Cabinet Office

ESRI Discussion Paper Series No.392

Inequality Dynamics in Japan, 1981-2021

Sagiri Kitao
Tomoaki Yamada

April 2024

Economic and Social Research Institute
Cabinet Office
Tokyo, Japan

Inequality Dynamics in Japan, 1981-2021*

Sagiri Kitao GRIPS

Tomoaki Yamada Meiji University

Abstract

This paper examines the path of economic inequality in Japan spanning four decades (1981-2021) using the Family Income and Expenditure Survey. Over this period, inequality in earnings, disposable income, and consumption has widened. Earnings inequality, measured by the Gini coefficient, exhibited a non-linear increase from 0.24 to 0.29, with a significant rise in the 1980s and early 2000s. Conversely, disposable income showed a modest downward trend since the mid-2010s. Despite this, consumption inequality continued to rise moderately, indicating a divergence in the dynamics of disposable income and consumption inequality. Analysis from a life cycle perspective confirms the different shapes of age profiles for income and consumption inequality. Our findings also highlight substantial variations in age-specific inequality across different consumption items.

Keywords: Inequality trends, life cycle inequality, Consumption inequality, Income inequality

JEL Classification: D12, D31, E21, J11

*We are grateful to Hirokazu Ishise and Yutaka Murayama for helpful comments. The Statistics Bureau of Japan provided us with the microdata from the Family Income and Expenditure Survey. This work is supported by JSPS KAKENHI Grant Numbers 18KK0368, 21K01404, 22H00831, and 22H05008. The views expressed in this paper are those of the authors and do not represent those of the institution the authors are affiliated with.

1 Introduction

Since the Great Recession, there has been growing concern about the widening economic inequality worldwide, as highlighted by movements such as Occupy Wall Street in 2011 and the bestselling book on inequality by Piketty (2014). In addition, the existence of tax havens has heightened the inequality associated with the concentration of wealth.[1] In Japan, interest in economic inequality grew earlier, with books on economic inequality already published in the late 1990s.[2] The rising concerns about inequality partly stem from the collapse of the Japanese employment system, characterized by lifetime employment and the seniority wage system, as well as the uncertain outlook for the Japanese economy following the burst of the bubble. This study analyzes the transition of economic inequality in Japan over the last four decades, from 1981 to the present.

Lise et al. (2014) conducted a comprehensive analysis of the dynamics of inequality in the Japanese economy in 1981-2008 as part of the Review of Economic Dynamics' (RED) special issue project.[3] The project aims to make international comparisons of inequality by aligning the definitions of variables in each country as much as possible. In Japan, the analysis was published in 2014, using four sets of microdata: panel data from the Japanese Panel Survey of Consumers (JPSC), the Basic Survey on Wage Structure (BSWS), the Family Income and Expenditure Survey (FIES), and the National Survey of Family Income and Expenditure (NSFIE). All data sets, except for the JPSC, are government statistics, and the analysis was conducted using data from 1981 to 2008, which was available at the time. Since then, the Japanese economy has undergone various events, such as the Great Recession, the Great East Japan Earthquake, Abenomics'

[1] For the recent discussion on global economic inequality, see Saez and Zucman (2019) and Milanovic (2016); ?? (Mil).

[2] For example, Tachibanaki (1998) points out the possibility of widening inequality in the late 1990s. Ohtake and Saito (1998) emphasized that demographic changes significantly impacted the rise in economic inequality in the 1970s and 1980s.

[3] The project aims to understand the time series and life cycle aspects of economic inequality measured by various aspects such as wages, labor income, consumption, and assets for nine countries (U.S., UK, Canada, Germany, Italy, Spain, Sweden, Russia, and Mexico). The results of the special issue are summarized in Krueger et al. (2010). Japan is added in 2014 (Lise et al. (2014)). Heathcote et al. (2023) update their data from 1967-2006, conducted by Heathcote et al. (2010), to 1967-2021 for the U.S. economy. Bryukhanov and Hryshko (2024) also provide an economic inequality analysis of the time-series direction and life cycle aspects of the Russian economy.

policy mix of quantitative and qualitative easing and expansionary fiscal policy, and the COVID-19 crisis. All of these are extremely important events for examining the transition of inequality, and it is also essential to understand the mechanism of inequality expansion by confirming how these events contributed to the expansion and contraction of inequality. This paper extends the period of their analysis to examine what has happened with respect to economic inequality in Japan over the last decades with a particular focus on the most recent decade.

The RED Project also addresses the life cycle aspects of economic inequality, a topic of increasing relevance given the ongoing demographic changes in Japan. It is widely known that demographic changes have distinct impacts on economic inequality. For instance, as Deaton and Paxson (1994), Ohtake and Saito (1998) and Abe and Yamada (2009) show, there is a significant difference in both the level and inequality between the labor income of young workers and that of older workers. This discrepancy can be influenced by various factors, including differences in skills and productivity associated with the birth cohort and years of experience, as well as efforts, luck and misfortune. As Japan's birthrate declines and its population ages rapidly, understanding how these demographic changes affect economic inequality is crucial for predicting their impact on the Japanese economy.

A unique feature of the RED project is its focus on the analysis of economic inequalities from a macroeconomist's perspective. Specifically, the analysis is based on households' budget constraints and proceeds on how the idiosyncratic risks faced by households spill over and affect widening inequality. The budget constraint of households assumed in this paper is a common basis for the so-called Heterogeneous Agent New Keynesian (HANK) model, which is currently attracting attention as a framework for analyzing monetary and fiscal policy.[4] The estimation of idiosyncratic risk itself is

[4]In the HANK models, policy analysis focuses on the relationship between economic inequality and monetary and fiscal policy. That is, it discusses how heterogeneity in households and firms creates differences in the effectiveness of economic policies or how fiscal and monetary policies affect income and consumption inequality. The number of analyses using the HANK model has increased rapidly in recent years; regarding the relationship between heterogeneity and macroeconomic policy, see, for example, Bilbiie (2008), Inui et al. (2017), Bayer et al. (2018), Kaplan et al. (2018), Bilbiie (2020), Gornemann et al. (2021), Inaba and Kengo Nutahara (2023).

not performed in this study because of the inability to distinguish between wages and hours worked due to the limitations of the data set.[5] Instead we focus on the time-series and life cycle dimensions of inequalities in this paper.

Our main research findings regarding the trends of labor and income inequality are as follows. First, labor income inequality increased in the 1980s and early 2000s and has remained high during the following two decades. It is important to note that we are not currently in a phase of rising inequality. Rather, disposable income inequality has slightly decreased during the Abenomics policy period. Both labor income and disposable income inequality have increased sharply during the COVID-19 crisis period.

Second, although income and consumption inequality trended in an almost parallel fashion before 2010, they started to diverge since the beginning of the 2010s. While the inequality in disposable income has declined slightly, consumption inequality has increased moderately in the 2010s. This discrepancy could be attributed to the permanent income hypothesis, in which households' consumption decisions depend not only on current income but also on future income. They may perceive the narrowing of income inequality as a temporary phenomenon, which is not reflected in consumption inequality.

This paper is organized as follows. Section 2 describes details of our data, the Family Income and Expenditure Survey. In Section 3, we documents the development of inequalities in earnings, income, and consumption across Japanese households from 1981 to 2021. Section 4 illustrates the life cycle aspects of inequality. In particular, we focus on the life cycle profiles of disaggregated expenditure items. Section 5 concludes.

2 Data

We use the Family Income and Expenditure Survey, which is compiled by the Statistics Bureau, Ministry of Internal Affairs and Communications.

[5]Following the approach by Blundell et al. (2008), Okubo (2015) estimate the size of permanent and transitory income shocks using microdata of Japanese economy. For recent progress in the estimation of income, see, for example, Arellano et al. (2017).

2.1 Family Income and Expenditure Survey (FIES)

The FIES is a monthly survey of households that collects information on earnings, income and expenditures of each household as well as various characteristics of household members such as their ages, gender, occupation, industry of employment, marital status, and region of residence.[6] In this study, we use 41 years of the survey data from January 1981 to December 2021. The FIES consists of two data sets: (i) households that consist of two or more members, such as couples and extended families, and (ii) single households. The FIES started collecting data for single households in January 2002, and the data for two or more household members are available for the entire sample period. Therefore, we focus on households with two or more household members for consistency.

The FIES is a rotating panel data that follows the same household for a maximum of six consecutive months, after which another household replaces the household; the sampled households overlap, and one-sixth of the total samples are generally replaced by new households each month. However, since there is no ID to identify the same household in our data set, the households are connected to form a panel based on household characteristics and prefecture information, following the approach by Stephens and Unayama (2011). Households participate in the survey for a maximum of six months, but some households drop out during the survey period, resulting in unbalanced panel data. The sample size for each month is approximately 8,000 households. Since the data is collected monthly, the FIES is suitable for capturing high-frequency dynamics of inequality, such as business cycles, in comparison to the Panel Study of Income Dynamics (PSID) and Consumer Expenditure Survey (CEX) in the U.S.

2.1.1 Target Variables

Our analysis focuses on the dynamics of inequality in earnings, income, and consumption. Regarding the definition of these three variables, we follow the approach of Heathcote et al. (2010) and Lise et al. (2014) for international comparisons and consistency. The

[6]The FIES is one of the government's "fundamental statistical surveys." It is used to calculate the Consumer Price Index in Japan and is also used to calculate private consumption expenditures in the GDP.

basic idea, as advocated by Heathcote et al. (2010), is to construct variables step-by-step from the following budget constraint of a household:

$$c + a' = y_L + (1 + r)a + b + T,$$
$$y = y_L + ra + b,$$
$$y_D = y_L + ra + b + T,$$

where c denotes consumption, a is asset holdings, y_L is household earnings, r is the real interest rate, b is private transfers, and T is net public transfers including tax payments and premiums for public pension, health insurance, and long-term care insurance programs.

We mainly focus on the dynamics of inequality in earnings y_L, pre-government income y, disposable income y_D, and consumption c.

2.1.2 Earnings, Asset Income and Disposable Income

In the FIES, each household reports two types of information on income: last year's annual income and monthly incomes. Annual income is reported only once for each household.[7] The annual income is the combined total income of all household members and cannot be separated for each earner. Given these limitations with the annual income variable, we primarily use monthly earnings of all household members to compute earnings of the household. We also use income information for detailed information about household finances such as asset income, taxes, and transfers.

The variables created from the monthly data are as follows:[8]:

- **Household earning** y_L: Household earning is the sum of monthly earnings of household head, his/her spouse and other household members. Monthly earnings includes regular salary, temporary salary, bonuses and piecework salary.

[7]The *previous year's* annual income depends on the timing of the survey; for example, a household that participated in the survey for the six months from March to August would have reported income for each month and last year's annual income for 12 months from last March to this February.

[8]For details, see Sudo et al. (2012), and Lise et al. (2014)

- **Pre-government income** y: To construct the pre-government income, we add private transfers b and asset income ra to the household earning y_L. The private transfers consist of remittances and gifts. Asset income includes house rents, property income, and income from self-employment.

- **Disposable income** y_D: To construct the disposable income, we add social security benefits to and subtract taxes and premium for social insurance programs from pre-government income y. The social insurance premium consists of premium for public pension, health insurance, and long-term care insurance programs. The taxes consists of income taxes, residence taxes and other taxes.

All variables related to income are deflated using the CPI. We equivalize all variables using the OECD equivalent scale following the convention in the RED Project.

2.1.3 Consumption/Expenditure

FIES sample households are required to keep a monthly household account book and submit it at the end of the survey period. Therefore, the information on expenditures is considered more accurate than that in so-called recall data such as the PSID. The definitions of the expenditure variables we focused on this analysis are as follows.

- **Non-durable expenditure** c_{ND}: As for the non-durable expenditure, we follow the definition by the Ministry of Internal Affairs and Communications. Thus, c_{ND} consists of general food items, fuel, light & water charges, domestic non-durable goods, medicines, health fortifications, school textbooks, books, tobacco, and other miscellaneous items.

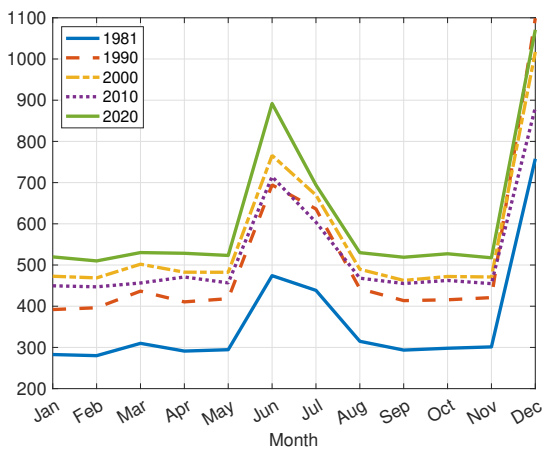
- **Total expenditure** c_T: The total expenditure includes, in addition to the non-durable expenditures defined above, services, semidurables and durable expenditures. Housing purchases are not included.[9]

Again, all variables are deflated by the CPI.

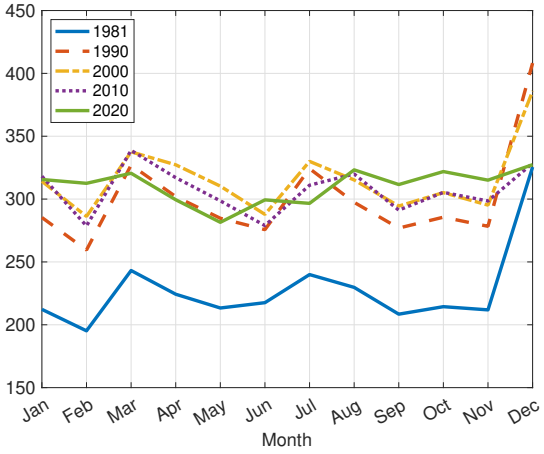
[9]For more details on the definition of expenditures, see Kitao and Yamada (2023).

2.1.4 Seasonality

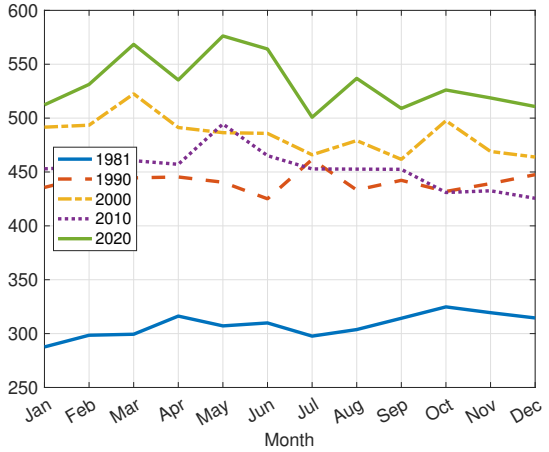
Monthly earnings and expenditures exhibit seasonality, as shown in Figures 1a and 1b, which plot raw monthly earnings and total expenditures, respectively. The monthly earnings in Japan exhibit a significant seasonal pattern due to a unique characteristic of the Japanese labor market, where bonuses are traditionally paid twice a year, in June (or July), and in December. Expenditures also have seasonality. For instance, education expenditures peak in March due to tuition fee payments as the new academic (and fiscal) year starts in April in Japan, while December marks a high season for leisure and expenditures to prepare for the new year.



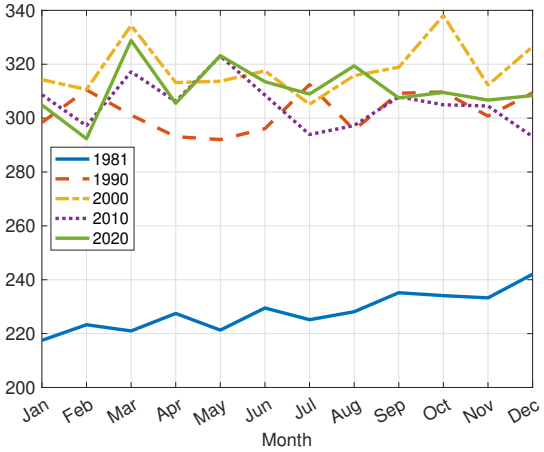
(a) Earnings y_L: Raw



(b) Total Expenditure c_T: Raw



(c) Earnings y_L: 6-months Average



(d) Total Expenditure c_T: 6-months Average

Figure 1: Seasonality in Earnings and Total Expenditure

Source: FIES. Unit is 1,000 yen. **SSY Figure 2.**

To weaken the influence of seasonality, we conduct the calculations following Lise et al. (2014) and Sudo et al. (2012). For each household, we take the 6-months average of earnings and total expenditure respectively, after controlling for monthly effects by running a regression with monthly dummies. We drop households that did not complete six months of survey. Since the bonuses are paid twice (summer and winter) a year traditionally, the 6-months average of earnings will weaken the influence of seasonality partially. In Figures 1c and 1d, we plot the 6-months average earnings y_L and total expenditure c_T for each month. Note that in this calculation, one household has a one

observation for earnings and consumption even if they answer consecutive six months for the survey. As the figures show, the seasonality patters flatten for both earnings and total expenditure, although weak seasonality still remains.

2.1.5 Sample Selection

In this study, we follow the method of Lise et al. (2014) for sample selection for the purpose of international comparisons and comparability with previous studies. However, as described below, in some cases we may use a different sample to maximize the potential of the data. We will use the following three sample selections.

Sample A: All sample The first method is to pool all samples. In this sample, we do not calculate the 6-months average discussed above and use all monthly data.[10] While the sample size is large as shown in Table 1, there are some problems due to the characteristics of the FIES. In the FIES, while almost all households report their consumption expenditures in all years, the monthly income is available only for households whose head is employed. The data is missing for households whose head is unemployed or self-employed.

Sample B: RED Lise et al. (2014) focus only on households whose head is an employed worker to ensure consistency among earnings, income and consumption. In addition, samples are restricted to households with heads aged between 25 and 59. There is a mandatory retirement system in Japan, and individuals typically have to retire when they reach a certain age according to company rules. In recent years, many companies have set the retirement age at 65 or 60; in the latter case, companies are now required to offer an opportunity to rehire the employees to continue working until age 65 after adjusting their wages. However, our data set goes back to the 1980s. In the labor market customs in those early years, rehiring programs are not standard, and many people retired at age 60. In fact, in the early 1980s, some companies had the retirement age

[10] We use this Sample A for the analysis of consumption expenditures and our results are not affected much when we use monthly dummies to remove seasonality.

of 55. In addition, Japanese companies traditionally have a retirement allowance system, and many companies, especially large ones, pay large lump-sum retirement benefits upon retirement. Since retirement allowances at large companies could amount to tens of millions of yen, we focus on households with heads of household aged 59 and below in Sample B, to eliminate the extreme inequality driven by this one-time payment.

Table 1, marked as Sample B, shows the sample size evolution when following the method of Lise et al. (2014). First, as noted above, we compute the six-month average for each household to remove seasonality. There are 698,317 households that responded for all six months. Of these, 450,381 are households whose head of household is at least 25 and less than 60. The final sample size is 338,317 after dropping households with missing income and consumption data and trimming the top and bottom 0.25% of the sample size.

Sample C: Quarterly Data The third dataset is quarterly data. Sample A utilizes the entire sample, so household information in the dataset is available on a monthly frequency. Sample B, on the other hand, averages the responses of each household over six months so that each household has only one observation, which is then pooled by year.[11] In Sample C, we construct a quarterly data set generated from the original monthly data. This is to create the primary data for time-series analysis since many of the aggregate data, such as GDP, is collected quarterly.

To create the quarterly data in Sample C, we combine each household's quarterly income and consumption data. For households that responded from January through June 2000, we take January-March totals as the first-quarter values and April-June totals as the second-quarter values. In the case of households that began responding in February for six months, only the second quarter values are added to the data set, and data from other periods are not used. As in Sample B, we also limit the sample to

[11]For example, a household who began responding in September 1990 would have responded for six months (September, October, November, and December in 1990, and January and February in 1991), and it is included as a observation for 1990. On the other hand, households that started in November are treated as a 1991 data set; if they started in October, they were treated as a 1990 data set, even though they responded for exactly half the time.

households whose heads are aged between 25 and 59.

Table 1: Sample Selection

	Observations deleted	Remaining observations
Original data set (1981 – 2021)		3,866,614
Sample A		3,866,614
Households who answer all the six-months		698,317
Aged less than 25 and more than 60	247,936	450,381
Non-positive/missing labor income	93,487	356,897
Non-positive/missing disposable income	17	356,880
Non-positive/missing consumption	0	356,880
Zero earnings at initial month	14,287	342,593
Trimming	4,276	338,317
Sample B		338,317
Construct quarterly series		417,768
Trimming	4,795	412,973
Sample C		412,973

3 Inequality Over Time

In this section, we analyze the dynamics of inequality in the Japanese economy from a time series direction.

3.1 Earnings Inequality

Figure 2 shows the trends of inequality in equivalized household earnings, based on various measures of inequality. As observed in all four figures, earnings inequality steadily increased between 1980 and 2000 and stabilized thereafter, staying at the elevated level for the following two decades.

As Figure 2a shows, labor income inequality, as measured by the logarithm of variance, has increased from 0.19 to 0.31 over the last 40 years. However, inequality does not continue to increase monotonically. Labor income inequality rose throughout the 1980s. After the bubble burst around 1990, inequality remained high. It was not until

around 2000 that labor income inequality began to grow again. Since the mid-2000s, it has again remained at a high level, as is already mentioned in Lise et al. (2014) and Sudo et al. (2012).

Since the 1980s, labor income inequality in Japan has been on an upward trend, and it is difficult to find a period when inequality has shrunk. In Figure 2a, the shaded periods indicate recessions.[12] From Figure 2a, it is difficult to find a simple relationship between booms and busts and widening economic inequalities. However, it is a recent trend that labor income inequality has shown a slight tendency to shrink during the boom period after 2013, the so-called Abenomics policy period. In addition, the COVID-19 crisis that began in 2020 raised labor income inequality sharply, despite the slight labor income inequality in the late 2010s.

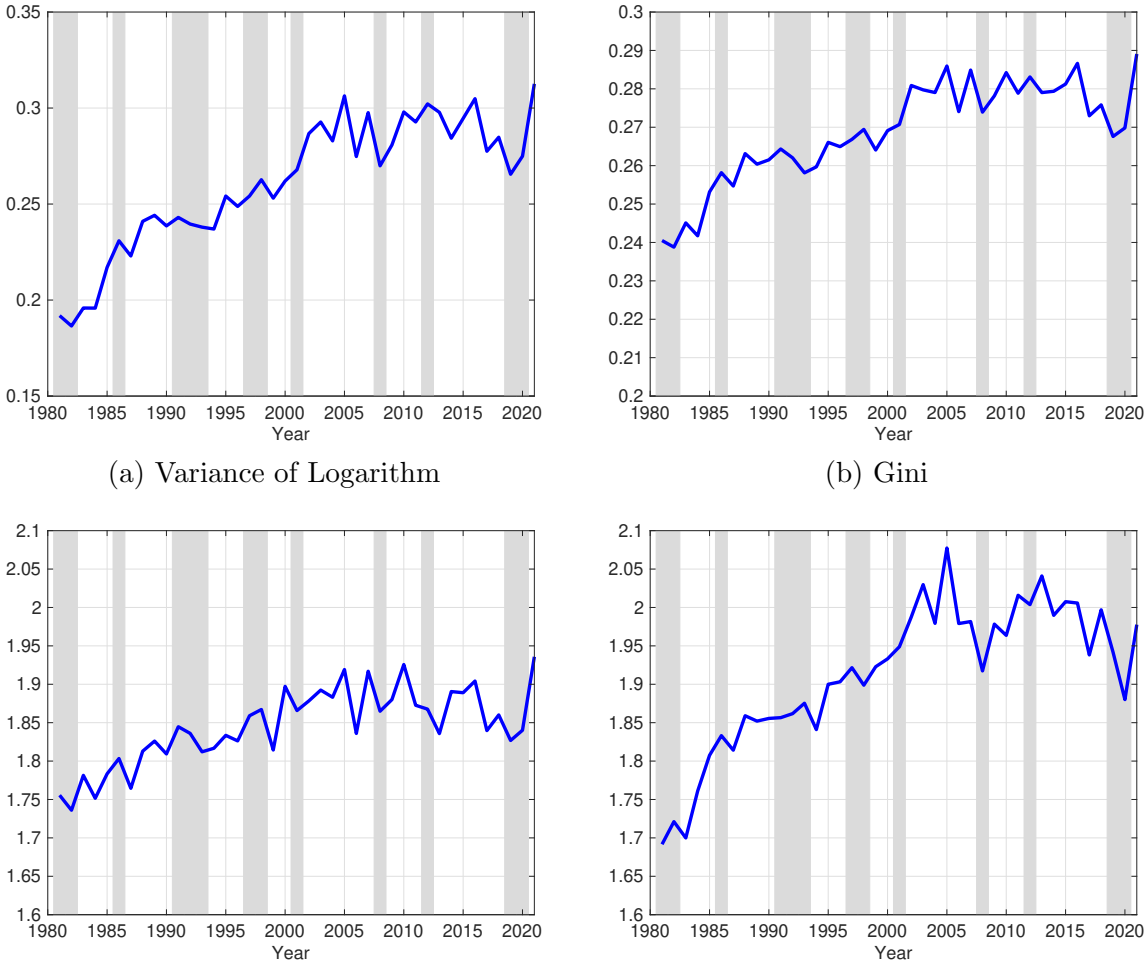
There are several ways to measure economic inequality. There are cases in which widening inequality is caused by the wealthy becoming even richer, and conversely, there are cases in which the bottom drops further, and inequality widens. In particular, as Piketty (2014) points out, there is a worldwide concern that wealth is becoming more concentrated as the rich become richer, especially in the U.S. To confirm this point, let us look at indicators other than the variance of logarithms.

Figure 2b shows the change in inequality as measured by the Gini coefficient, a representative indicator used to measure economic inequality. Compared to Figure 2a, no significant differences are observed. Although the variance of logarithmic tends to increase as nearly zero earners increase, there is no clear difference between the two indicators regarding economic inequality.

Figure 2c shows the ratio of the labor income of households in the 10th percentile to that of households in the 50th percentile for each year. In other words, as the labor income of the bottom 10th percentile declines relative to the median, this value will increase. The P50/P10 continued to rise moderately from 1981 to the early 2000s, after which it stopped expanding. The rise in P90/P50 in Figure 2d created the widening gap in the 1980s stated above. P90/P50 also re-expanded in the 2000s, but then declined

[12]The recessionary period is according to the official view of the Cabinet Office: https://www.esri.cao.go.jp/jp/stat/di/hiduke.html.

slightly. These developments suggest that the Japanese economy has not experienced an extreme concentration of labor income.[13]



(a) Variance of Logarithm

(b) Gini

(c) P50/P10

(d) P90/P50

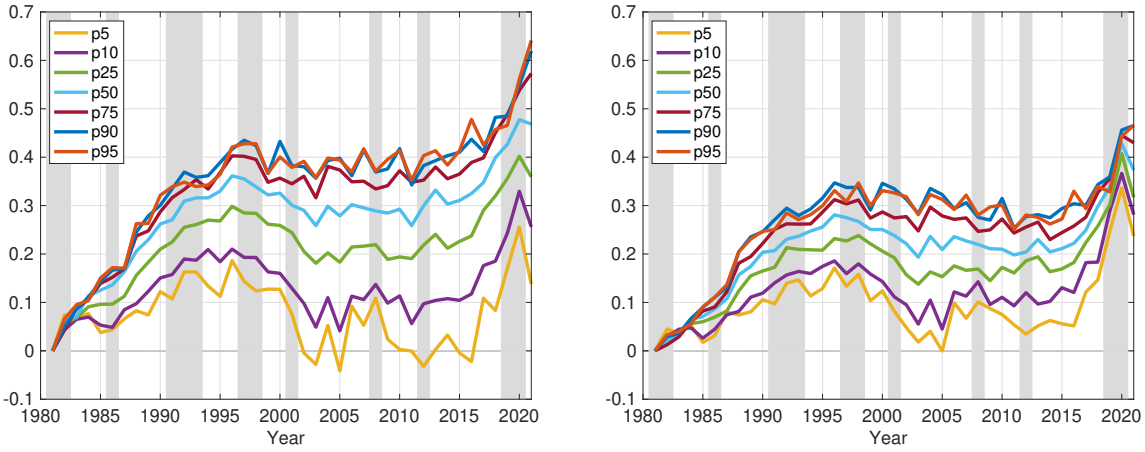
Figure 2: Various Measures of Equivalized Household Earnings Inequality

Source: FIES. Sample B is used.

To understand this trend of inequality in more details, Figure 3 shows the equivalized household earnings and disposable income at different percentiles. Dividing the earnings and income values by those in 1981 for normalizaion, all percentiles indicate how much they have grown since 1981. As shown in Figure 3a, household earnings grew much more rapidly in the upper percentiles from 1981 to around 2000. At the top 5, 10 and 25

[13]For the evolution of concentration of income in the long-run, see, for example, Moriguchi and Saez (2008).

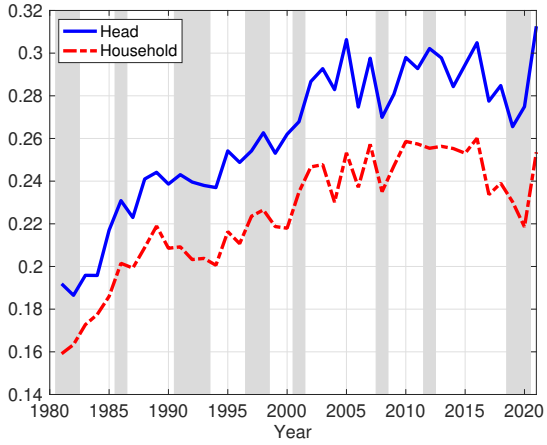
percentiles, earnings in 2000 was about 40% above the level in 1981, but at the bottom 5 and 10 percentiles, earnings grew by only 20% or less during the same period. After 2000, earnings at all percentiles ceased to grow, at least until the late 2010s, which accounts for the flat path of inequality index shown in Figure 2. The paths of disposable income are more compressed than those of earnings as shown in Figure 3b, mainly due to the progressive labor income taxes. The disposable incomes of the bottom 5% and 10% grew in the mid to late 2020s, while the top 5% and 10% grew relatively mildly, which has narrowed the gap. However, the COVID-19 crisis reduced earnings and disposable income of households who are below median levels, resulting in the widening inequality.



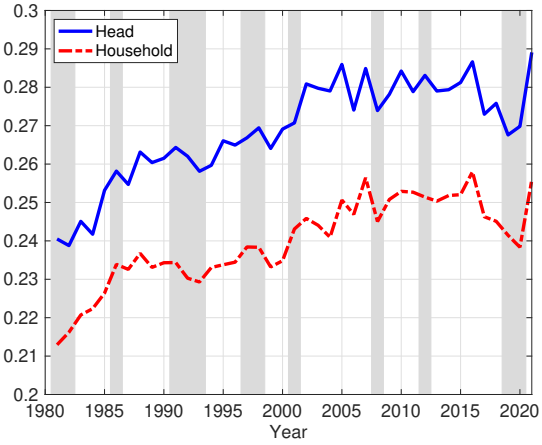
(a) Equivalized Household Earnings (b) Equivalized Disposable Income

Figure 3: Percentiles of the Equivalized Household Earnings Distribution
Source: FIES. Sample B is used.

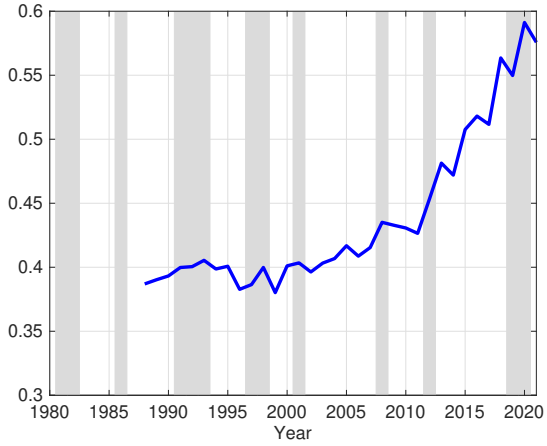
Figure 4 compares the inequality trend in earnings of household heads with that of equivalized households. As shown in the two top panels, the level of inequality is lower for equivalized earnings of households, implying that earnings of family members mitigate inequality across households. The share of two-earner household has increased since early 2000s, as female labor force participation has increased during this period.



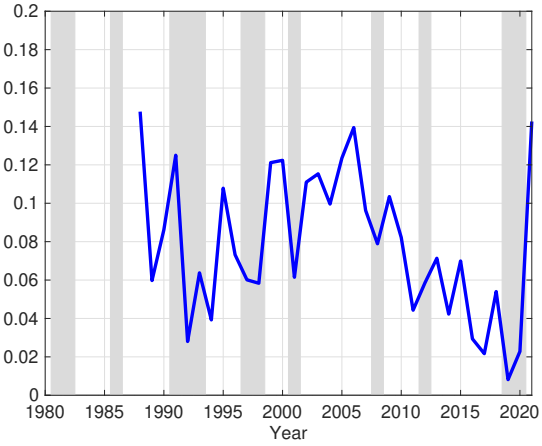
(a) Head and Equivalized Household Earnings (Var. of Log)



(b) Head and Equivalized Household Earnings (Gini)



(c) Proportion of Two-earner Households



(d) Between-spouse Corr. of Log Earnings

Figure 4: Understanding the Role of the Family for Earnings Inequality

Source: FIES. Sample B is used.

3.2 Income Inequality

Generally, the inequality in labor income attracts much attention due to the ease of collecting data. However, what ultimately determines our welfare is not how much we earn in some periods, but how much we consume (and enjoy leisure). According to the permanent income/life cycle hypothesis, the permanent income, which includes past and future income, determines current consumption. It is also important to consider the role of public and private transfers in shaping income distribution. Private transfers, such

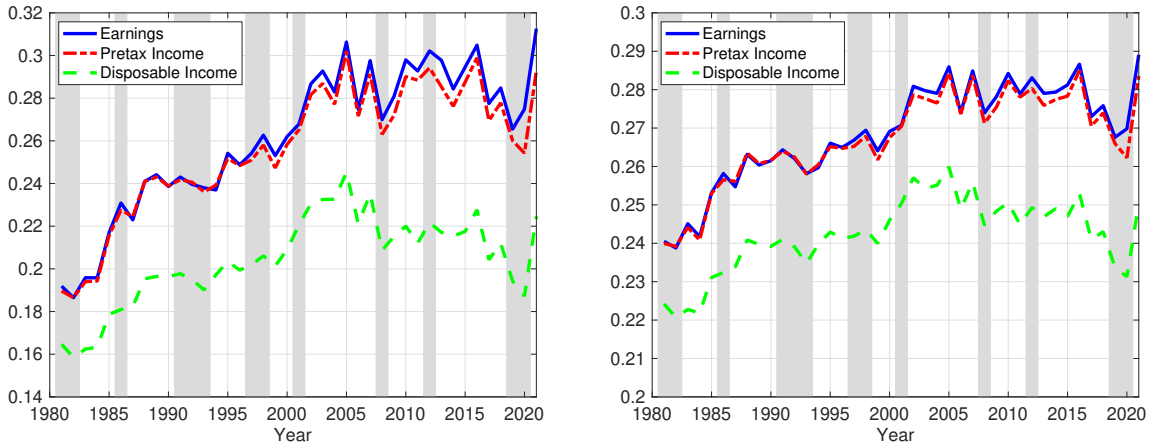
as remittances from relatives, and public transfers, such as the payments based on the social security system, can significantly impact an household's income.[14] Additionally, due to progressive income taxation, the higher the income, the higher the income tax bracket and more taxes are deducted from income. Also, since our dataset is based on households rather than individuals, if retired adults are included as household members, his/her public pension benefit will be added to the total income. Thus, although our sample selection focuses on working households with heads aged 25-59, our results would be affected by the public pension system via cohabiting family members. There are also significant differences in household composition between the 1980s and 2020s, such as the share of individuals living with their elderly parent(s). Note that the OECD equivalent scale would adjust for some of the effects of household composition but does not entirely control for it.

Figure 5 compares the trend of inequality in earnings, pretax income, and disposable income. Inequality does not differ much between earnings and pretax income, which also includes asset income. In the FIES, households have a relatively small amount of asset income, and adding it does not affect pre-government income inequality. However, this point may be due to the possibility that households under-report asset income in the FIES. Some studies point out the same possibility with the National Survey of Family Income and Expenditure (NSFIE), but data limitations make further analysis difficult.

Inequality of disposable income is lower as the dispersion is compressed by progressive labor income taxes. The gap between pre-government and disposable income is wider after 2010 than in the 1980s. In other words, redistributive effects of progressive income taxes and other government policies have strengthened. In the 1980s, the progressivity of income tax in Japan was high, with the highest marginal tax rate of above 70%. As the Reagan and Thatcher administrations lowered the marginal tax rates in the U.S. and the U.K. in the 1980s, Japan followed suit, leading to a weaker redistributive effect of income taxation. The data apparently show the opposite relationship. How did it happen? In the FIES, income earners who are in the highest marginal tax bracket is

[14]It is worth noting that health and long-term care insurance systems are often in-kind transfers and therefore may not be reflected in income from surveys like the FIES.

very few, as most of them are employed workers. Therefore, the reduction in the top marginal tax rates does not necessarily result in higher inequality in after-tax income. Moreover, as shown in Figure 3b, disposable income below median grew rapidly, which contributed to a decline in inequality.



(a) Earnings and Pretax Income (Var. of Log) (b) Earnings and Pretax Income (Gini)

Figure 5: From Earnings to Disposable Income

Source: FIES. Sample B is used.

3.3 Consumption Inequality

Figure 6 shows that consumption and disposable income tend to move in the same direction, as also indicated by the positive covariance in Figure 6a. Although inequality in disposable income declined since the mid-2010s, inequality in consumption remains flat, resulting in a mild decline in covariance. Consumption of non-durable goods exhibits lower inequality than total consumption. Non-durable goods consists of items that are typically essential for all households, such as general food items and utility charges and tend to vary less across households compared to durable goods and services. This pattern is consistent with the standard consumption smoothing theory. That is, households adjust their consumption across time so that the marginal utilities are equal intertemporally. Consumption smoothing is easier for non-durable goods and more diffi-

cult for durable goods, purchased less frequently and more expensive.[15] This contributes to higher inequality of total and durable consumption expenditures than that of non-durable expenditures.[16]

It is an interesting observational fact that the most recent decade has seen a divergence in disposable income and consumption inequality trends. Until around 2008, when Lise et al. (2014) and Sudo et al. (2012) conducted their analysis, income and consumption inequality had been moving almost parallel. Why have they diverged in recent years?

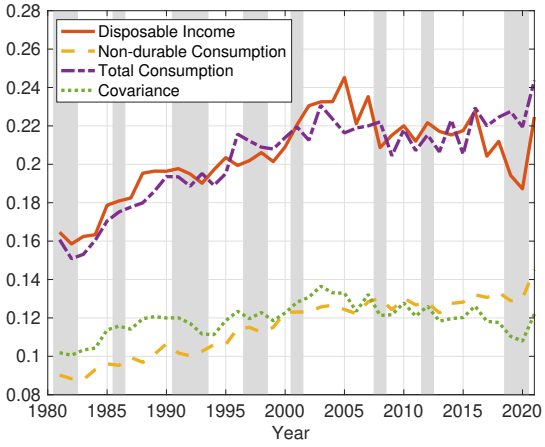
One possibility is that the nature of the idiosyncratic risk faced by households may have changed. As noted by Storesletten et al. (2004) and Blundell et al. (2008), households' labor income faces idiosyncratic risks of a different nature; persistent and temporary shocks. Temporary shocks are iid shocks determined each period; for example, the Japanese bonus system is uncorrelated with the previous period.[17] On the other hand, a persistent shock is one that, once realized, affects earnings over a long period, such as a wage base increase or promotion. In both cases, as the shock size increases, the inequality measured by the variation in a particular year appears to widen. However, as Blundell et al. (2008), Okubo (2015) and Kubota (2020) have analyzed, consumption responds to changes in permanent income but rarely to temporary income shocks. Thus, if the size of persistent shocks increases while temporary shocks decrease, income inequality may remain constant or decrease slightly, but consumption inequality may increase. Another possibility is the presence of unrealized capital gains of stocks or upsurge of household assets. Japanese stock prices rose substantially during the Abenomics policy period. However, the income inequality in the data has not increased without selling stocks/assets. Under these circumstances, households holding stocks make consumption decisions based on their unrealized but inflated lifetime assets, thus creating a discrep-

[15] Higa (2019) discusses the possibility of under-reporting of durable goods purchase due to survey fatigue.

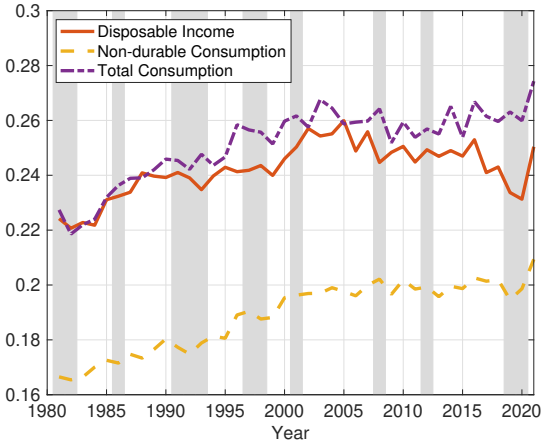
[16] For mode details on the consumption smoothing and consumption insurance, see Kaplan and Violante (2010), Attanasio and Pistaferri (2014, 2016) and Aguiar and Bils (2015).

[17] More precisely, bonuses may not be iid shocks since the bonus payments depend on firm performance with the business cycle, which is persistent for several years.

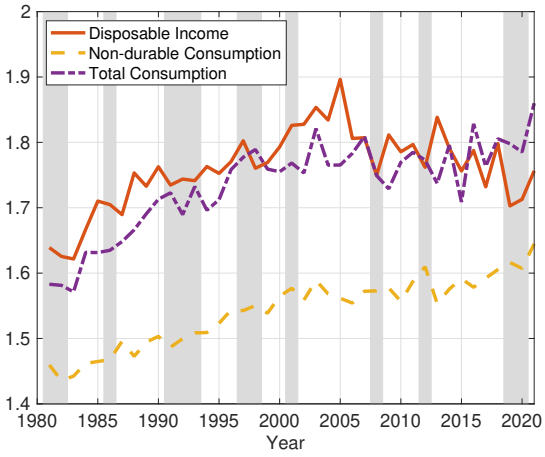
ancy between income inequality and consumption inequality movements. Various other hypotheses are possible, but this point requires further research based on theoretical models.[18]



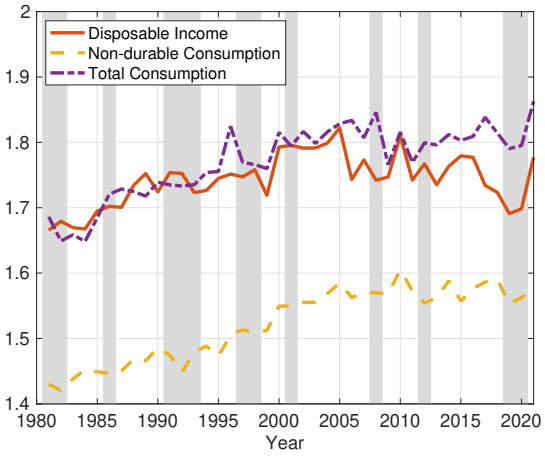
(a) Equiv. Disposable Income and Consumption (Var. of Log)



(b) Equiv. Disposable Income and Consumption (Gini)



(c) Equiv. Disposable Income and Consumption (P50/P10)



(d) Equiv. Disposable Income and Consumption (P90/P50)

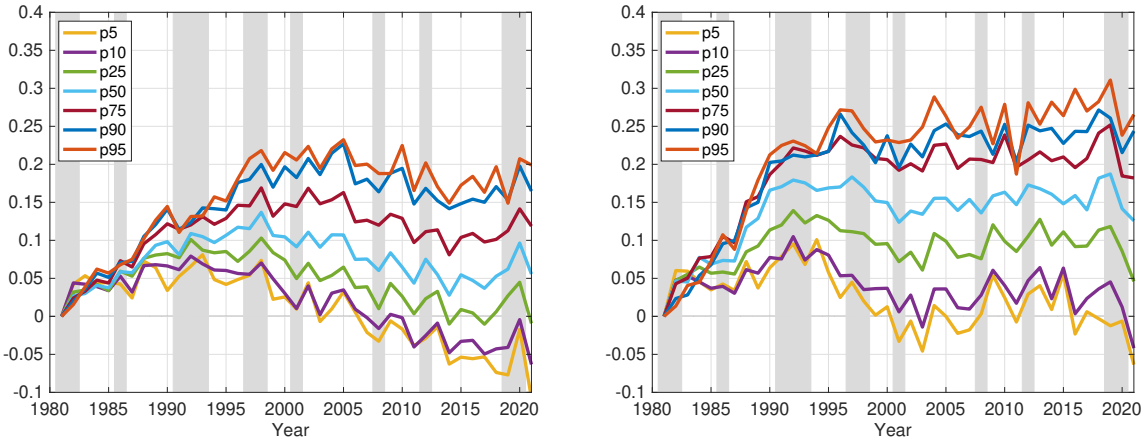
Figure 6: From Disposable Income to Consumption

Source: FIES. Sample B is used.

Figure 7 shows the changes in equivalized consumption expenditures at different percentiles. As shown in Figure 7a, the level of non-durable expenditures at the top 5 and 10 percentiles grew rapidly, reaching 20% above the level of 1980 by the late

[18]Based on the U.S. data, Krueger and Perri (2006) explain that income inequality and consumption inequality are not necessarily linked in the limited enforcement model.

1990s, and stayed at the same level until around 2010. Non-durable expenditures at the bottom 5 and 10 percentiles grew more slowly initially and started to decline after the late 1990s, falling below the level of 1980 by the late 2000s. The path of equivalized total consumption expenditures show a similar trend until around 2000, but the consumption level remained stable for all percentiles thereafter, accounting for a different time path of inequality index in Figure 6 above.



(a) Equivalized Non-durable Expenditure (b) Equivalized Total Expenditure

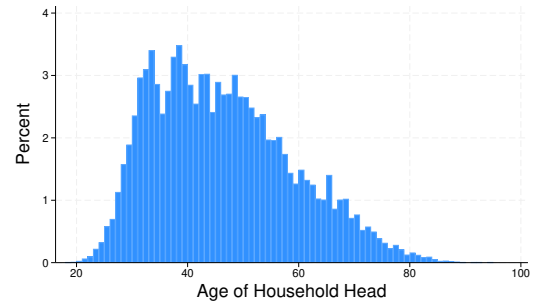
Figure 7: Percentiles of the Equivalized Household Expenditure Distribution
Source: FIES. Sample B is used.

4 Inequality Over the Life Cycle

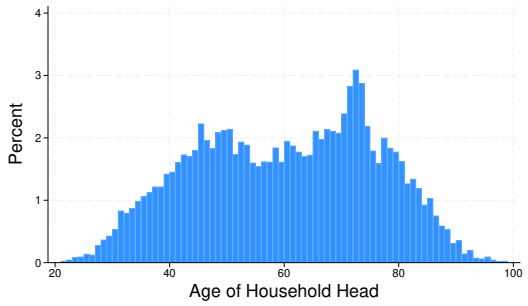
4.1 Demographic Changes in Japan

The Japanese economy has experienced many changes over the past four decades. One of the most significant changes that has impacted the long-term transition is the shift in the demographic structure. With a rise in life expectancy, the birth rate has declined, leading to a decrease in the number of children and then the working generation. In Figure 8, we show the age distribution in our FIES sample in 1981 and 2021, as well as the distribution from the Census Survey. The peak of the age distribution in 1981 was at the baby boom generations aged around 35 then, who were born in the late 1940s. In 2021, there are two peaks, the first baby boom generations now in their 70s,

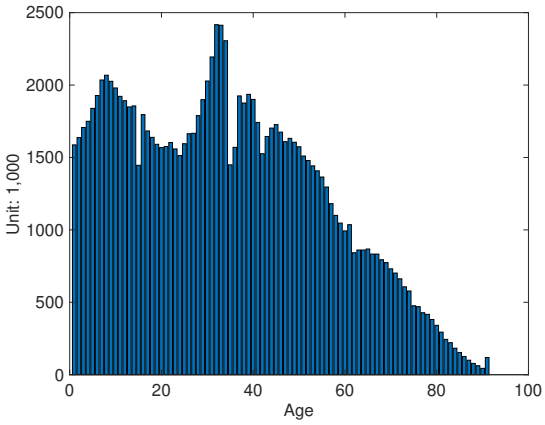
and their children aged around 50. As shown in Figure 8d, the population falls almost monotonically below age 50 due to low fertility rates below the replacement rate since the early 1970s. The same pattern is observed among our FIES samples.



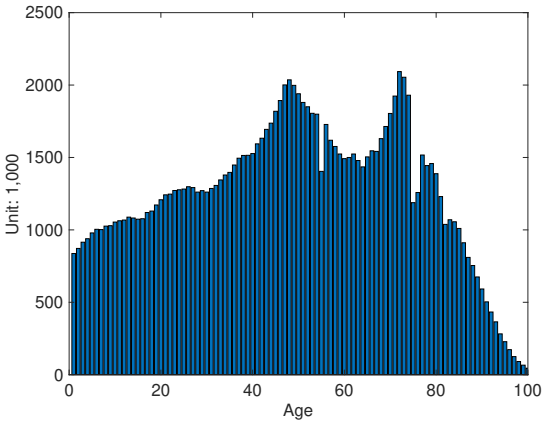
(a) Year 1981: FIES



(b) Year 2021: FIES



(c) Year 1981: Census Survey



(d) Year 2020: Census Survey

Figure 8: Changing Age Distribution

Source: FIES and Population Census Survey.

4.2 Inequality by Age Controlling for Time and Cohort Effects

We now demonstrate how the inequalities of earnings, income and consumption evolve over the life cycle. The estimation procedure is as follows. First, we calculate the variance of the logarithm of each variable for each age by calendar year or cohort.[19] For example, $X_{t,j}$ is the variance of the logarithm of labor income for age j in year t (or

[19]Regarding issues associated with the control of year and cohort effects, see Heathcote et al. (2005).

cohort t).[20] We then regress $X_{t,j}$ on age and calendar year/cohort, and plot the age effects.

Figure 9 shows age profiles of various indicators inequality among our FIES samples. In the estimation, we control for time and cohort effects and extract the component that varies by age only. Inequality of earnings and disposable income monotonically increases between 25 and 59, and the latter grows more mildly because of the redistributive policies such as progressive income taxation and transfers.

The rising inequality in labor income and disposable income by age is similar to the findings in previous studies.[21] Labor income inequality is relatively small at young ages, either because human capital accumulation is insufficient to exhibit large dispersion, or because employers do not know the extent of the individual employees' ability. However, as human capital accumulates with age, differences in wages also emerge.[22] In addition, because of the accumulation of permanent income shocks, the variance of the logarithms of labor income tends to increase with age, and this is commonly observed in many countries.

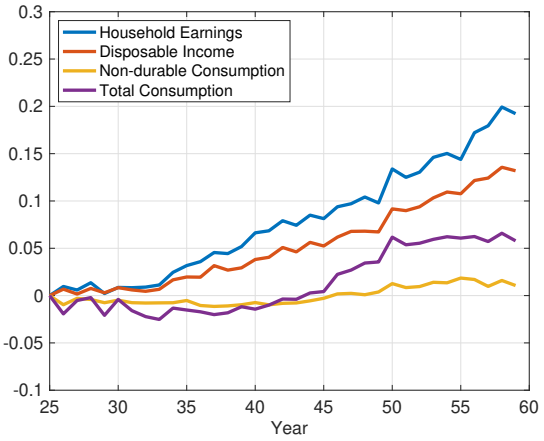
As explained in Section 3.3, rising income inequality does not necessarily imply a widening of consumption inequality. Households can smooth consumption by mitigating various shocks through precautionary savings and by various kinds of insurances. However, while temporary shocks could be intertemporally smoothed with the withdrawal and accumulation of the precautionary savings, persistent income shocks are more difficult to alleviate, and thus, consumption inequality rises with age. Figure 9 shows that the age profile of non-durable consumption is very flat, and differences by age are not so pronounced. On the other hand, the age profile of total consumption is characterized by a convex shape. As also noted by Abe and Yamada (2009), the total consumption inequality profile tends to be flat or declines gradually with age from the

[20] In the estimation, we create the cohort dummies for 5-year increments, starting from the generation born in 1925-1929. The original mean and the variance of log profiles by cohort are summarized in Appendix A.

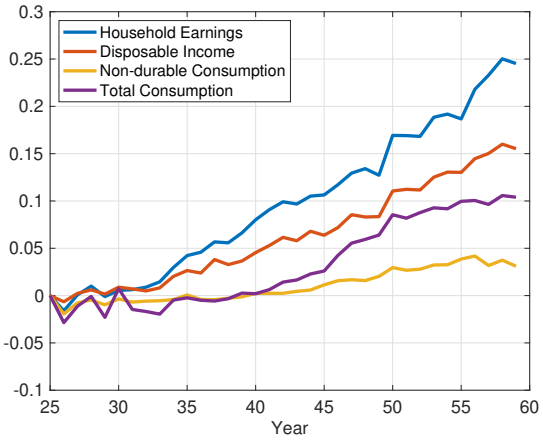
[21] See, for example, Heathcote et al. (2010) and Krueger et al. (2010)

[22] For earlier papers on the issues of human capital accumulation over the life cycle and the estimates of wage dynamics, see, for example, Heckman et al. (1998) and Guvenen (2007).

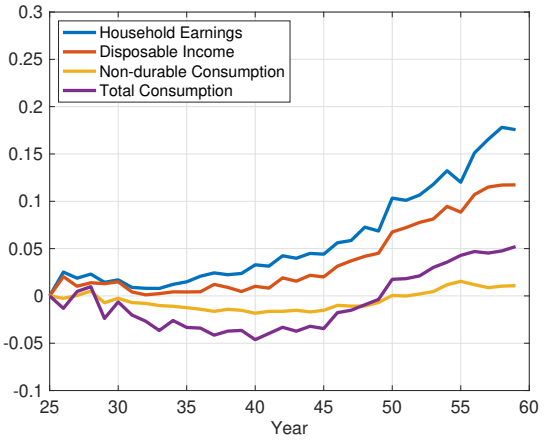
20s to around 40, and then begins to rise. No clear explanation has yet been provided as to why this trend occurs, but it is similarly observed in life cycle profiles using the most recent data.



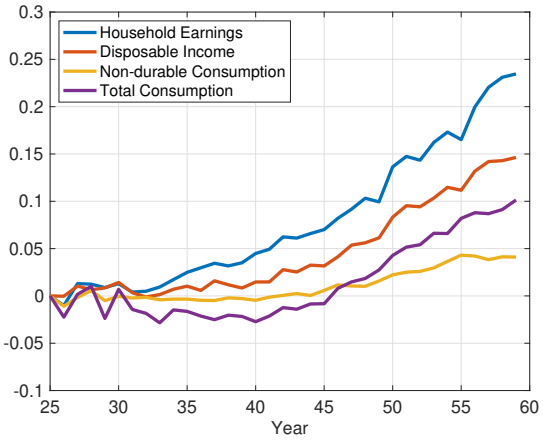
(a) Var. of log Raw (Control for Year Effects)



(b) Var. of log Raw (Control for Cohort Effects)



(c) Var. of log Equivalized (Control for Year Effects)



(d) Var. of log Equivalized (Control for Cohort Effects)

f

Figure 9: Life Cycle Inequality: Controlling for Time and Cohort Effects

Source: FIES. Sample B is used.

4.3 More on Life Cycle Consumption

Although consumption is relatively smooth over the life cycle compared to earnings and income, and inequality is lower, consumption expenditures are far from constant over the life cycle. In this section, we examine characteristics of consumption expenditures

over the life cycle in more detail. The FIES classifies expenditures recorded in household accounts into four categories: (i) non-durable, (ii) service, (iii) semi-durable, and (iv) durable expenditures. Semi-durable expenditures are combined with durable expenditures to focus on the three categories of non-durable, durable, and service expenditures. Figure 10 shows the life cycle profiles of total consumption and the three categories, with only the age effects extracted from the estimation.[23]

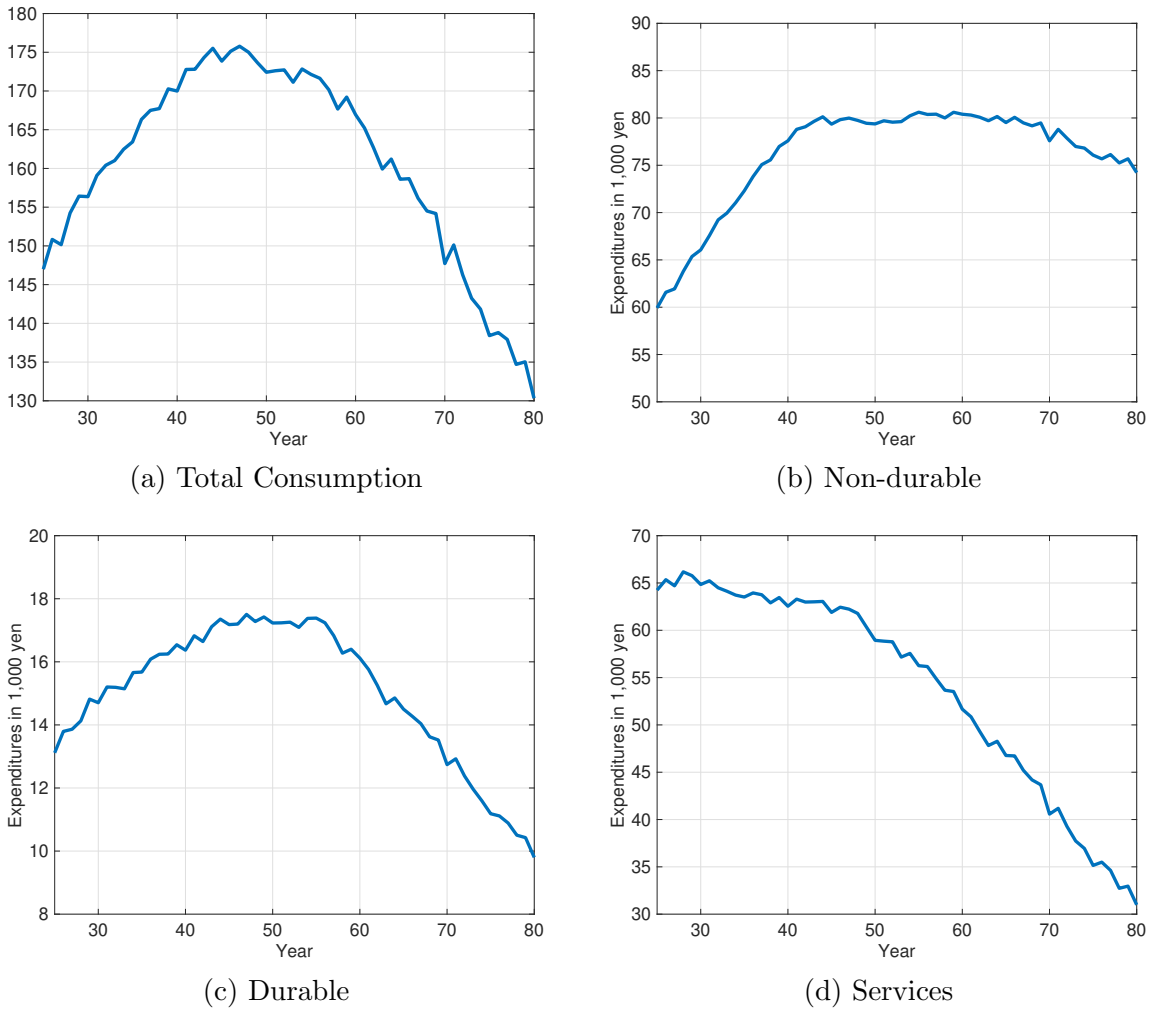
Total consumption exhibits a hump-shape, as shown in Figure 10a. The age profiles, however, significantly differ by consumption categories and by items, as shown in Figures 10b to Figures 10d. It is well known in the literature that the total consumption profile is hump-shaped, resembling the inverse U-shaped labor income profile associated with human capital accumulation, the seniority wage system, and other factors.[24] However, the decomposition of expenditures reveals different patterns over the life cycle. Non-durable consumption expenditures increase until around age 40, but after that, they remain almost flat, with little change by age. Consumption smoothing as implied by the Euler equation is a basic foundation in macroeconomics. From Figure 10b, households are observed to smooth their non-durable expenditures intertemporally except for their younger ages when they may face liquidity constraints. Conversely, durable expenditures exhibit a hump-shape, similar to total consumption. Since individuals consume durable goods over a long period after purchase, they tend to purchased more often when they are young and middle-aged, and they are less likely to make as many new purchases after retirement. Service spending declines almost monotonically with age. The decomposition analysis reveals that the hump-shaped total consumption profile results from a mix of expenditures of these different categories.

[23] Our sample consists of households headed by individuals aged between 25 and 80, using data from the years 1987 to 2020. The following model is estimated.

$$\ln C_{it} = \beta_0 + \beta_{\text{age}} D_{it}^{\text{age}} + \beta_c D_{it}^{\text{cohort}} + \beta_t D^{\text{year}} + \beta_m D^{month} + \beta_{\text{fam}} \mathbf{X}_{it} + \epsilon_{it} \tag{1}$$

where C_{it}^k is expenditure of household i in period t on consumption item k, D_{it}^{age} is a vector of age dummies. All items are deflated using the CPI of each items. For more details on the data and estimation procedure, see Kitao and Yamada (2023).

[24] For more on the life cycle consumption profile, see, for example, Gourinchas and Parker (2002) and Ferńandez-Villaverde and Krueger (2007).



(a) Total Consumption (b) Non-durable

(c) Durable (d) Services

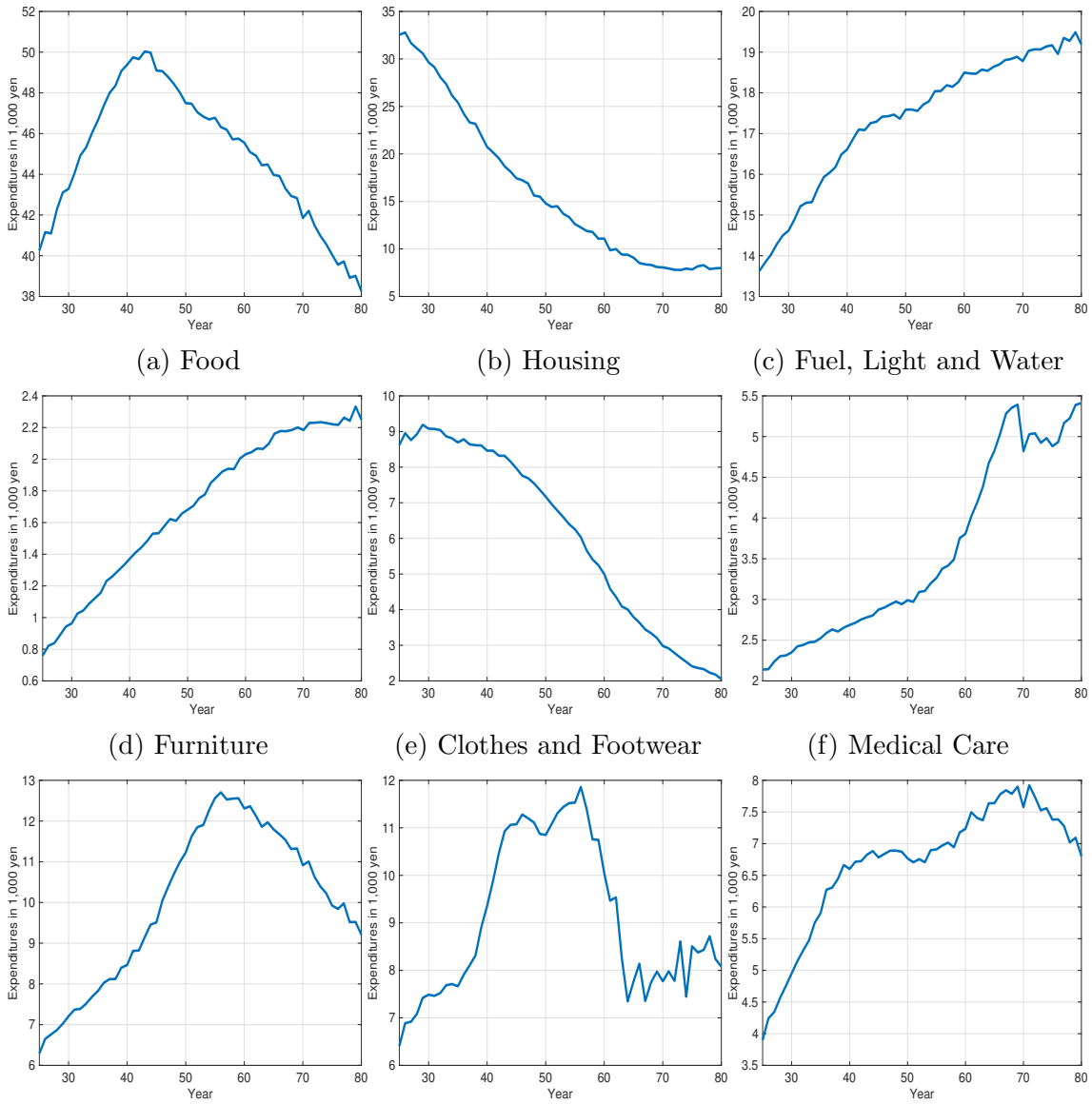
Figure 10: Life Cycle Profiles by Category

Source: FIES. Unit: 1,000 yen. Sample A is used.

Further disaggregation of expenditures reveals even more diverse expenditure patterns over the life cycle. Figure 11 shows expenditures of nine finer categories: (a) food, (b) housing, (c) fuel, light and water, (d) furniture, (e) clothes and footwear, (f) medical care, (g) transportation and communication, (h) education, and (i) culture and recreation. Adding other expenditure items (including unknown expenditures such as sending money home to parents) to the sum of these nine categories yields total consumption.

Figure 12 plots the coefficients of age dummies. At the first glance, expenditure profiles of some items are hump-shaped, some are monotonically increasing, and others are decreasing. On the one hand, items such as clothing and shoes, for which people

tend to spend much more when they are young and less when they are old, show a decreasing profile. On the other hand, medical care spending rises sharply after their late 50s. Education spending starts to rise in their late 30s and reaches its maximum at their mid-50s, as spending increases when their children, rather than themselves, start attending high school and continue to college. Transportation spending increases with age but peaks and declines in their late 50s. This item includes a mix of transportation and communication expenses. As Aguiar and Hurst (2013) point out, transportation expenses are high during the working period but decline once individuals retire, because they are less likely to go far away from home as often. Note that "housing" here refers to house maintenance and other expenses, not house purchases, which are not included in the expenditure data.



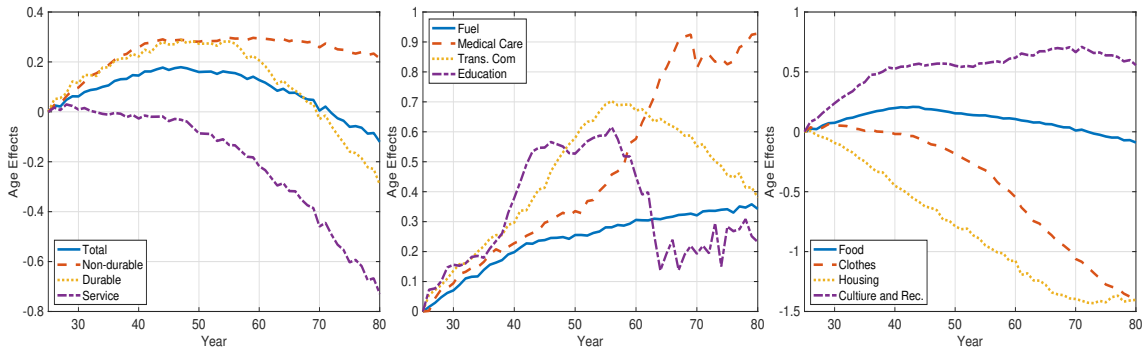
(a) Food (b) Housing (c) Fuel, Light and Water

(d) Furniture (e) Clothes and Footwear (f) Medical Care

(g) Transp. and Communication (h) Education (i) Culture and Recreation

Figure 11: life cycle Profiles of Consumption by Item Groups

Source: FIES. Sample A is used.



(a) By Categories (b) Group (1) (c) Group (2)

Figure 12: Age Effects of Consumption by Categories

Source: FIES. Sample A is used.

4.4 Variance of Residuals

Figures 13 and 14 plot the profile of expenditure inequality by age, where we use Sample A. Following Aguiar and Hurst (2013), each consumption variable is regressed on household characteristics such as family structure, and time and cohort dummies, and then we calculate the variance of the logarithm of residuals by age. Figure 13 reveals that the consumption inequality follows a convex path from age 25 to 60, decreasing initially from 25 to 35 and rising sharply thereafter. However, as with the mean levels of consumption expenditures, the shapes of the variance of the logarithm profile vary by the expenditure items, as shown in 14. For example, the variance in food expenditures is the smallest at around age 40, but it is nearly flat, staing in a narrow range between 0.15 and 0.20 over the life cycle. Non-durable expenditures follow a convex profile, reaching the lowest level at around age 40, while the variation in service and durable goods expenditures increases with age.

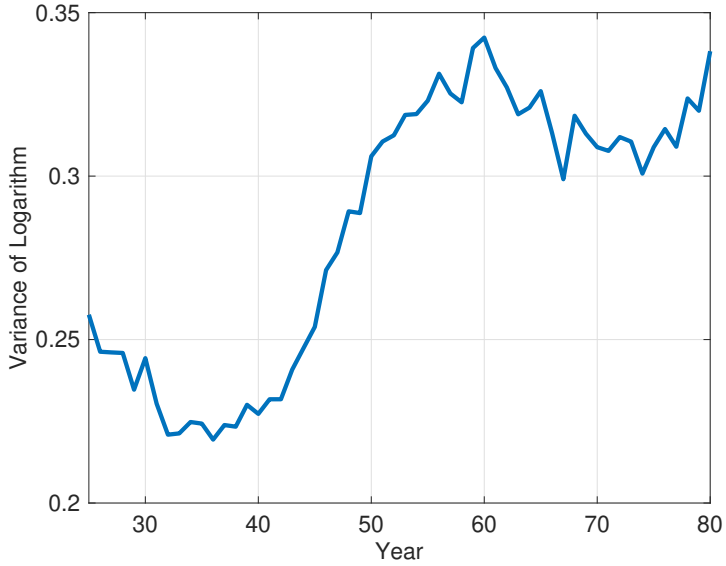
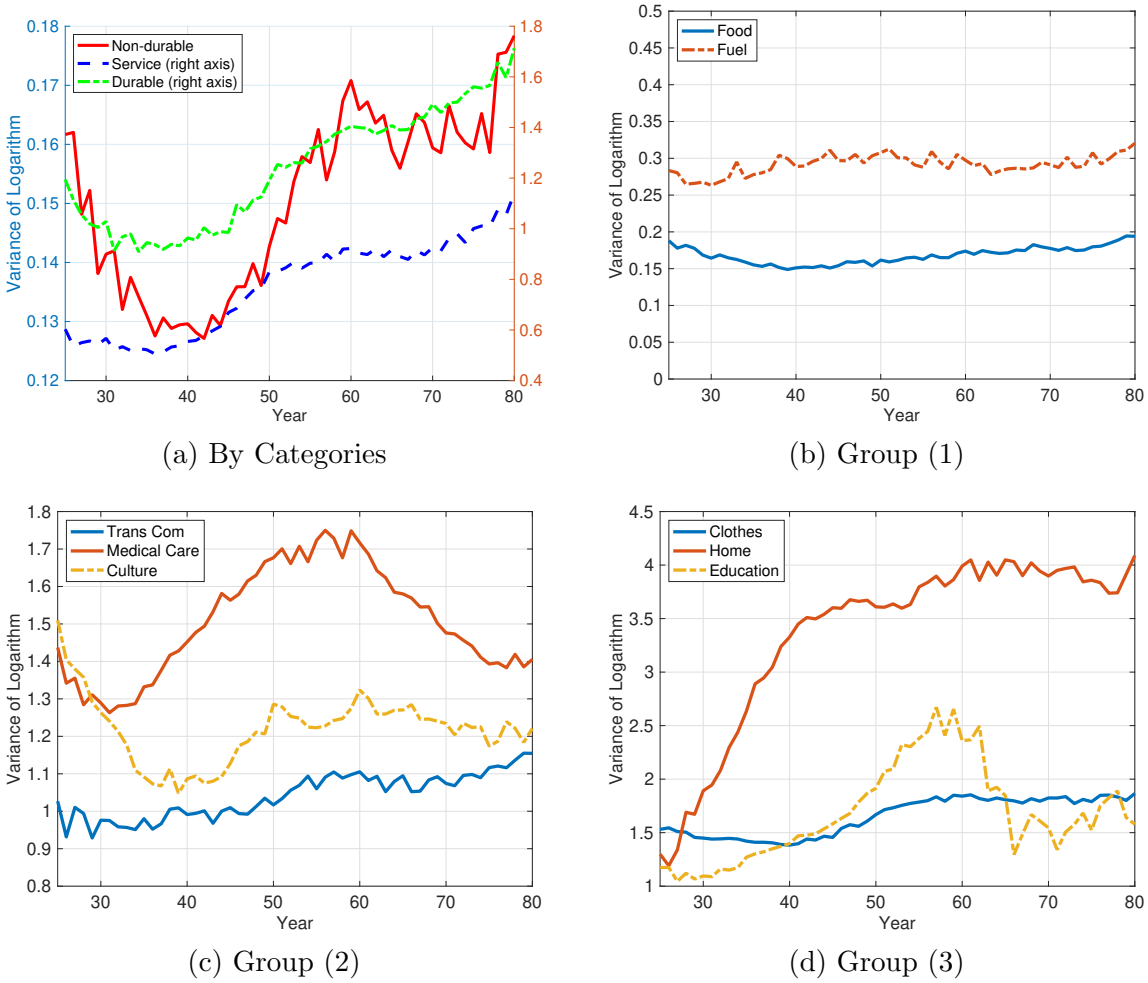


Figure 13: Variance of Residuals of Total Consumption

Source: FIES. Sample A is used.



(a) By Categories

(b) Group (1)

(c) Group (2)

(d) Group (3)

Figure 14: Variance of Residuals of Consumption by Categories and Item Groups
Source: FIES. Sample A is used.

5 Conclusion

This paper has analyzed economic inequality in Japan from 1981 to 2021 using the Family Income and Expenditure Survey. During this period, earnings, income, and consumption inequality increased. However, the pattern of this increase was neither monotonic nor uniform across the three variables; there were some periods of rising inequality and other periods of stabilization. Labor income inequality increased in the 1980s and early 2000s. While it has remained high in the recent decade, it has not risen further from that level. Conversely, inequality in disposable income, calculated by

adding capital income and public transfers to labor income and subtracting taxes, has declined in the 2010s, corresponding to the Abenomics policy period. From our analysis, it remains to be determined whether this trend is due to some specific policy or other reasons, requiring further investigation.

Compared to the trend of earnings and income inequality trends, the dynamics of consumption inequality is different. In the past, consumption inequality moved almost in parallel with disposable income inequality. However, since the mid-2010s, disposable income inequality has been gradually declining, while consumption inequality has been rising, albeit slightly. Further research with a theoretical model is needed to investigate this issue.

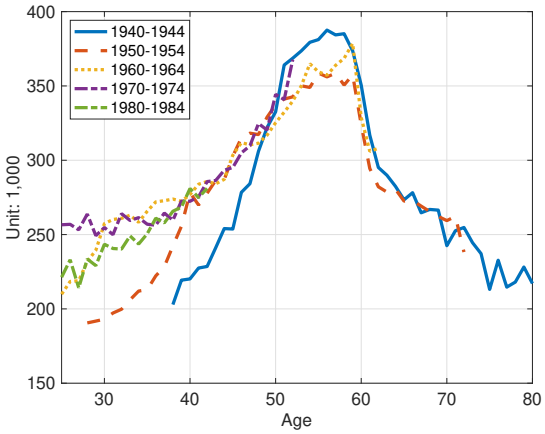
Demographic changes continue to have a significant long-term impact on the Japanese economy. As is well known, earnings and income inequality tends to increase with age. While this finding is not new, we confirm that the relationship still holds when we add data over the last decades.

Consumption inequality profiles over the life cycle show complex movements. The variance of the logarithm of the total consumption follows a convex path over the life cycle, with a gradual decline in consumption inequality from young to middle ages, followed by an increase. Moreover, the variation of individual items shows different patters.

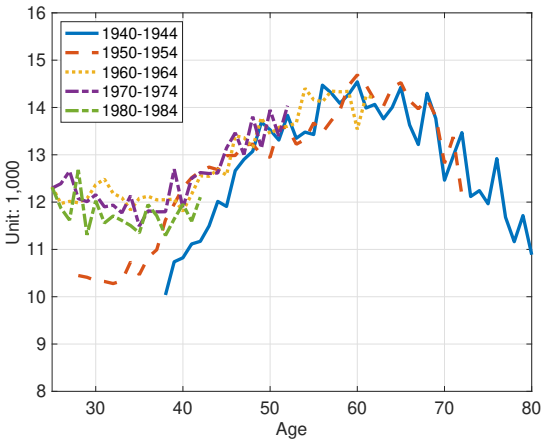
In summary, the fact that disposable income inequality has decreased during the most recent economic expansion would be an interesting finding. However, income inequality has started to rise again during the COVID-19 crisis. What happened since the pandemic remains to be confirmed with additional data, and we must carefully analyze future trends. Our study provides fundamental materials for examining the relationship between economic inequality and the macroeconomy. Our results also offer calibration targets that should be reconciled in the construction of structural macro models and in conducting various policy analyses pertaining to economic inequality. The exploration of various policy analyses related to economic inequality, using dynamic general equilibrium models, is a subject of future research.

A Life Cycle Profiles by Cohorts

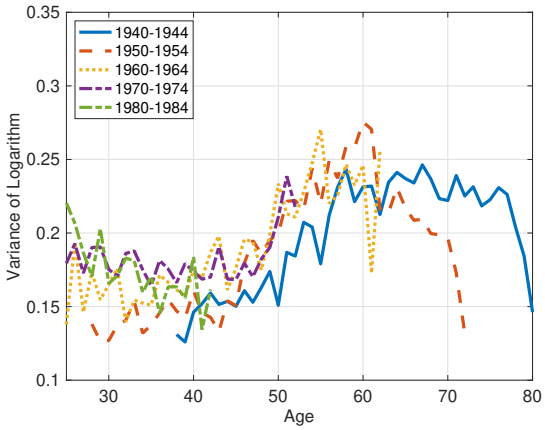
Figure A.1 shows the mean and variance of the logarithms of age profile for total consumption and annual income for different cohorts.



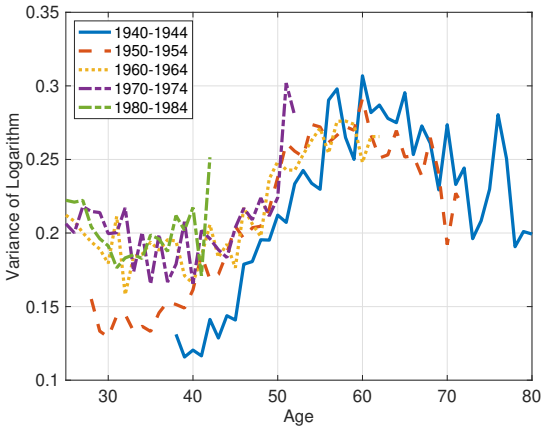
(a) Mean: Equivalized Annual Income



(b) Mean: Equivalizd Total Consumption



(c) Varlog: Equivalized Annual Income



(d) Varlog: Equivalized Total Consumption

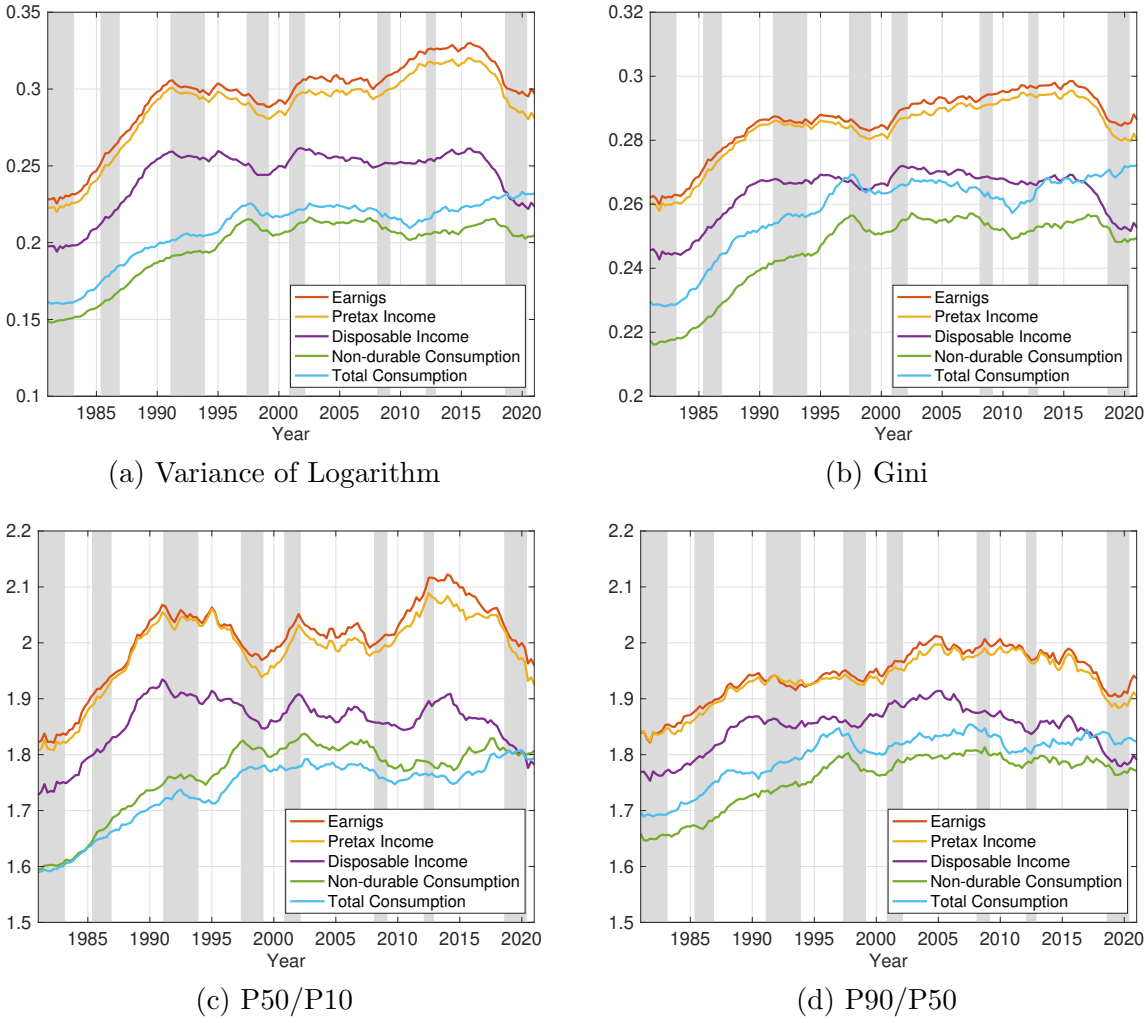
Figure A.1: Mean and Variance of Logarithm by Cohort

Source: FIES. Sample A is used.

B Inequalities Over Business Cycle

Figures B.1 – B.3 in this section show the paths of inequality indexes based on quarterly data of earnings, pre-government income, disposable income, non-durable expenditure,

and total consumption. Because the original series of inequality is very volatile as shown in Figure B.4, we compute the moving average of each series of data.[25]



(a) Variance of Logarithm

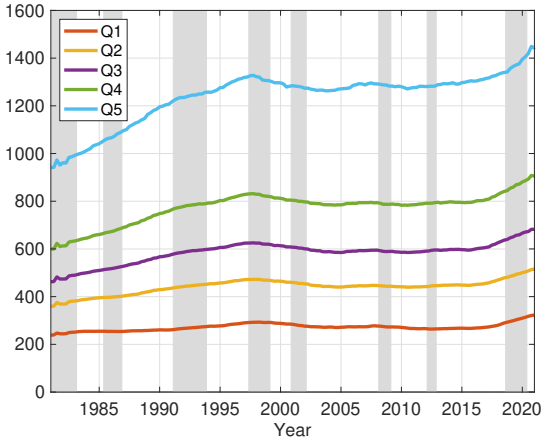
(b) Gini

(c) P50/P10

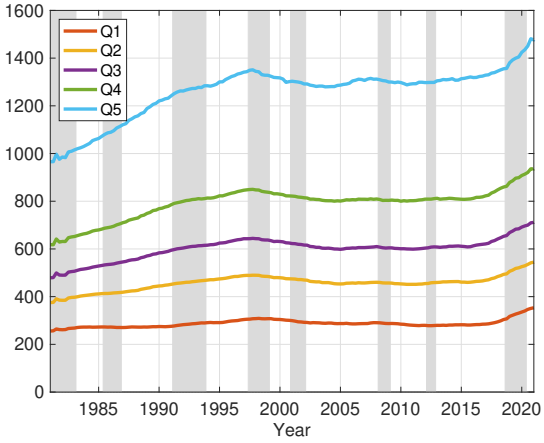
(d) P90/P50

Figure B.1: Quarterly Series of Inequality in Earnings, Income and Consumption
Source: FIES. Sample C is used.

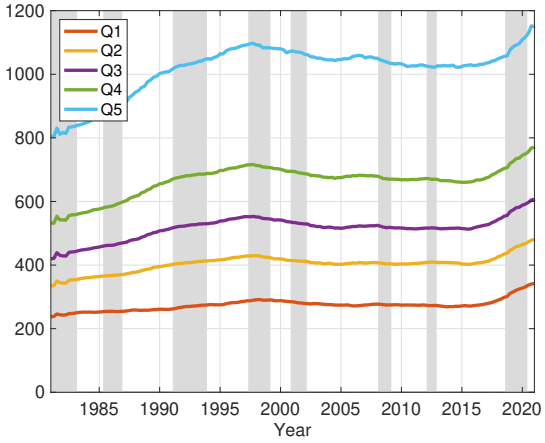
[25]For recent progress on the understanding of the relationship between economic inequality and business cycle, see Heathcote et al. (2020) and Bilbiie et al. (2023).



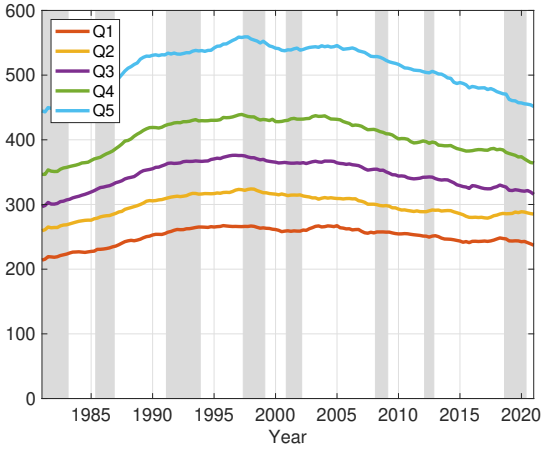
(a) Earnings y_L



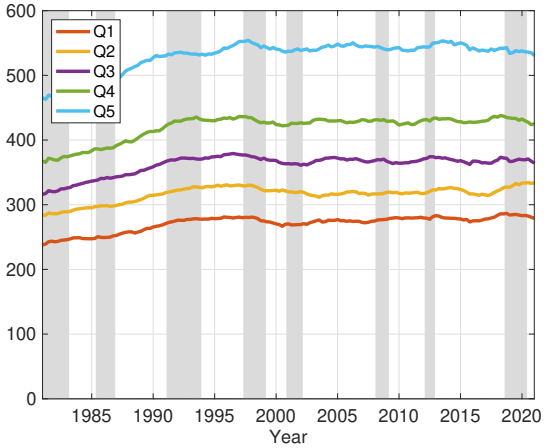
(b) Pre-government Income: y



(c) Disposable Income: y_D

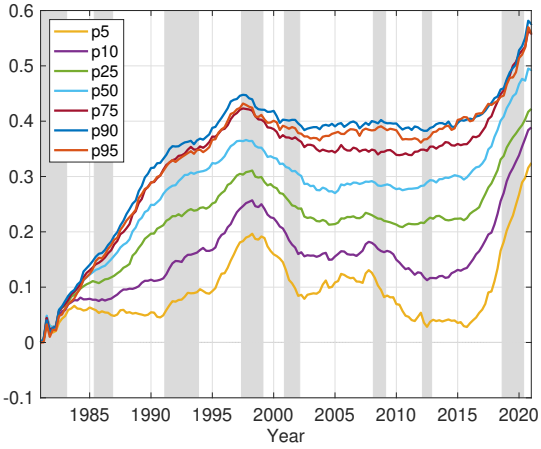


(d) Non-durable Expenditure: c_{ND}

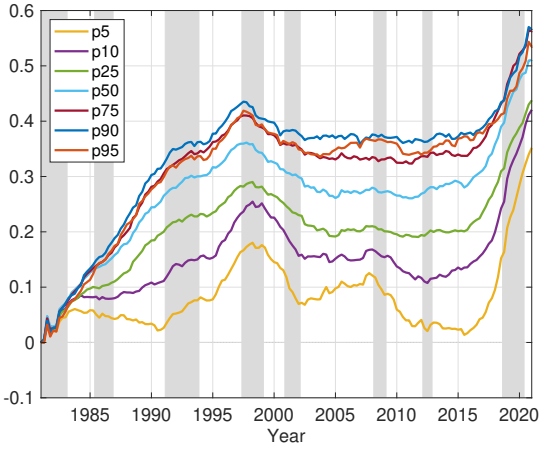


(e) Total Consumption: c_T

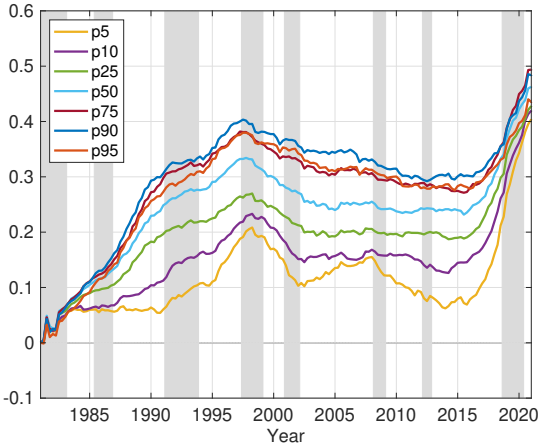
Figure B.2: Quarterly Series of Each Quintiles of Earnings, Income and Consumption
Source: FIES. Unit: 1,000 yen. Sample C is used.



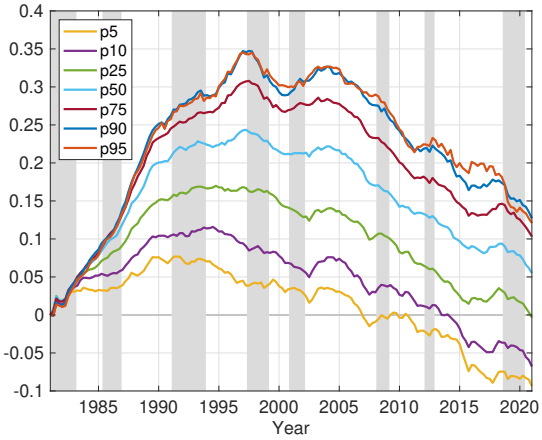
(a) Earnings: y_L



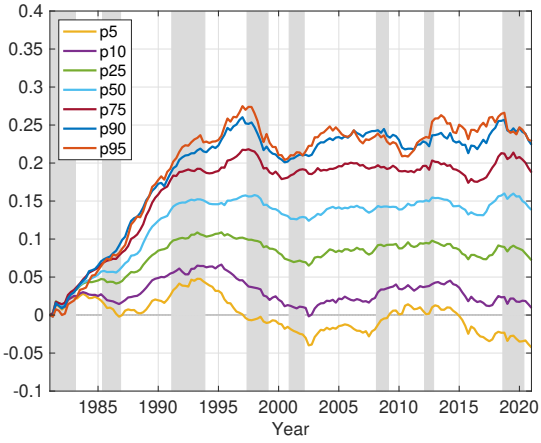
(b) Pre-government Income: y



(c) Disposable Income: y_D

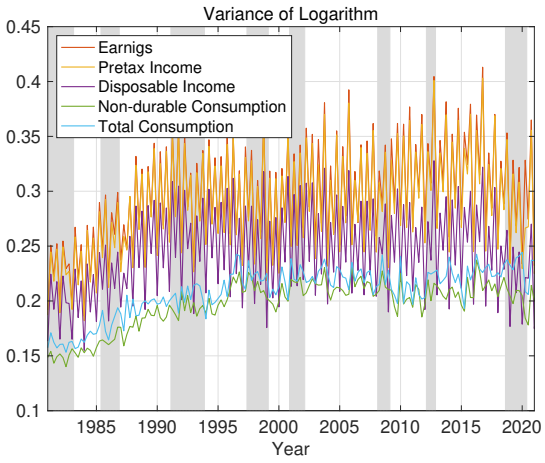


(d) Non-durable Expenditure: c_{ND}

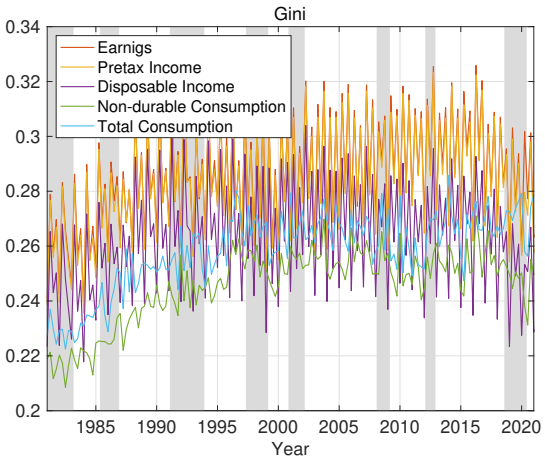


(e) Total Consumption: c_T

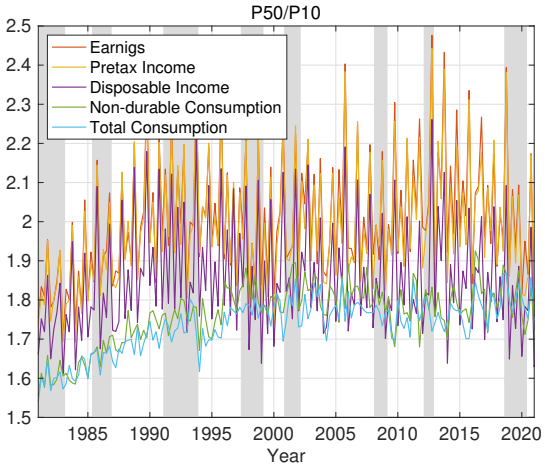
Figure B.3: Quarterly Series of Percentiles of Earnings, Income and Consumption
Source: FIES. Sample C is used.



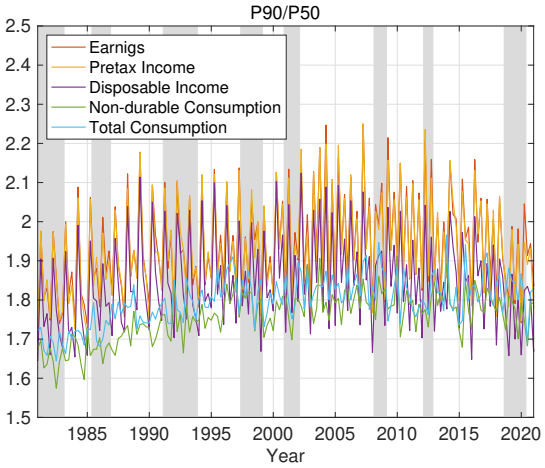
(a) Variance of Logarithm



(b) Gini



(c) P50/P10



(d) P90/P50

Figure B.4: Quarterly Series of Unadjusted Inequality Measures

Source: FIES. Sample C is used.

References

Abe, N. and T. Yamada (2009). Nonlinear income variance profile and consumption inequality. *Journal of the Japanese and International Economies 23*, 344–366.

Aguiar, M. A. and M. Bils (2015). Has consumption inequality mirrored income inequality? *American Economic Review 105*(9), 2725–2756.

Aguiar, M. A. and E. Hurst (2013). Deconstructing lifecycle expenditure. *Journal of Political Economy 121*(3), 437–492.

Arellano, C., L. Maliar, S. Maliar, and V. Tsyrennikov (2017). Envelope condition method with an application to default risk models. *Journal of Economic Dynamics and Control 69*, 436–459.

Attanasio, O. P. and L. Pistaferri (2014). New directions and opportunities for rsearch on consumption with the PSID. *American Economic Review: Papers & Proceedings 104*(5), 122–126.

Attanasio, O. P. and L. Pistaferri (2016). Consumption inequality. *Journal of Economic Perspectives 30*(2), 3–28.

Bayer, C., R. Lütticke, L. Pham-Dao, and V. Tjaden (2018). Precautionary savings, illiquid assets, and the aggregate consequences of shocks to household income risk. *Econometrica*. forthcoming.

Bilbiie, F. (2008). Limited asset markets participation, monetary policy and (inverted) aggregate demand logic. *Journal of Economic Theory 140*(1), 162–196.

Bilbiie, F. (2020). The new keynesian cross. *Journal of Monetary Economics 114*, 90–108.

Bilbiie, F., G. Primiceri, and A. Tambalotti (2023). Inequality and business cycle. NBER Working Paper No. 31729.

Blundell, R., L. Pistaferri, and I. Preston (2008). Consumption inequality and partial insurance. *American Economic Review 98*(5), 1887–1921.

Bryukhanov, M. and D. Hryshko (2024). Inequality in russia over time and over the life cycle. *Scandinavian Journal of Economics*.

Deaton, A. and C. Paxson (1994). Intertemporal choice and inequality. *Journal of Political Economy 102*(3), 437–467.

Ferńandez-Villaverde, J. and D. Krueger (2007). Consumption over the life cycle: Facts from consumer expenditure survey data. *Review of Economics and Statistics 89*(3), 552–565.

Gornemann, N., K. Kuester, and M. Nakajima (2021). Doves for the rich, hawks for the poor? distributional consequences of monetary policy. Mimeo.

Gourinchas, P.-O. and J. A. Parker (2002). Consumption over the life cycle. *Econometrica 70*(1), 47–89.

Guvenen, F. (2007). Learning your earning: Are labor income shock really very persistent? *American Economic Review 97*, 687–712.

Heathcote, J., F. Perri, and G. L. Violante (2020). The rise of us earnings inequality: Does the cycle drive the trend? *Review of Economic Dynamics 37*, 181–204.

Heathcote, J., F. Perri, G. L. Violante, and L. Zhang (2023). More unequal we stand? inequality dynamics in the United States, 1967-2021. *Review of Economic Dymamics*.

Heathcote, J., K. Storesletten, and G. L. Violante (2005). Two views of inequality over the life-cycle. *Journal of the European Economic Assocciation 3*(2-3), 765–775.

Heathcote, J., K. Storesletten, and G. L. Violante (2010). The macroeconomic implications of rising wage inequality in the United States. *Journal of Political Economy 118*(4), 681–672.

Heckman, J. J., L. Lochner, and C. Taber (1998). Explaining rising wage inequality: Explorations with a dynamic general equilibrium model of labor earnings with heterogeneous agents. *Review of Economic Dynamics 1*(1), 1–58.

Higa, K. (2019). Estimating consumption inequality in Japan over the last three decades. ESRI Discussion Paper Series No. 350.

Inaba, M. and D. S. Kengo Nutahara (2023). Sources of inequality and business cycles: Evidence from the us and japan. CIGS Working Paper Series No. 23-006E.

Inui, M., N. Sudo, and T. Yamada (2017). The effects of monetary policy shocks on inequality in japan. BIS Working Papers, No. 642.

Kaplan, G., B. Moll, and G. L. Violante (2018). Monetary policy according to hank. *American Economic Review 108*(3), 697–743.

Kaplan, G. and G. L. Violante (2010). How much consumption insurance beyond self-insurance? *American Economic Journal: Macroeconomics 2*(4), 53–87.

Kitao, S. and T. Yamada (2023). The time trend and life-cycle profiles of consumption. RIETI Discussion Paper 23-E-036.

Krueger, D. and F. Perri (2006). Does income inequality lead to consumption inequality? evidence and theory. *Review of Economic Studies 73*(1), 163–193.

Krueger, D., F. Perri, L. Pistaferri, and G. L. Violante (2010). Cross-sectional facts for macroeconomists. *Review of Economic Dynamics 13*(1), 1–14.

Kubota, K. (2020). Partial insurance in Japan. *Japanese Economic Review*.

Lise, J., N. Sudo, M. Suzuki, K. Yamada, and T. Yamada (2014). Wage, income and consumption inequality in Japan, 1981-2008: from boom to lost decades. *Review of Economic Dynamics 17*, 582–612.

Milanovic, B. (2016). *Global Inequality: A New Approach for the Age of Globalization*. Belknap Press.

Moriguchi, C. and E. Saez (2008). The evolution of income concentration in Japan, 1886-2005: Evidence from income tax statistics. *Review of Economics and Statistics 90*(4), 713–734.

Ohtake, F. and M. Saito (1998). Population aging and consumption inequality in Japan. *Review of Income and Wealth 44*, 361–381.

Okubo, M. (2015). Earnings dynamics and profile heterogeneity: Estimates from japanese panel data. *Japanese Economic Review 66*(1), 112–146.

Piketty, T. (2014). *Capital in the Twenty-First Century*. Cambridge: The Belknap Press of Harvard University Press.

Saez, E. and G. Zucman (2019). *The Triumph of Injustice: How the Rich Dodge Taxes and How to Make Them Pay*. WW Norton & Co Inc.

Stephens, M. and T. Unayama (2011). The consumption response to seasonal income: Evidence from japanese public pension benefits. *American Economic Journal: Applied Economics 3*(4), 86–118.

Storesletten, K., C. I. Telmer, and A. Yaron (2004). Cyclical dynamics in idiosyncratic labor market risk. *Journal of Political Economy 112*(3), 695–717.

Sudo, N., M. Suzuki, and T. Yamada (2012). Inequalities in japanese economy during the lost decades. CIRJE Discussion Paper Series, CIRJE-F-856.

Tachibanaki, T. (1998). *Nihon-no-Keizai-Kakusa*. Iwanami Shinsho.