-19', *Eurasian Business Review*, 13, 221–256.

Almeida, Vanda, Salvador Barrios, Michael Christl, Silvia De Poli, Alberto Tumino, and Wouter van der Wielen (2021). 'The impact of COVID-19 on households' income in the EU', *The Journal of Economic Inequality,* 19, 413–431.

Angelov, Nikolay and Daniel Waldenstr (2023). 'COVID-19 and income inequality: evidence from monthly population registers', *The Journal of Economic Inequality*, 21, 351–379.

Aspachs, Oriol, Ruben Durante, Alberto Graziano, Josep Mestres, Jose G. Montalvo, and Marta Reynal-Querol (2022). 'Real-time inequality and the welfare state in motion: evidence from COVID-19 in Spain', *Economic Policy*, 37(109), 165–199.

Autor, David H. and Michael J. Handel (2013). 'Putting tasks to the test: human capital, job tasks, and wages', *Journal of Labor Economics*, 31(2), S59–S96.

Banks, James and Xiaowei Xu (2020). 'The mental health effects of the first two months of lockdown during the COVID-19 pandemic in the UK', *Fiscal Studies,* 41(3), 685–708.

Beland, Louis-Philippe, Abel Brodeur, Derek Mikola, and Taylor Wright (2022). 'The short-term economic consequences of COVID-19: occupation tasks and mental health in Canada', *Canadian Journal of Economic*, 55(S1), 214–247.

Blundell, Richard, Monica Costa Dias, Jonathan Cribb, Robert Joyce, Tom Waters, Thoams Wernham, and Xiaowei Xu (2022). 'Inequality and the COVID-19 crisis in the United Kingdom', *Annual Reviews of Economics*, 14, 607–636.

Bu, Feifei, Andrew Steptoe, and Daisy E. Fancourt (2020). 'Who is lonely in lockdown? Cross-cohort analyses of predictors of loneliness before and during the COVID-19 pandemic', *Public Health*, 186, 31–34.

Clark, Andrew E., Conchita D'Ambrosio, and Anthony Lepinteur (2021). 'The fall in income inequality during COVID-19 in four European countries', *The Journal of Economic Inequality*, 19, 489 –507.

Crossley, Thomas F., Paul Fisher, and Hamish Low (2021). 'The heterogeneous and regressive consequences of COVID-19: Evidence from high quality panel data', *Journal of Public Economics*, 193.

Delhey, Jan and Ulrich Kohler (2011). 'Is happiness inequality immune to income inequality? New evidence through instrument-effect-corrected standard deviations', *Social Science Research*, 40, 742–756.

Delhey, Jan, Stephanie Hess, Klaus Boehnke, Franziska Deutsch, Jan Eichhorn, Ulrich Kühnen, and Christian Welzel (2023). 'Life satisfaction during the COVID-19 pandemic: the role of human, economic, social, and psychological capital', *Journal of Happiness Studies*, 24, 2201–2222.

Dickinson, Pascarn R., and Philip S. Morrison (2022). 'Aversion to local wellbeing inequality is moderated by social engagement and sense of community', *Social Indicators Research*, 159, 907–926.

Etheridge, Ben and Lisa Spantig (2022). 'The gender gap in mental well-being at the onset of the Covid-19 pandemic: evidence from the UK', *European Economic Review*, 145, 104114.

Gambau, Borja, Juan C. Palomino, Juan G. Rodríguez, and Raquel Sebastian (2022). 'COVID-19 restrictions in the US: wage vulnerability by education, race and gender', *Applied Economics*, 54(25), 2900–2915.

Goff, Leonard, John F. Helliwell, and Guy Mayraz (2018). 'Inequality of subjective well-being as a comprehensive measure of inequality', *Economic Inquiry*, 56(4), 2177–2194.

Grimes, Arthur, Stephen P. Jenkins, and Florencia Tranquilli (2023). 'The relationship between subjective wellbeing inequality: an important role for skewness', *Journal of Happiness Studies*, 24, 309–330.

Hacıoğlu-Hoke, Sinem, Diego R. Känzig, and Paolo Surico (2021). 'The distributional impact of the pandemic', *European Economic Review*, 134, 103680.

Huebener, Mathias, Sevrin Waights, C. Katharina Spiess, Nico A. Siegel, and Gert G. Wagner (2021). 'Parental well-being in times of COVID-19 in Germany', *Review of Economics of Household*, 19, 91–122.

Jenkins, Stephen P. and Philippe Van Kerm (2006). 'Trends in income inequality, pro-poor income growth, and income mobility', *Oxford Economic Paper,* 58, 531–548.

Jenkins, Stephen P. (2020). 'Comparing distributions of ordinal data', *The Stata Journal*, 20(3), 505–531. https:// doi.org/ 10. 1177/ 15368 67x20 953565

Nagasu, Miwa, Kaori Muto, and Isamu Yamamoto (2021). 'Impacts of anxiety and socioeconomic factors on mental health in the early phases of the COVID-19 pandemic in the general population in Japan: a web-based survey', *PLoS ONE*, 16(3), e0247705.

O'Donoghue, Cathal, Denisa M. Sologon, Iryna Kyzyma, and John McHale (2020). 'Modelling the distributional impact of the COVID-19 crisis', *Fiscal Studies*, 41(2), 321–336.

Okulicz-Kozaryn, Adam, and Joan Maya Mazelis (2017). 'More unequal in income, more unequal in wellbeing', *Social Indicator Research*, 132, 953–975.

Palomino, Juan C., Juan G. Rodríguez, and Raquel Sebastian (2020). 'Wage inequality and poverty effects of lockdown and social distancing in Europe', *European Economic Review*, 129, 103564.

Shimazu, Akihito, Wilmar B. Schaufeli, Shotaro Kosugi, Ayako Suzuki, et al. (2008). 'Work Engagement in Japan: validation of the Japanese version of the Utrecht Work Engagement Scale', *Applied Psychology*, 57(3), 510–523.

Stantcheva, Stefanie (2022). 'Inequality in the times of a pandemic', *Economic Policy*, 37(109), 5–41.

Sudo, Naoki (2022). 'The positive and negative effects of the COVID-19 pandemic on subjective well-being and changes in social inequality: evidence from prefectures in Japan', *SSM-Population Health*, 17, 101029.

Tanaka, Soichiro (2022). 'Korona-ka to Shotoku-kakusa, Nippon no doko to Kokusai hikaku', *Jichi Soken Tukan*, 524, 35–46 (in Japanese).

Veenhoven, Ruut (1990). 'Inequality in happiness: inequality in countries compared between countries', paper presented at the 12th Work Congress of Sociology, Madrid, July 1990.

Veenhoven, Ruut (2005). 'Return of inequality in modern society? Test by dispersion of life-satisfaction across time and nations', *Journal of Happiness Studies*, 6, 457–487.

Yamamura, Eiji and Yoshiro Tsutsui (2022). 'How does the impact of the COVID-19 state of emergency change? An analysis of preventive behaviors and mental health using panel data in Japan', *Journal of The Japanese and International Economies*, 64, 101194.

[1] In the JHPS2022, after data cleaning, the correlation coefficient of household gross and disposable incomes is 0.96, and that of household gross income and total amount of each source of income is 0.95.

[2] The following questionnaire items regarding abstract tasks are included in the JHPS: (1) the length of the longest document that must be read; (2) the frequency with which knowledge of mathematics, such as algebra, geometry, trigonometry, probability/statistics, and calculus, is required; (3) the frequency of solving problems that require at least 30 minutes to find a good solution; and (4) the proportion of the workday spent managing or supervising other workers.

[3] The Gini coefficients are calculated in the same way as the one presented in Figure 2. The coefficients are the same as those presented by Tanaka (2022).

[4] In Table 2, the income data are derived from the total of individual household members' incomes. This differs from the total household income derived from the other questionnaire item presented in Figure 2.

[5] In Figure 4, the violin plot is a mixture of box and kernel density plots, which shows the distribution, mode (peak of the distribution), and median (white dot) in the data.

[6] Similar changes are observed in income shares before the pandemic (2018–2019).

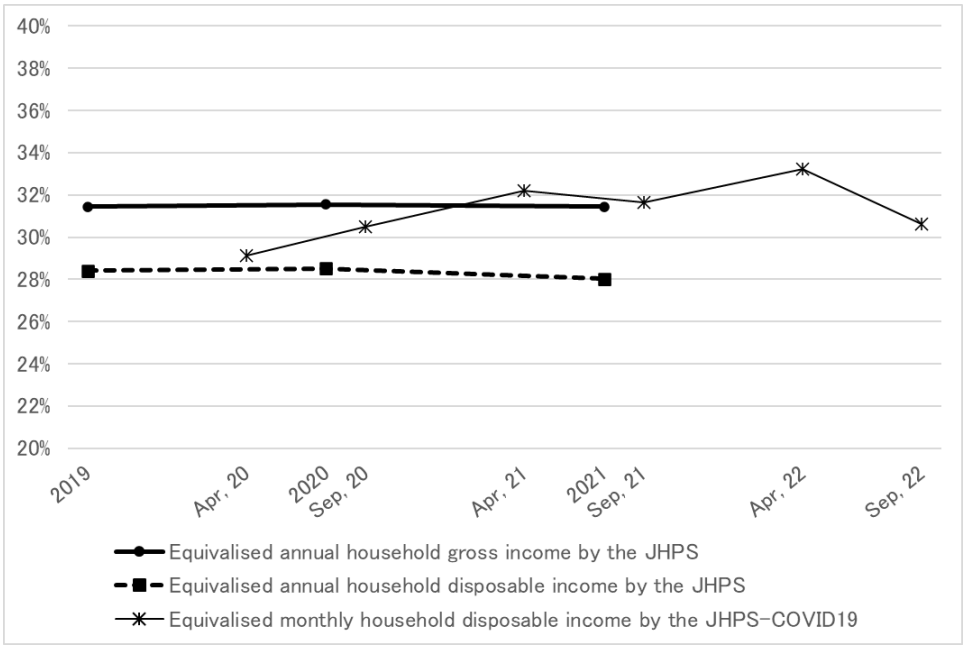
[7] Since there is no golden rule for measuring well-being inequality, the other indices for well-being inequality, such as Jenkins' inequality index (Jenkins, 2020) and percent maximum standard deviation (Delhey and Kohler, 2011), are also calculated. The results are shown in Appendix. The trends are almost the same among those indices.

[8] The low-income group shows a high rate of remote work, with self-employed individuals and those in family businesses contributing the largest portion to this rate. The rate of remote work is higher among self-employed individuals and those in family businesses than among regular employees, and the proportion of self-employed individuals and those in family businesses is the highest in the low-income group.

[9] The regression analyses of sleeping hours, job satisfaction, and work engagement restrict the sample to only workers.

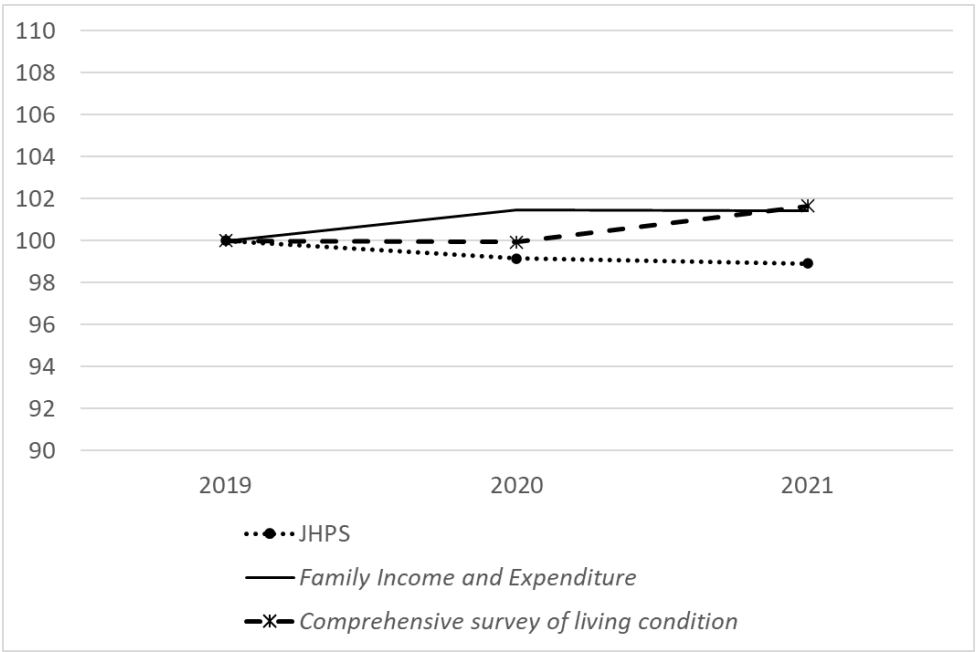
[10] In addition, we estimate the fixed-effects models by adding a dummy variable for overtime work and abstract task score as the independent variable. However, these variables do not change the significance or magnitude of the coefficient of the cross terms.

**Figure 1. Gini coefficient from 2019 to 2021 by the JHPS**




Source: Authors' calculation using the JHPS and the JHPS-COVID19

**Figure 2. Relative Gini Coefficients from 2019 to 2021 by three surveys (2019=100)**

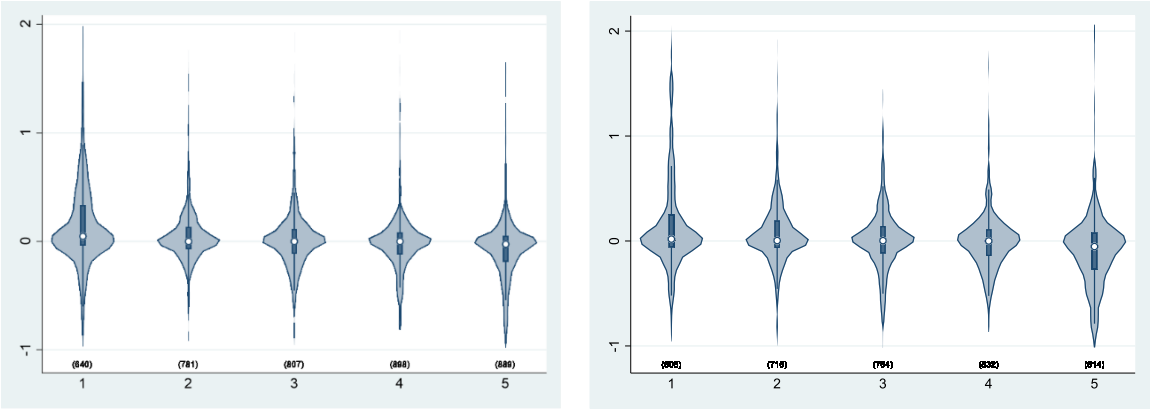



Source: Authors' calculation using the JHPS, *Family Income and Expenditure*, and *Comprehensive survey of living condition*

Notes: The definition of income in Figure 2 is household gross income. Income in the JHPS and *Comprehensive survey of living condition* is annual, and *Family Income and Expenditure* is averaged monthly. Income is not equivalized.

**Figure 3. Violin plot of the percentage of income change by income groups from 2019 to 2020 and 2019 to 2021 using the JHPS**

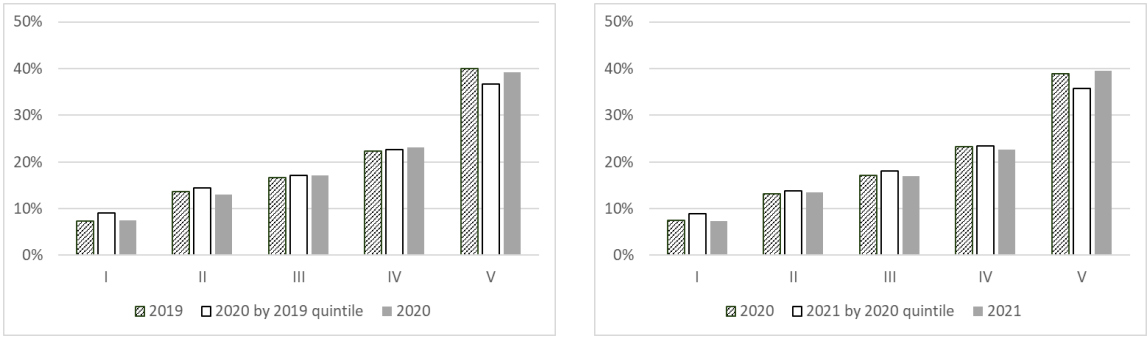
**(a) 2019 to 2020 by income group in 2019** **(b) 2019 to 2021 by income group in 2019**




Source: Authors' calculation using the JHPS
Notes: 1) The definition of income in Figure 3 is equivalized annual household gross income.
2) The income group is defined by the income in 2019.

**Figure 4. Changes in income share by income groups before and after COVID-19 using the JHPS**

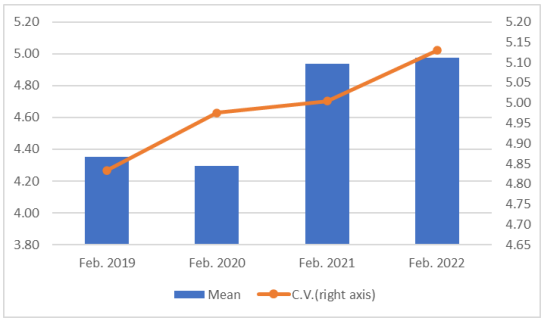
**(a) Change in income share, 2019 to 2020** **(b) Change in income share, 2020 to 2021**



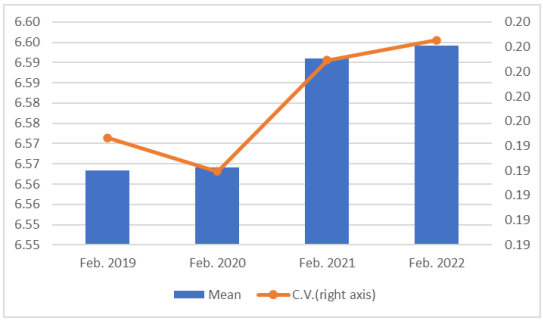

Source: Authors' calculation using the JHPS
Notes: 1) The definition of income in Figure 4 is equivalized annual household gross income
2) They are calculated with consequent two years balanced panel data

## Figure 5. Means and coefficient of variation of well-being measures

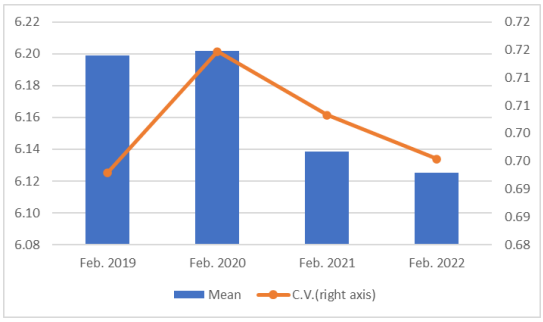
### (1) Mental health (K6)



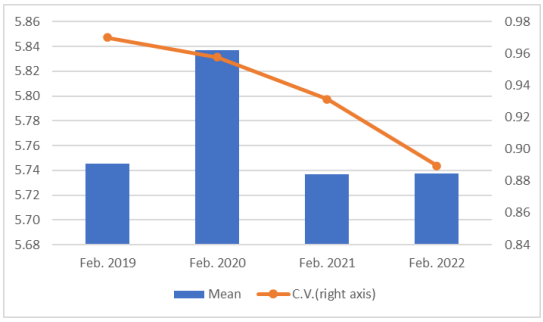

### (2) Weekday sleeping hours



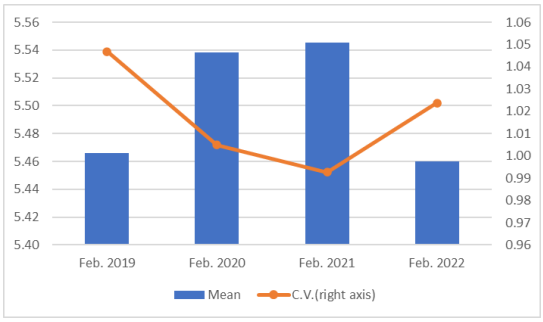

### (3) Life satisfaction



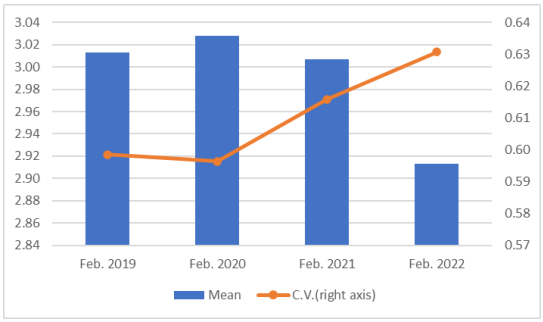

### (4) Health satisfaction




### (5) Job satisfaction (workers only)



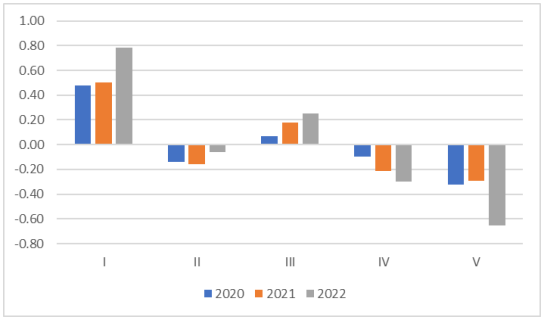

### (6) Work engagement (workers only)



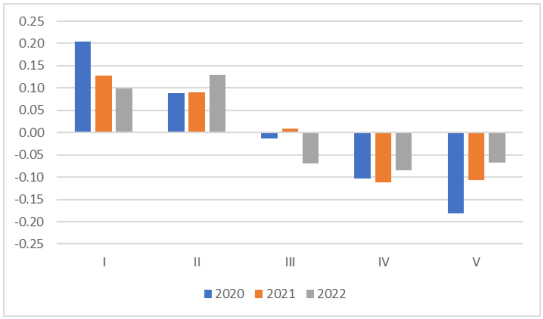

Source: Authors' calculation using the JHPS

**Figure 6. Mean deviations of each well-being measure from the total mean for each pre-pandemic income quintile group in February 2020, 2021, and 2022**

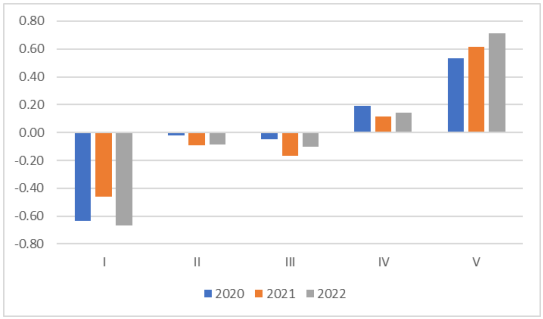
**(1) Mental health (K6)**



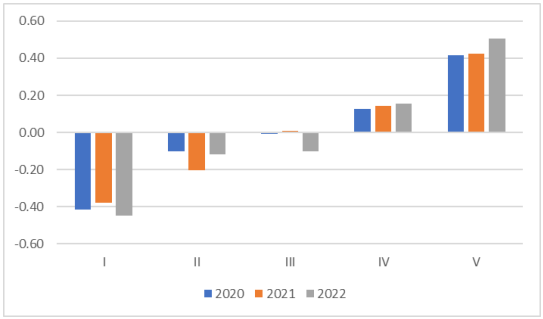

**(2) Sleeping hours (weekday)**



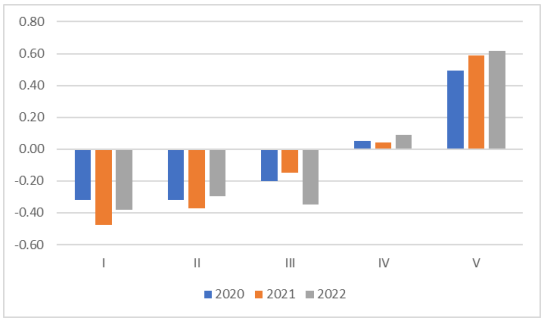

**(3) Life satisfaction**



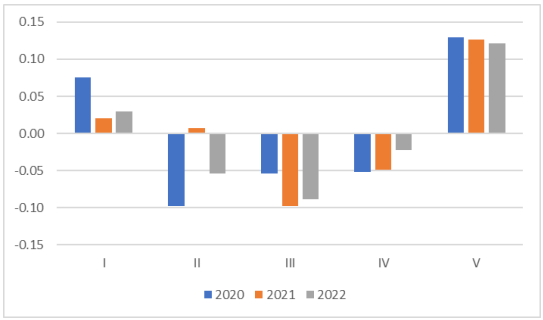

**(4) Health satisfaction**




**(5) Job satisfaction (workers only)**




**(6) Work engagement (workers only)**




Source: Authors' calculation using the JHPS
Note: Income quintile is calculated by the pre-pandemic income.

**Table 1. Changes in household disposable income by income group among the working population from 2019 to 2022**

(Unit: yen)

| | | Ⅰ | II | III | IV | Ⅴ |
|---|---|---|---|---|---|---|
| 2019-2020 | Current income | -1,402 | -7,103 | -7,780 | 10,656 | 10,713 |
| | Non-current income | 9,710 | 11,794 | 16,411 | 19,659 | 24,451 |
| | Nonconsumption expenditures | -270 | 1,076 | -1,229 | 5,887 | 6,584 |
| | Disposable income | 8,577 | 3,615 | 9,861 | 24,427 | 28,580 |
| 2020-2021 | Current income | -9,683 | 8,849 | 13,683 | -6,683 | 19,714 |
| | Non-current income | -6,853 | -9,059 | -14,709 | -14,714 | -17,467 |
| | Nonconsumption expenditures | -2,589 | -2,001 | -918 | -4,196 | 2,633 |
| | Disposable income | -13,930 | 1,175 | -109 | -17,200 | -386 |
| 2021-2022 | Current income | 22,362 | 9,751 | -2,129 | 20,656 | 15,340 |
| | Non-current income | 268 | -835 | 100 | -2,067 | -419 |
| | Nonconsumption expenditures | 4,329 | 3,469 | 1,577 | 5,497 | 3,257 |
| | Disposable income | 18,301 | 5,448 | -3,606 | 13,091 | 11,664 |

Source: Authors' calculation using *Family Income and Expenditure*, following Tanaka (2022) Table 2

Note: 1) The definition of income in Table 1 is averaged monthly household income, and it is not equivalized.

2) Current income is regular or replicable income that significantly affects households' consumption behavior, such as earning, business income, asset income, and regularly receiving social security benefit. Non-current income is irregular income such as donation and includes Special Cash Payment.

**Table 2. Changes in household gross income by income group**

(Unit: 10 thousands yen)

| | | Ⅰ | II | III | IV | Ⅴ | Total |
|---|---|---|---|---|---|---|---|
| 2019-2020 | Current income | -1.9 | -16.0 | -1.1 | 10.8 | -27.1 | -8.7 |
| | Non-current income | 9.5 | 12.7 | 14.8 | 13.7 | 16.8 | 13.5 |
| | Totalised household income | 8.3 | -3.6 | 14.2 | 24.4 | -10.6 | 4.9 |
| 2020-2021 | Current income | -9.9 | 16.8 | -2.0 | -13.1 | -23.7 | -8.6 |
| | Non-current income | -6.6 | -7.1 | -10.5 | -9.9 | -6.8 | -8.3 |
| | Totalised household income | -17.2 | 9.3 | -11.2 | -22.8 | -29.9 | -16.7 |

Source: Authors' calculation using the JHPS

Note: 1) The definition of income in Table 2 is annual household gross income, and it is not equivalized.

2) Current income includes earning, business income, asset income, interest, remittances, pension, and other regularly received social security benefits. Non-current income is other than current income and includes Special Cash Payment.

**Table 3. Workstyle and tasks before and after the pandemic**

| | Rate of remote work | | | Rate of overwork | | | Abstract task score | | |
|---|---|---|---|---|---|---|---|---|---|
| | Jan.2020 | Jan.21 | Jan.22 | Jan.2020 | Jan.21 | Jan.22 | Jan.2020 | Jan.21 | Jan.22 |
| I | 1% | 12% | 18% | 5.8% | 6.8% | 8.1% | -29% | -32% | -21% |
| II | 0% | 9% | 9% | 7.3% | 6.4% | 6.0% | -14% | -12% | -15% |
| III | 0% | 13% | 9% | 8.3% | 4.2% | 6.0% | -12% | -8% | -5% |
| IV | 0% | 16% | 13% | 9.3% | 9.9% | 9.3% | 8% | 11% | 4% |
| V | 3% | 24% | 19% | 8.9% | 8.1% | 5.7% | 19% | 26% | 22% |

Source: Authors' calculation using the JHPS
Note: 1) The definition of ratio of remote work is engaging in remote work more than once a week.
2) The definition of ratio of overwork is working more than 60 hours a week.
3) The calculations are made using working sample only.

## Table 4. Determinant of well-being from 2020 to 2022: fixed model estimation results

| | Mental health (K6) | | Sleeping hours | | Life satisfaction | | Health satisfaction | | Job satisfaction | | Work engagement (UWES3) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | [1] | [2] | [3] | [4] | [5] | [6] | [7] | [8] | [9] | [10] | [11] | [12] |
| Pre-pandemic income quintile (ref: I & II) | | | | | | | | | | | | |
| III | -0.129 | -0.128 | -0.0255 | -0.0257 | 0.348*** | 0.348*** | 0.270*** | 0.269*** | 0.152 | 0.152 | 0.0526 | 0.0526 |
| | -0.187 | -0.187 | -0.0519 | -0.0519 | -0.081 | -0.081 | -0.0916 | -0.0916 | -0.116 | -0.116 | -0.0667 | -0.0667 |
| IV | -0.444** | -0.445** | -0.103** | -0.102** | 0.580*** | 0.581*** | 0.311*** | 0.312*** | 0.438*** | 0.439*** | 0.038 | 0.0379 |
| | -0.18 | -0.18 | -0.0485 | -0.0485 | -0.0779 | -0.0779 | -0.0881 | -0.088 | -0.109 | -0.109 | -0.0624 | -0.0624 |
| V | -0.648*** | -0.642*** | -0.114** | -0.115** | 0.929*** | 0.926*** | 0.652*** | 0.649*** | 0.863*** | 0.859*** | 0.179*** | 0.179*** |
| | -0.181 | -0.181 | -0.0482 | -0.0481 | -0.0784 | -0.0784 | -0.0886 | -0.0886 | -0.108 | -0.108 | -0.062 | -0.0621 |
| Year 2022 dummy | 0.740*** | 0.761*** | -0.0289 | -0.0401 | -0.0935** | -0.107** | -0.176*** | -0.186*** | -0.0015 | -0.0289 | -0.0559 | -0.0549 |
| | -0.111 | -0.111 | -0.0323 | -0.0327 | -0.044 | -0.0443 | -0.05 | -0.0504 | -0.0805 | -0.0815 | -0.0424 | -0.043 |
| Intersection of pre-pandemic income quintle and Year 2022 dummy (Y2022) | | | | | | | | | | | | |
| III * Y2022 | -0.0436 | -0.0413 | 0.0457 | 0.0481 | -0.0779 | -0.0792 | -0.0784 | -0.0793 | -0.108 | -0.102 | -0.0696 | -0.0698 |
| | -0.185 | -0.185 | -0.0485 | -0.0485 | -0.0737 | -0.0737 | -0.0838 | -0.0838 | -0.121 | -0.121 | -0.0637 | -0.0638 |
| IV * Y2022 | -0.261 | -0.242 | 0.0765* | 0.0744 | -0.0432 | -0.0547 | 0.116 | 0.107 | 0.00934 | 0.00397 | -0.0025 | -0.0023 |
| | -0.178 | -0.179 | -0.0453 | -0.0453 | -0.071 | -0.0711 | -0.0807 | -0.0809 | -0.113 | -0.113 | -0.0596 | -0.0596 |
| V * Y2022 | -0.326* | -0.294 | 0.0812* | 0.0743 | 0.120* | 0.101 | 0.185** | 0.170** | 0.0193 | 0.00314 | -0.023 | -0.0224 |
| | -0.18 | -0.181 | -0.0455 | -0.0456 | -0.0718 | -0.0722 | -0.0816 | -0.0821 | -0.114 | -0.114 | -0.0598 | -0.0599 |
| Dummy of remote work | | -0.326* | | 0.0907** | | 0.201** | | 0.156* | | 0.216** | | -0.0081 |
| | | -0.193 | | -0.042 | | -0.0785 | | -0.0893 | | -0.102 | | -0.0548 |
| Constant | 4.432*** | 4.433*** | 6.431*** | 6.430*** | 5.846*** | 5.845*** | 5.587*** | 5.586*** | 5.293*** | 5.292*** | 3.038*** | 3.038*** |
| | -0.111 | -0.111 | -0.0336 | -0.0336 | -0.0481 | -0.0481 | -0.0543 | -0.0543 | -0.0754 | -0.0753 | -0.0432 | -0.0432 |
| Observations | 8,395 | 8,395 | 5,815 | 5,815 | 8,424 | 8,424 | 8,428 | 8,428 | 5,815 | 5,815 | 5,807 | 5,807 |
| Number of id | 4,846 | 4,846 | 3,518 | 3,518 | 4,844 | 4,844 | 4,847 | 4,847 | 3,519 | 3,519 | 3,510 | 3,510 |

Source: Authors' calculation using the JHPS

Note: 1) ***, **, and * indicate statistical significance at the 1 %, 5 %, and 10 % levels, respectively.
2) The sample is restricted to workers only for columns [3], [4], [9], [10], [11], and [12].

## Appendix Table. Other well-being inequality indices

| | 2019 | 2020 | 2021 | 2022 |
|---|---|---|---|---|
| K6 | | | | |
| Jenkins' inequlaity Index (upward-looking status) | 0.615 | 0.612 | 0.623 | 0.622 |
| Percent maximum standard deviation | 0.496 | 0.502 | 0.512 | 0.519 |
| Standard deviation | 4.587 | 4.622 | 4.970 | 5.052 |
| Coefficient of variation | 4.833 | 4.975 | 5.004 | 5.130 |
| Job satisfaction | | | | |
| Jenkins' inequlaity Index (upward-looking status) | 0.597 | 0.598 | 0.597 | 0.596 |
| Percent maximum standard deviation | 0.480 | 0.475 | 0.472 | 0.475 |
| Standard deviation | 2.392 | 2.359 | 2.346 | 2.364 |
| Coefficient of variation | 1.047 | 1.005 | 0.993 | 1.024 |
| Work engagement | | | | |
| Jenkins' inequlaity Index (upward-looking status) | 0.552 | 0.552 | 0.554 | 0.552 |
| Percent maximum standard deviation | 0.448 | 0.448 | 0.454 | 0.452 |
| Standard deviation | 1.343 | 1.344 | 1.361 | 1.356 |
| Coefficient of variation | 0.599 | 0.596 | 0.616 | 0.631 |
| Health satisfaction | | | | |
| Jenkins' inequlaity Index (upward-looking status) | 0.596 | 0.596 | 0.597 | 0.594 |
| Percent maximum standard deviation | 0.477 | 0.480 | 0.467 | 0.457 |
| Standard deviation | 2.361 | 2.364 | 2.311 | 2.259 |
| Coefficient of variation | 0.970 | 0.958 | 0.931 | 0.890 |
| Life satisfaction | | | | |
| Jenkins' inequlaity Index (upward-looking status) | 0.586 | 0.587 | 0.587 | 0.585 |
| Percent maximum standard deviation | 0.427 | 0.434 | 0.427 | 0.424 |
| Standard deviation | 2.072 | 2.105 | 2.078 | 2.064 |
| Coefficient of variation | 0.693 | 0.715 | 0.703 | 0.695 |

Source: Authors' calculation using the JHPS