Review of Economic Dynamics 17 (2014) 582–612

Contents lists available at ScienceDirect

Review of Economic Dynamics

www.elsevier.com/locate/red

Wage, income and consumption inequality in Japan, 1981–2008: From boom to lost decades ☆

Jeremy Lise [a,*], Nao Sudo [b], Michio Suzuki [c], Ken Yamada [d], Tomoaki Yamada [e]

[a] University College London and Institute for Fiscal Studies, United Kingdom
[b] Bank of Japan, Japan
[c] University of Tokyo, Japan
[d] Singapore Management University, Singapore
[e] Meiji University, Japan

ARTICLE INFO

Article history:
Received 29 January 2013
Received in revised form 27 December 2013
Available online 10 January 2014

JEL classification:
D31
D91
E23

Keywords:
Inequality trends
Life-cycle inequality
Wage dynamics

ABSTRACT

In this paper we document the main features of the distributions of wages, earnings, consumption and wealth in Japan since the early 1980s using four main data sources: the Basic Survey on Wage Structure (BSWS), the Family Income and Expenditure Survey (FIES), the National Survey of Family Income and Expenditure (NSFIE) and the Japanese Panel Survey of Consumers (JPSC). We present an empirical analysis of inequality that specifically considers the path from individual wages and earnings, to household earnings, after-tax income, and finally consumption. We find that household earnings inequality rose substantially over this period. This rise is made up of two distinct episodes: from 1981 to 1996 all incomes rose, but they rose faster at higher percentiles; from 1996 to 2008 incomes above the 50th percentile remained flat but they fell at and below the 50th percentile. Inequality in disposable income and in consumption also rose over this period but to a lesser extent, suggesting taxes and transfers as well as insurance channels available to households helped to insulate household consumption from shocks to wages. We find the same pattern in inequality trends when we look over the life cycle of households as we do over time in the economy. Additionally we find that there are notable differences in the inequality trends for wages and hours between men and women over this period.

1. Introduction

Japan experienced a period of rapid economic growth and very low unemployment in the 1980s, followed by a severe contraction in the 1990s and continued stagnation throughout the 2000s. This period, widely referred to as Japan's "lost decades", has been of considerable interest to international policy-makers and the focus of macroeconomic research. The

☆ We have benefited from comments from Naohito Abe, Richard Blundell, Masahiro Hori, Tokuo Iwaisako, Yasushi Iwamoto, Daiji Kawaguchi, Miki Kohara, Ashley Kurtz, Tsutomu Miyagawa, Makoto Saito, Masaya Sakuragawa, Mototsugu Shintani, Takashi Unayama, Gianluca Violante, an anonymous referee, and seminar participants at Keio, Hitotsubashi, and Kobe Universities. We gratefully acknowledge permission to use the data from the Statistics Bureau, the Japanese Ministry of Internal Affairs and Communications and the Institute for Research on Household Economics. This paper combines and supersedes two papers previously circulated as J. Lise and K. Yamada, "Wage, Income and Consumption Inequality in Japan" and Sudo, Suzuki, and T. Yamada, "Inequalities in Japanese Economy during the Lost Decades". M. Suzuki and T. Yamada gratefully acknowledge financial support from the Ministry of Education, Science, Sports, and Culture, Grant-in-Aid for Research Activity Start-up 22830023, a Grant-in-Aid for Scientific Research (B) 22330090 and the Seimeikai Foundation. The views expressed in this paper do not necessarily reflect the official views of the Bank of Japan.

* Corresponding author. Fax: +44 (0) 20 7916 2775.
E-mail addresses: j.lise@ucl.ac.uk (J. Lise), nao.sudou@boj.or.jp (N. Sudo), msuzuki@e.u-tokyo.ac.jp (M. Suzuki), kenyamada@smu.edu.sg (K. Yamada), tyamada@meiji.ac.jp (T. Yamada).

1094-2025/$ – see front matter
http://dx.doi.org/10.1016/j.red.2014.01.001

impact of the lost decades on Japanese households has received less attention. The Japanese experience is an interesting case to study the links between macroeconomic dynamics and individual- and household-level inequality.

This paper examines the evolution of inequality in wages, earnings, disposable income and consumption during the boom years of the 1980s and the subsequent lost decades. We present a unified empirical analysis of inequality in Japan, both to help understand the patterns across these various measures within Japan and as a point of comparison with other advanced industrialized countries. For this latter purpose we present the facts in a manner that is directly comparable to other country studies. Specifically, we provide an analysis of inequality in Japan that is comparable with the analysis in the *Review of Economic Dynamics* special issue on Cross Sectional Facts for Macroeconomists, and summarized in Krueger, Perri, Pistaferri, and Violante (2010, henceforth KPPV).[1] The contribution of this article relative to the existing literature is to present a unified analysis of inequality trends in wages, hours, income, and consumption, documenting both the time series trends and the life cycle aspects of inequality. We examine both individual-level inequality, separately for men and women, as well as household-level inequality, unifying the analysis by means of the household budget constraint, which links individual wages, hours, taxes and transfers to household consumption expenditures.

We begin by summarizing our main findings. Looking first at individual wages during the lost decades, we find that the variance of log hourly wages remained roughly unchanged between 1991 and 2008 when calculated using all employed individuals.[2] This apparent stability, however, masks very different trends for men and women. Over this period wage inequality for men rose while it fell for women; these trends cancel out in the aggregate when pooling all workers. Interestingly, although there is a decline in wage inequality for women, there is a sharp rise in hours inequality and in the correlation between hours and wages, resulting in an overall rise in earnings inequality for women. Indeed the variance of log earnings for women is higher than for men over this entire period and the increase is larger. Compared to the other countries summarized by KPPV, the gender premium in wages (male over female) is very high at 1.80 in the year 2000, compared to an average premium of 1.32. The college wage premium in Japan is 1.43, below the average of 1.60, while the experience premium is marginally higher than average at 1.34 compared to 1.28. Between 1991 and 2008 the gender premium declined in Japan by 14 log points, which is the same rate as the average of countries summarized by KPPV. In contrast, the college premium in Japan remained flat and the experience premium actually fell, where on average these measures both rose substantially in the comparison countries.

Moving from individuals to households, the rise in earnings inequality for men and women is mirrored by a rise in household earnings inequality. The rise in inequality between 1981 and 2008 is characterized by two distinct episodes. Between 1981 and 1996 real incomes rose for all households, but they rose more quickly at higher than lower percentiles of the distribution, leading to an increase in inequality. From 1996 to 2008, real incomes of households above the 50th percentile were flat, while households at and below the 50th percentile experienced declines in real income. Rising inequality in the early period was associated with rising real incomes across the board, while during the latter period the rise in inequality was the result of stagnant real incomes for households above the median and falling real incomes for households below the median, similar to the experience during the 1970s in the United States. From 1981 to 2008, the rise in household income inequality is mirrored by an equal rise in consumption inequality. This is in striking contrast to the experience of the United States and the United Kingdom, where the rise in consumption inequality is substantially lower than the rise for income inequality. Specifically, the rise in household consumption inequality is roughly of the same order in Japan as in the US and the UK, but Japan did not experience anywhere close to the same rise in income inequality.

We also consider the rise in inequality over the life cycle. Household earnings inequality increases substantially with age, there is a smaller increase in disposable income inequality and even smaller increase when considering consumption expenditures. In contrast to the time trends in inequality, when we look at the life cycle, the increase in consumption inequality is always substantially lower than the increase in income inequality. Furthermore, we document stark differences in life-cycle profiles of wages, hours, and earnings between men and women and between younger and older cohorts. A very stark finding is that while average wage profiles for men in Japan display the usual hump shape in age, rising until about age 50 and then declining, the average wage profiles for women are essentially flat, or slightly declining with age.

The remainder of the paper is organized as follows. Section 2 describes the four data sets used for the analysis. Section 3 sets the analysis in the context of the macroeconomy and compares several aggregates computed from the survey data to those available in the national accounts. In Sections 4 and 5 we consider first the inequality trends over time and next the evolution of inequality over the life cycle. Section 6 presents estimates of the variance of permanent and transitory shocks to wages. Section 7 documents what we can learn about trends in wealth inequality. Section 8 concludes.

2. The data sets

In this section we describe the four micro data sets used. These are the Basic Survey on Wage Structure (BSWS), the Family Income and Expenditure Survey (FIES), the National Survey of Family and Income Expenditure (NSFIE), and the

[1] The special issue includes comparable studies for the United States (Heathcote et al., 2010), Canada (Brzozowski et al., 2010), the United Kingdom (Blundell and Etheridge, 2010), Germany (Fuchs-Schuendeln et al., 2010), Italy (Jappelli and Pistaferri, 2010), Spain (Pijoan-Mas and Sanchez-Marcos, 2010), Sweden (Domeij and Floden, 2010), Russia (Gorodnichenko et al., 2010), and Mexico (Binelli and Attanasio, 2010).

[2] Data availability limits the analysis of wages and hours to the period 1991–2008.

Japanese Panel Survey of Consumers (JPSC). Some additional details regarding sample selection and variable definitions are included in Appendixes A–D.

2.1. Basic Survey on Wage Structure (BSWS)

The BSWS is a cross-sectional establishment survey conducted annually by the Japanese Ministry of Health, Labour, and Welfare. The survey has been conducted continuously since 1948; however, we have access to data for the period 1991–2008 for research purposes. The universe of the survey is private establishments with five or more regular employees and public establishments with 10 or more regular employees in Japan, except those classified in agriculture, forestry, fishery, and the legislative, administrative, and judicial branches of local and national governments. Approximately 55,000 establishments provide valid responses every year, and those surveyed include approximately 810,000 male employees and 470,000 female employees per year. Although board members are not surveyed, all types of workers (regular and temporary workers and full- and part-time workers) are surveyed. Detailed information on hours and wages, including overtime hours and annual bonus pay are collected from payroll records, along with demographic information including age, sex, and education. There is neither top nor bottom coding of wage records. Given the structure of the survey, all information is available only at the individual level and it is not possible to construct household-level earnings or income measures from this survey.

The survey was redesigned in 2005, largely for the purpose of obtaining better data on non-permanent workers. Some questions asked differ before and after 2005. From 2005 onward, the survey includes questions about temporary workers and workers that would not normally be thought of as permanent employees.[3] The biggest effect seems to be to increase the variance of hours and earnings post 2005. As a result, some of the measures of inequality calculated from this data display a jump between 2004 and 2005. In all figures in which we use this data we avoid connecting the years 2004 and 2005 to remind the reader of the change in survey design.

2.2. Family Income and Expenditure Survey (FIES)

The Family Income and Expenditure Survey (FIES) is a cross-sectional household survey conducted monthly by the Japanese Ministry of Internal Affairs and Communications. The survey was first conducted in 1953; however, we have access only to data for the period 1981–2008 for research purposes. The survey unit is a household and the universe for the survey includes all Japanese households with the exception of (i) institutional households; (ii) students living alone; (iii) households in which the household business is a restaurant, or boarding house which shares the same dwelling; (iv) households with boarders who share meals (even if this is not the main source of income); (v) households with four or more live-in employees; (vi) households where the head is absent for more than three months in the year; and (vii) foreigners. Multiple-person households are surveyed for six consecutive months, while single-person households are surveyed for three consecutive months, but only after 2002. One-sixth of the households are rotated out and replaced by new households every month. Approximately 8000 multiple-person households are surveyed every month, meaning that approximately 16,000 households are surveyed every year.

The survey contains rich information on the earnings of household members, as well as household consumption expenditures; however, detailed information on monthly income is collected only if the household head is employed, but not if the household head is non-employed, self-employed, executive, freelancer, farmer, forester, or fisher. The household head is defined as the primary earner in the household. The data is collected by a combination of survey questions and a household diary in which households are requested to fill in daily expenditures. There is neither bottom nor top coding of income and consumption records.

2.3. National Survey of Family Income and Expenditure (NSFIE)

The National Survey of Family Income and Expenditure (NSFIE) is a cross-sectional household survey conducted every five years by the Japanese Ministry of Internal Affairs and Communications. The survey was first conducted in 1959; however, only five most recent waves (1984, 1989, 1994, 1999, and 2004) are available to us for research purposes. The survey unit is a household and the universe for the survey includes all Japanese households, with the same exception as in the FIES. Multiple-person households are surveyed for three consecutive months from September to November, while single-person households are surveyed for two consecutive months from October to November. Approximately 60,000 households, of which approximately 5000 households are single-person households, are surveyed every survey year. The survey contains rich information on household income, consumption expenditures, savings and liabilities. As with the FIES, detailed information on monthly income is collected only if the household head is employed, but not if the household head is non-employed, self-employed, executive, freelancer, farmer, forester, or fisher. The household head is defined as the primary earner in the

[3] Until 2004, workers are categorized into regular workers (*joyo rodosha*) and temporary workers according to the length of their contracts and full time workers and part time workers according to days and hours of work. After 2005, full time workers and part time workers are, respectively, further categorized into permanent workers (*seishain*) and the rest of workers. There is eventually a jump in the number of part-time workers from 2004 to 2005, and the increase in part-time workers corresponds to an increase in female workers.

Table 2.1
Means of demographic characteristics.

	1981–1989		1990–1999			2000–2008		
	FIES	NSFIE	FIES	NSFIE	BSWS	FIES	NSFIE	BSWS
Household size	3.85	3.53	3.68	3.28		3.60	3.12	
Number of children	1.30	1.13	1.07	0.92		1.04	0.82	
Number of adults	2.55	2.40	2.61	2.36		2.56	2.30	
Number of workers	1.55	1.59	1.65	1.58		1.65	1.57	
Extended family (%)	30.3	27.7	31.9	27.6		29.8	25.3	
Age of household head	41.9	41.0	43.6	42.5		44.3	43.4	
Male age	41.8	41.0	43.4	42.7	40.9	44.1	43.6	41.2
Female age	40.2	39.2	41.1	41.0	41.4	42.0	42.2	41.5
Male college degree (%)					28.6			34.3
Female college degree (%)					8.0			14.5
Number of observations	95,131	63,818	92,980	67,849	9,457,656	71,404	27,652	8,987,581

household. The data is collected by a combination of survey questions and a household diary in which households are requested to fill in daily expenditures. There is neither bottom nor top coding of income and consumption records.

2.4. Japanese Panel Survey of Consumers (JPSC)

The Japanese Panel Survey of Consumers (JPSC) is an ongoing panel survey which the Institute for Research on Household Economics started in 1993, with data available at the time of writing covering 1993–2007. The JPSC follows several cohorts of young and middle-aged women and their families. The original cohort consists of a group of 1500 women born between 1959 and 1969 who were selected from across Japan in 1993 for an in-home questionnaire survey. In 1997 a second cohort was added, consisting of 500 women born between 1970 and 1973. A third cohort was added in 2003 consisting of 836 women born between 1974 and 1979. The relatively high response rate and the continued introduction of new cohorts keeps the sample representative, albeit of the younger population of Japan. The oldest women in the data were those aged 34 in 1993, implying by the 2007 survey the oldest women are 48. The husbands of these women tend to be slightly older; the age range for men in the sample is from 25 to 57.

The four data sets just described each have their strengths and drawbacks. The BSWS is a large annual survey that provides detailed information on wages and hours at the individual level, but tells us nothing about what is happening at the household level. To understand what is happening to earnings at the household level and how this relates to household consumption expenditure we rely mainly on the FIES. The FIES provides cross-sectional data on individual and household earnings, as well as household consumption expenditure every year. The NSFIE contains financial assets data unavailable in other surveys, but only every five years. The drawback here is a lack of individual-level data on wages and hours, and the fact that the NSFIE is only conducted every five years. The BSWS, the FIES and the NSFIE are all cross-sectional surveys. To understand wage and earnings dynamics at the household level we need panel data, which is provided in the JPSC.

2.5. Sample selection

We make the following sample selections. For the BSWS, we keep workers aged 25 to 59.[4] We then exclude missing values and trim the top and bottom 0.25% of observations for the wage and earnings distributions by sex and year. We keep multiple-person households for the FIES and both multiple-person and single-person households for the NSFIE in which the household head is aged 25 to 59. We then exclude non-positive values in disposable income and trim the top and bottom 0.25% of observations for the distributions of head earnings, household earnings, disposable income, and consumption in each year. Finally, for the JPSC we keep households where the household head is aged 25 to 59 and was born between 1950 and 1979; we trim the top and bottom 0.5% of observations for male earnings and wages in each year. In Appendix A we describe further details regarding sample selection and variable definitions; in Appendix B we compare the time-series and life-cycle trends in the means and variances of earnings calculated from the BSWS, the FIES, and the NSFIE.

There are several notable trends in the demographic characteristics when comparing the 1980s to the 2000s (see Table 2.1). Over the three decades, the average household size declines from 3.85 to 3.60, which reflects a decline in the average number of children per household from 1.30 to 1.04. Extended families are very common in Japan and this is reflected in the fact that the average number of adults per household exceeds 2.5 in all years, and there does not appear to be any change over the three decades. The share of households comprising an extended family, which includes one or more relatives, other than the head and spouse, who are either aged 25 and older or working, ranges between 30 and 32 percent (25 and 28 percent) in the FIES (NSFIE) between the 1990s and 2000s. There is, however, an increase in the average number of workers per household, rising from 1.55 in the 1980s to 1.65 in the 2000s. There is some aging of the population, reflected in the rise in age of household head from 41.9 to 44.3. Finally, between the 1990s and 2000s men and women have

[4] We exclude workers aged 60 or older as it is typical for companies in Japan to impose mandatory retirement at age 60.

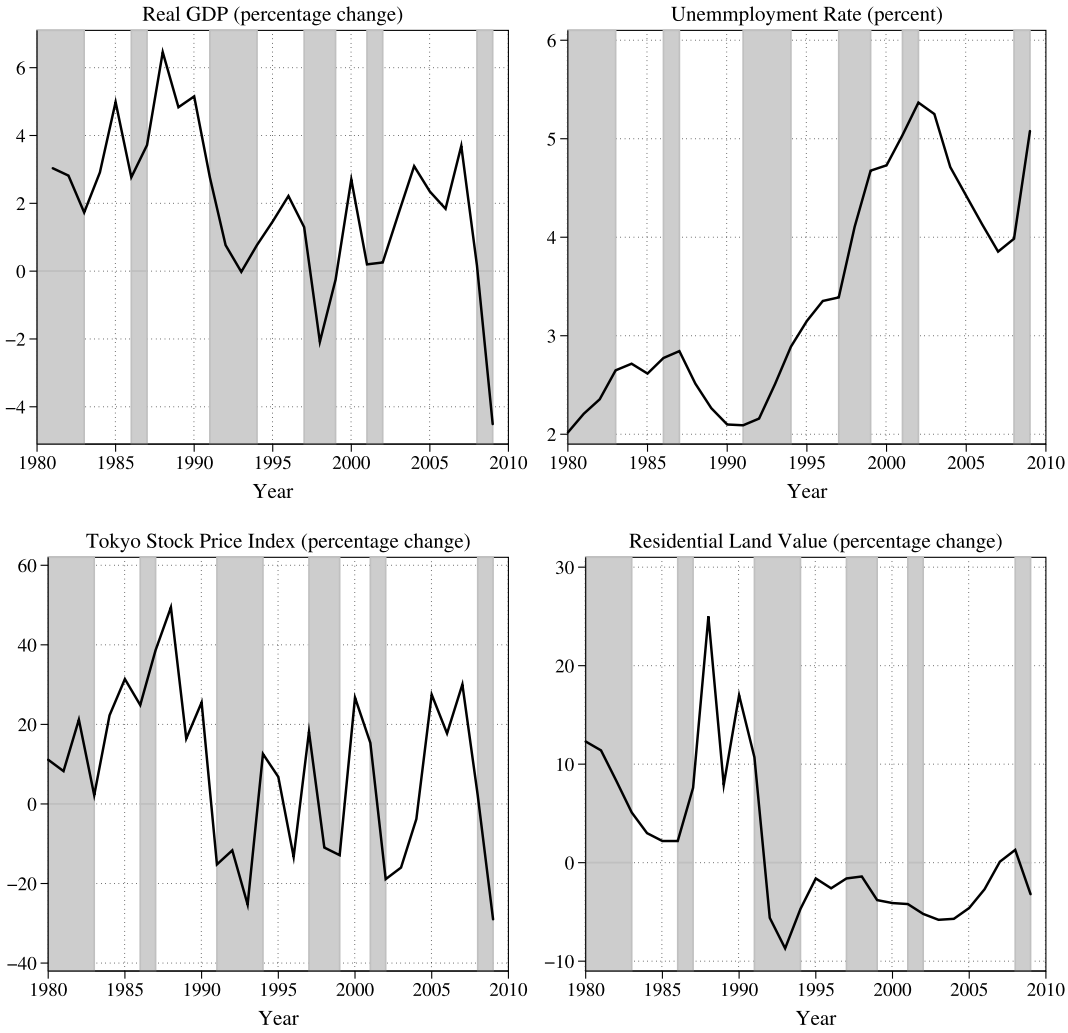

Fig. 3.1. Macroeconomic indicators Japan 1980–2010. *Notes*: Shaded bars are recessions according to business cycle dating by the Japanese Cabinet Office.

become more educated, with the share of men with a college degree increasing from 28.6 to 34.3 percent and the share of women with a college degree increasing from 8.1 to 14.7 percent.

3. Overview of the macroeconomic environment

Before turning to an analysis of the evolution of inequality, we first discuss the general macroeconomic environment and consider the extent to which the survey data (specifically the FIES and the NSFIE) aligns with the official aggregates from the System of National Accounts 1993 (SNA93). The survey data available to analyze economic inequality covers the period from 1981 to 2008. The period after the early 1990s, commonly known as the "lost decades", followed several decades of rapid growth and extremely low unemployment. Fig. 3.1 plots the growth rate of GDP, the unemployment rate, the percentage change in the Tokyo Stock Price Index, and the percentage change in residential land value over the period 1980 to 2009. The 1980s are characterized by strong growth, averaging 3.7 percent per year, and very low unemployment, averaging 2.5 percent. The bubble burst in 1991, followed by both residential land values and the Tokyo Stock Price Index experiencing their largest drops. During the 1990s and 2000s, growth slowed and was negative in 1993, 1998, 1999 and 2009. Unemployment rose steadily from 2.1 percent in 1990 to a high of 5.4 percent in 2002. Unemployment subsequently fell to 3.9 percent in 2006 but following the 2007 financial crisis had climbed to 5.1 percent by 2009. We have access to most of the cross-sectional data on household earnings and expenditure since 1981. However, survey data on wages and hours is not available prior to 1991 and panel data does not exist prior to 1993. Thus we are limited to some extent in our ability to analyze how inequality evolved during the boom times of the 1980s compared to the bust and lost years.

We begin by comparing per capita earnings, disposable income and expenditures calculated from the FIES and the NSFIE to the official SNA accounts. In Fig. 3.2 we plot per capita pre-tax income and the employment rate from the SNA and the Labour Force Survey (LFS) for the years 1981 to 2008, and the same quantities calculated from the original samples in

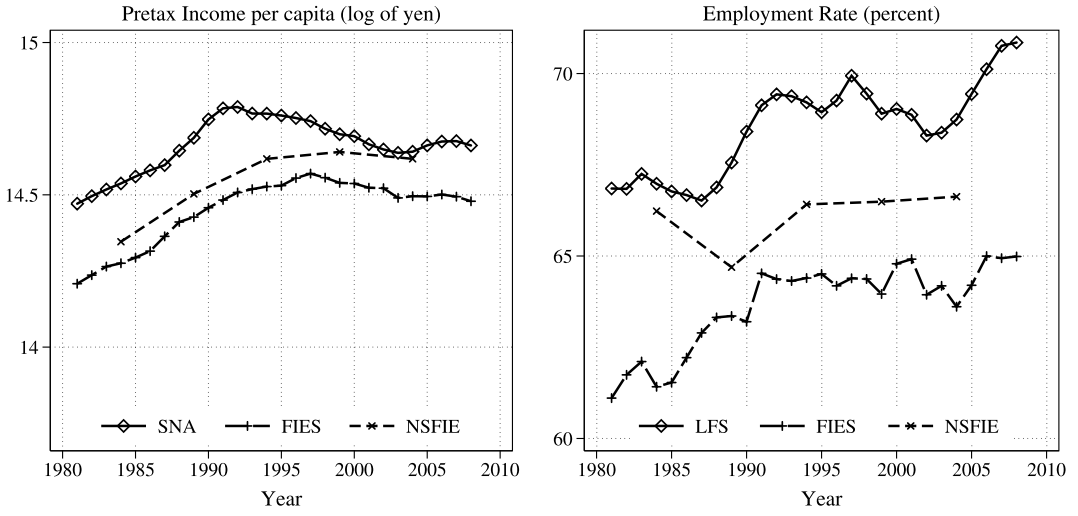

Fig. 3.2. Comparison between averages in FIES, NSFIE and National Accounts: pre-tax income and employment.

the FIES data for each year 1981 to 2008 and in the NSFIE for the survey years 1984, 1989, 1994, 1999, and 2004. Pretax income per capita in the FIES is calculated as the weighted sum of household pre-tax income, divided by the weighted sum of household size. The employment rate in the FIES is calculated as the weighted sum of employed household members divided by the weighted sum of household members over the age of 15. The general trends in each series coincide between the SNA, LFS, FIES and NSFIE; however, the estimates based on the NSFIE and the FIES are all systematically below the SNA. This finding is consistent with Hayashi et al. (1988) who compare the SNA68 and NSFIE in 1984.

3.1. Wages, hours and earnings

In Fig. 3.3 we plot mean wages, hours, and earnings by gender from 1991 to 2008. There are several notable features in this figure. The first is the large drop in mean hours and large increase in mean wages between 1992 and 1993. Historically Japan had a statutory workweek of 48 hours (6 days per week, 8 hours per day). During the mid-1980s, the government legislated a gradual reduction in the workweek (see Hayashi and Prescott, 2002; Lee et al., 2012, for more details). In 1987 the workweek was reduced to 46 hours; it was further reduced to 44 hours in 1991 and 40 hours in 1993. The sharp drop in hours reflect this last change. The rise in mean earnings through 1995 and the subsequent decline mirror the pattern for per capita income presented in Fig. 3.2.

3.2. Consumption

In Fig. 3.4, we compare two measures of per capita consumption calculated from the FIES and the NSFIE and contrast them with the National Accounts measures. In the left we plot non-durable consumption and in the right we plot durable consumption. Our measure of non-durable consumption based on the FIES and the NSFIE line up quite well, at least until the mid-1990s. They are, however, both approximately 50 percent below the National Accounts measures. For durable consumption, the FIES measure is below both the NSFIE and the National Accounts measures. Despite the difference in levels, the trends in the survey data appear to align quite well with the trends in the National Accounts. Both the income and the expenditure survey data appear to suffer from under reporting or possibly an under sampling of high-income households. The under-representation of income and especially consumption expenditures in survey data relative to national accounts data is common in most countries, and it does not appear to be much worse for Japan than it is for the United States and the United Kingdom (see Heathcote et al., 2010; Blundell and Etheridge, 2010).

4. Inequality over time

4.1. Individual-level inequality

4.1.1. Wages

We begin our discussion of inequality by considering the dispersion of individual wages, hours and earnings. We draw on material in Yamada and Kawaguchi (2012) for some of the results on the wage structure. It is particularly instructive to consider separately men and women when looking at the evolution of wage inequality as they have experienced very different patterns in the evolution of wage inequality between 1991 and 2008. In Fig. 4.1 we plot four measures of inequality in hourly wages for male and female workers separately and pooled. The variance of log wages for all workers appears to

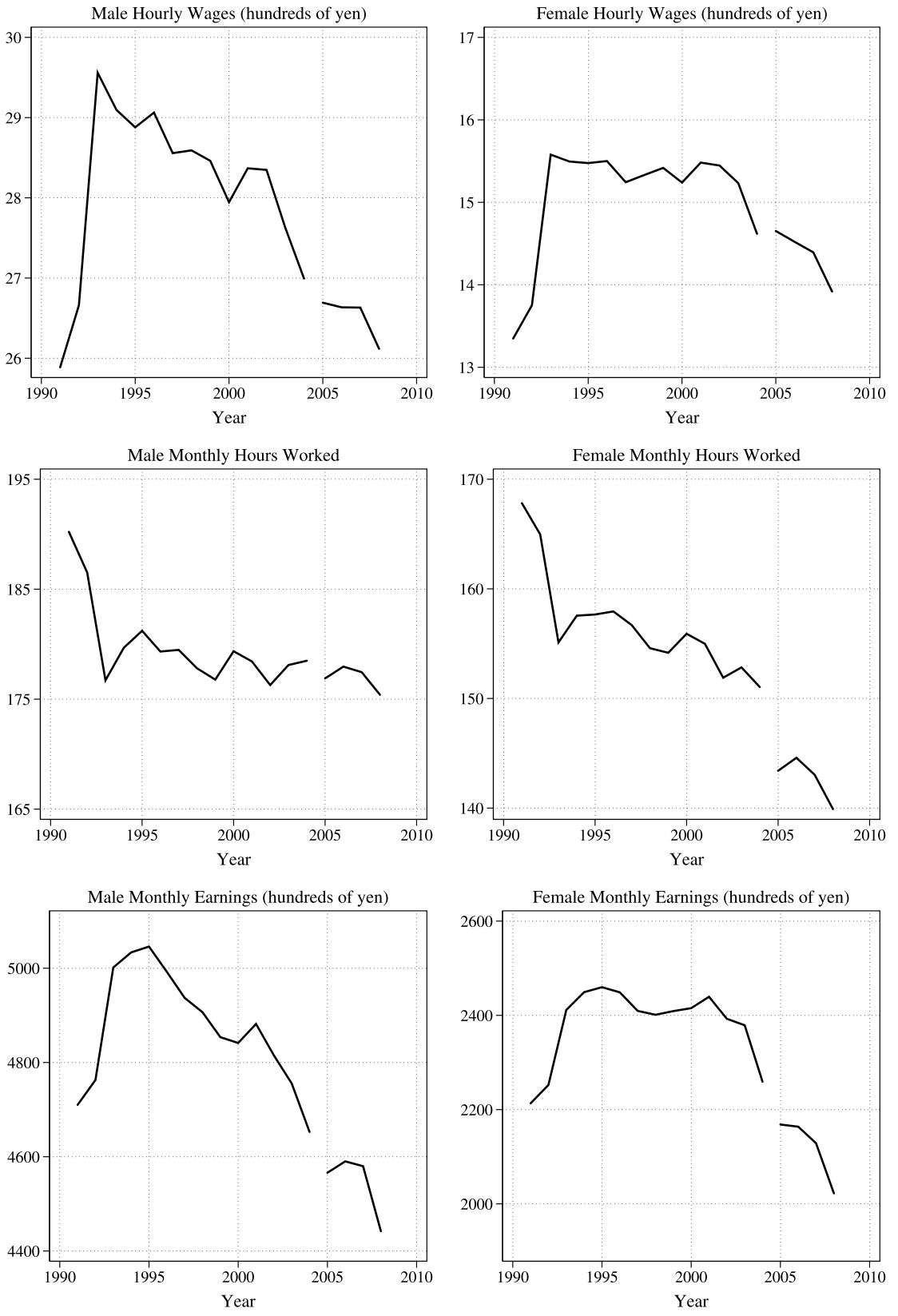

Fig. 3.3. Average wages and hours worked for men and women (BSWS).

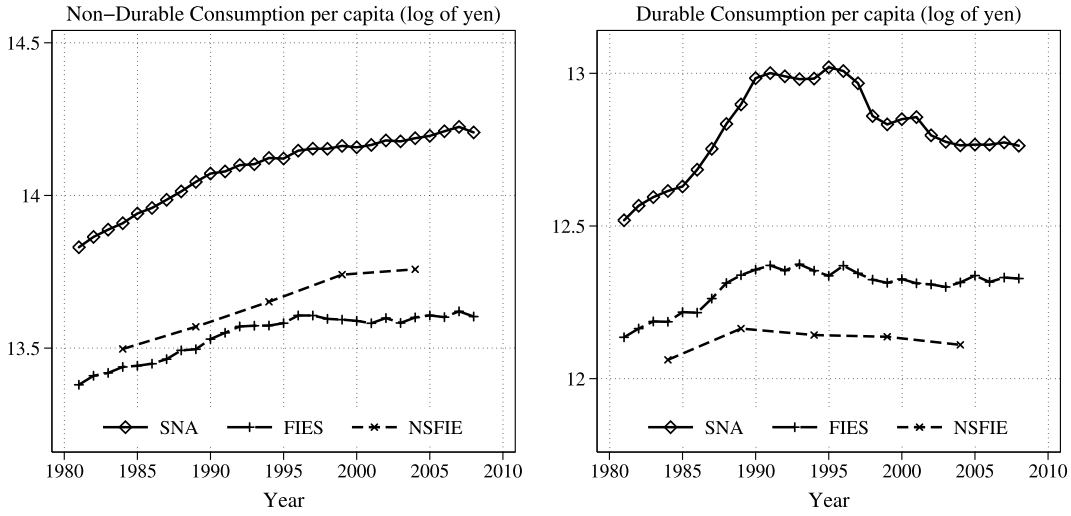

Fig. 3.4. Comparison between averages in FIES, NSFIE and National Accounts: consumption.

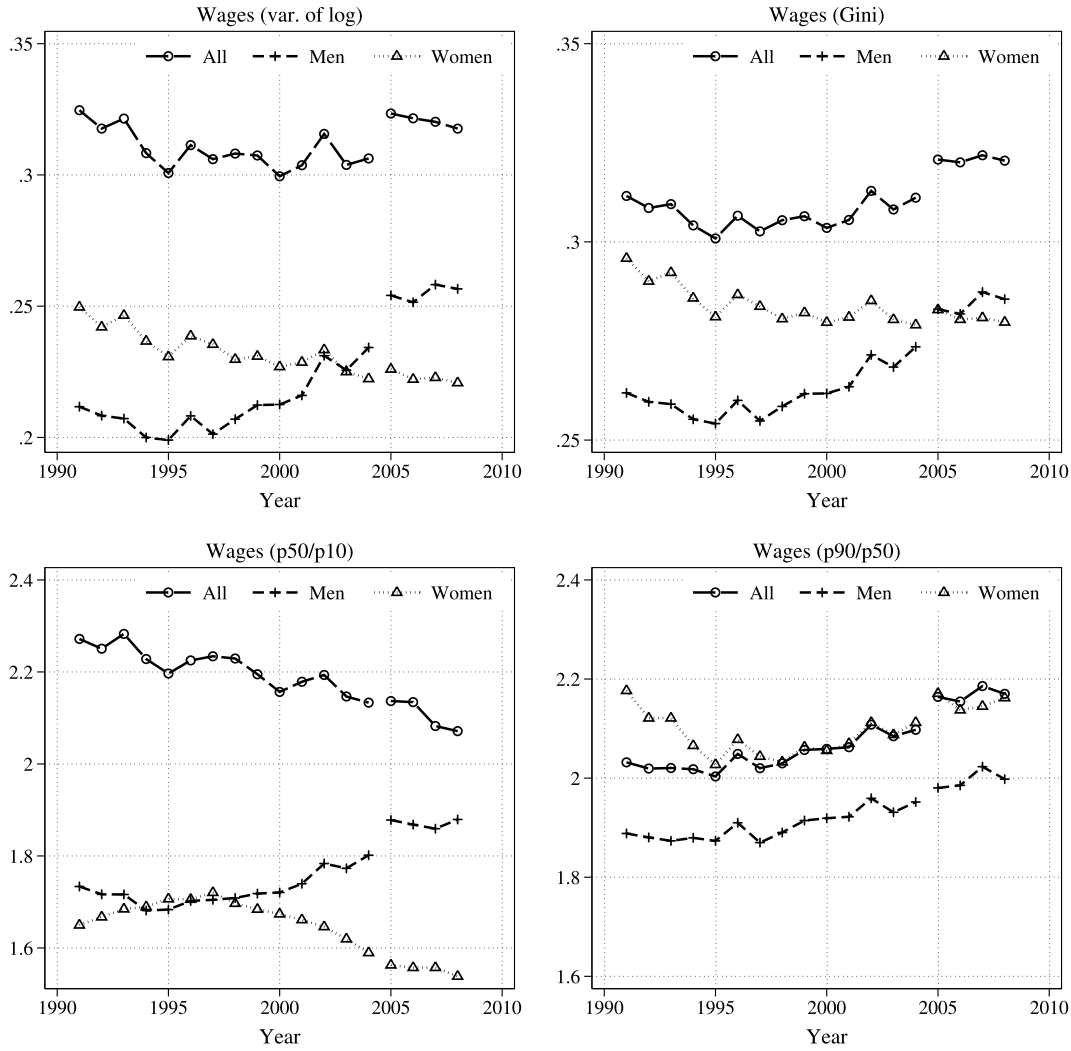

Fig. 4.1. Wage inequality for men and women (BSWS).

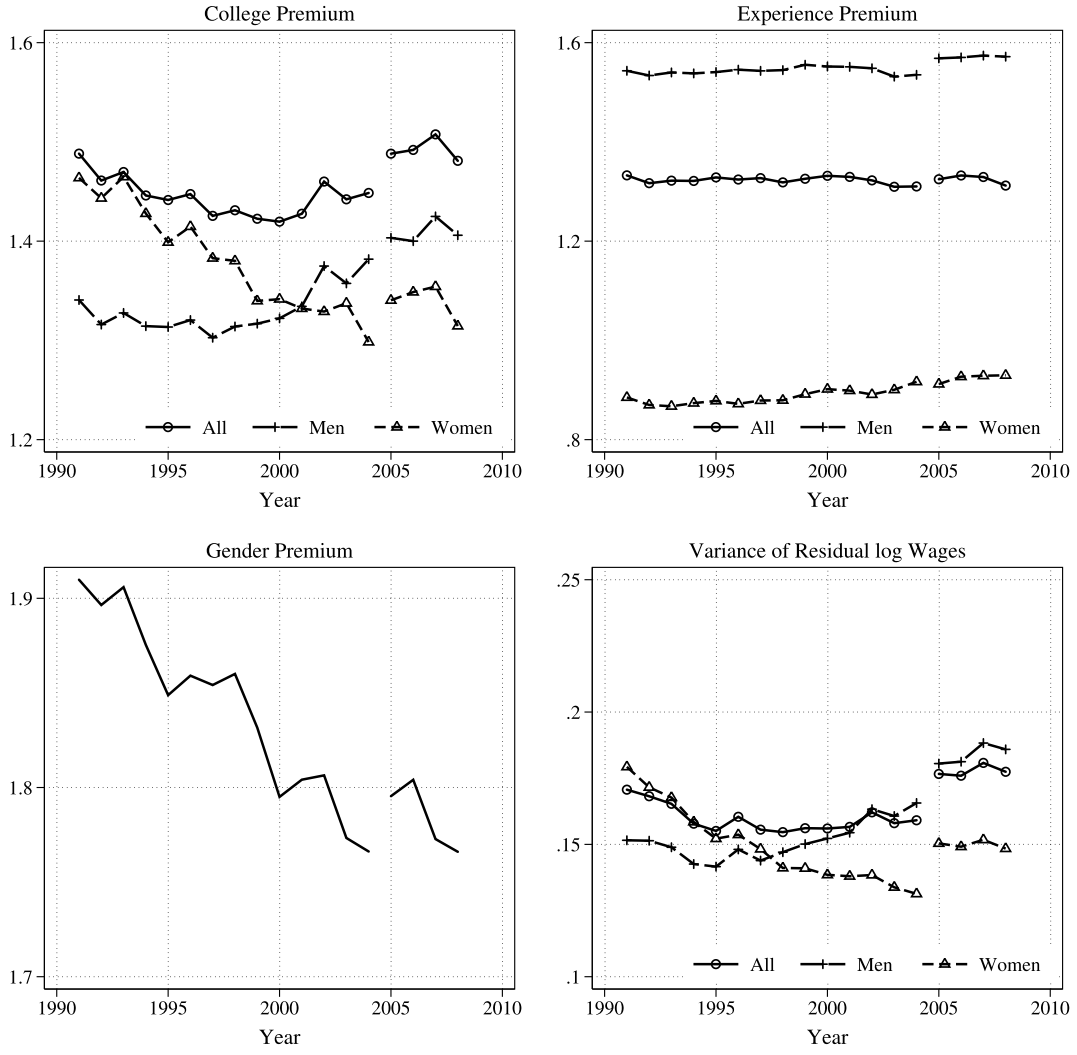

Fig. 4.2. Education, experience, gender wage premia, and residual wage inequality (BSWS).

indicate that wage inequality remained basically unchanged over this period. However, once we look separately at men and women it becomes clear that this is the result of averaging over rising inequality for men and declining inequality for women. The same pattern is true if we look at the Gini coefficient: inequality appears to be increasing slightly when looking at all workers while male wage inequality is rising and female wage inequality is falling.[5] A similar difference in trends is observed when looking at quantile ratios for men and women. The 50/10 ratio is rising for men and declining for women, although with an initial fall for men between 1991 and 1994 and an initial rise for women between 1991 and 1997. The ratio for all workers is declining, reflecting the fact that women are over-represented in the bottom half of the wage distribution. Kambayashi et al. (2013) find that a steady rise in the minimum wage over this period accounts for a substantial share of the fall in the 50/10 ratio for women, who make up the majority of minimum wage workers. Looking at inequality at the top of the wage distribution we see that, with the exception of a fall between 1991 and 1995 for women, the 90/50 ratio is increasing for both men and women.

4.1.2. Observables and residuals

In Fig. 4.2 we plot the time-series for the education-, experience-, and gender-premium in wages. The trends in the wage premium for education, measured at the ratio of mean wages for college educated relative to less than college educated

[5] It is important to keep in mind, as discussed in Section 2.1, that the BSWS changed the questionnaire in 2005 in an attempt to obtain better information on non-permanent workers. There appears to be a slight discontinuity in some of the figures between 2004 and 2005, but the overall trends are not sensitive to considering the entire period 1991 to 2008 or the shorter period 1991 to 2004.

workers once again differ for men and women.[6] The overall college premium in 2000 was 1.43, which is closer to Germany and Spain (1.38 and 1.48) than to the US and Canada (1.80) (see KPPV Table 3, reproduced as Table C.1). Mirroring the trends in earnings inequality for men and women, the education premium rose for men and fell for women over this period, and appears to have converged by 2001, by which point educated men and women have wages 1.35 times that of uneducated men and women. It is not clear why the college premium for men and women should be moving in opposite directions. The fraction of women with college education increased substantially, from 5.9 percent in 1991 to 17.4 percent in 2008, while at the same time the fraction of college educated men increases from 26.3 percent to 37.1 percent. One possibility is that the 5.9 percent of women who were college educated in 1991 were substantially more productive than the next 5 percent who attained college education by 2000, this change in composition could explain the decline in the premium for women. To rationalize the fact that the premium for men was unchanged from 1990 to 2000 it would need to be the case that increasing the fraction of educated men from 26.3 to 31.4 had very little effect on the composition. Post 2000 the premium rose for men and flattens out for women, which is consistent with a story of skill-biased technical change over this period pushing up the premium for both men and women. It is interesting to note that the US also had a falling college premium for women between 1968 and 1981. As we will see again below, many of the patterns for women in Japan resemble the patterns in the US and the UK 20 to 25 years earlier.

The experience premium, measured as average wages of 45–55 year olds relative to 25–35 year olds, changed little over this period. What is striking once again is the substantial difference between men and women, and the fact that the experience premium for women is actually less than one, a pattern observed in the UK from 1980 to 2005 and in the US prior to 1985 (Blundell and Etheridge, 2010; Heathcote et al., 2010). The pooled experience premium in 2000 was 1.34, which is close to the average reported in Table C.1. Over the same period the raw gender differential fell from 1.91 to 1.77, a substantial decline, but still much higher in levels compared to the US or UK which have a raw gender differential of 1.3 in 2000. Indeed, in 2000 Japan had a differential of 1.80 which is substantially higher than the average (1.27), and even the maximum (Russia, 1.49) of the countries summarized in Table C.1. Historically Japan has stood out from other OECD countries on this dimension. In 1969 the raw gender premium in Japan was 2, it decreased to 1.8 by 1975, and then rose again to 2 by 1990. All other OECD countries had both substantially lower and declining gender premiums (see Blau and Kahn, 1995, Fig. 3.1). Residual inequality is plotted in the bottom right panel. This is the residual for all, male or female workers, after controlling for demographics including age, education, sex, and part-time job. The pooled residual variance ranges between 0.16 and 0.18 while the raw variance (Fig. 4.1) ranges between 0.30 and 0.33, indicating that observables account for about one half of the variance over this period.

4.1.3. Labor supply

In the bottom right panel of Fig. 4.3 we plot the variance of log earnings for men and women. In contrast to the inequality trends in wages, inequality in earnings rose for both men and women between 1991 and 2008.[7] Since earnings are the product of wages and hours, the variance of log earnings can be decomposed into the variance of log wages plus the variance of log hours plus twice their covariance. The other three panels of the same figure plot the variance of log wages, log hours, and their correlation. For women, the decline in the variance of log wages is offset by a larger rise in the variance of log hours, and a positive correlation between the two. For men, the variance is rising for both log wages and hours, and is muted slightly by a negative correlation. The finding that the rise in inequality of earnings is larger than the rise for wages is consistent with the results reported in KPPV (p. 5). KPPV also report that for all the countries they summarize, the correlation between hours and wages is negative for men, and less so for women.

4.1.4. Earnings

In Fig. 4.4 we dig deeper into the sources of the change in earnings inequality. We rank individuals by earnings, and then for the bottom, middle and top deciles of the earnings distribution we calculate mean earnings, wages and hours worked. To highlight the dynamics we plot the percentage change for each decile relative to 1991.[8]

The top decile remained unchanged in real terms between 1991 and 2008; the middle decile experienced a small decline of less than one percent, and the bottom decile experienced a real decline of five percent. Over this period wages for the top and middle deciles remained virtually unchanged, and only in the bottom decile do we see any real wage rise of about four percent, reflecting the steady rise in the minimum wage over this period (Kambayashi et al., 2013). The fall in earnings for the bottom decile is driven by a large decline in hours worked over this period. Individuals in the bottom decile experienced a 17 percent drop in average hours. Hours remained unchanged for the top and middle deciles. The large decline in average hours worked by the lowest decile appears to be associated with an increase in part-time and temporary work. While there were almost no men working part-time in 1991 five percent are working part-time by 2008. Similarly for women, the share working part-time rose from 25 to 40 percent over this period. There was also a slight rise in the share of temporary (fixed-term) employment over this period. Most of the change in earnings inequality from 1991 to 2008

[6] Since education information is collected only for full-time workers, we exclude part-time workers from the sample when calculating the education premium.

[7] Again, we see a jump between 2004 and 2005 that is likely the result of changes to the survey questions. Whether we include or exclude the years 2005–2008 has no effect on the overall trends.

[8] The patterns are similar for men and women.

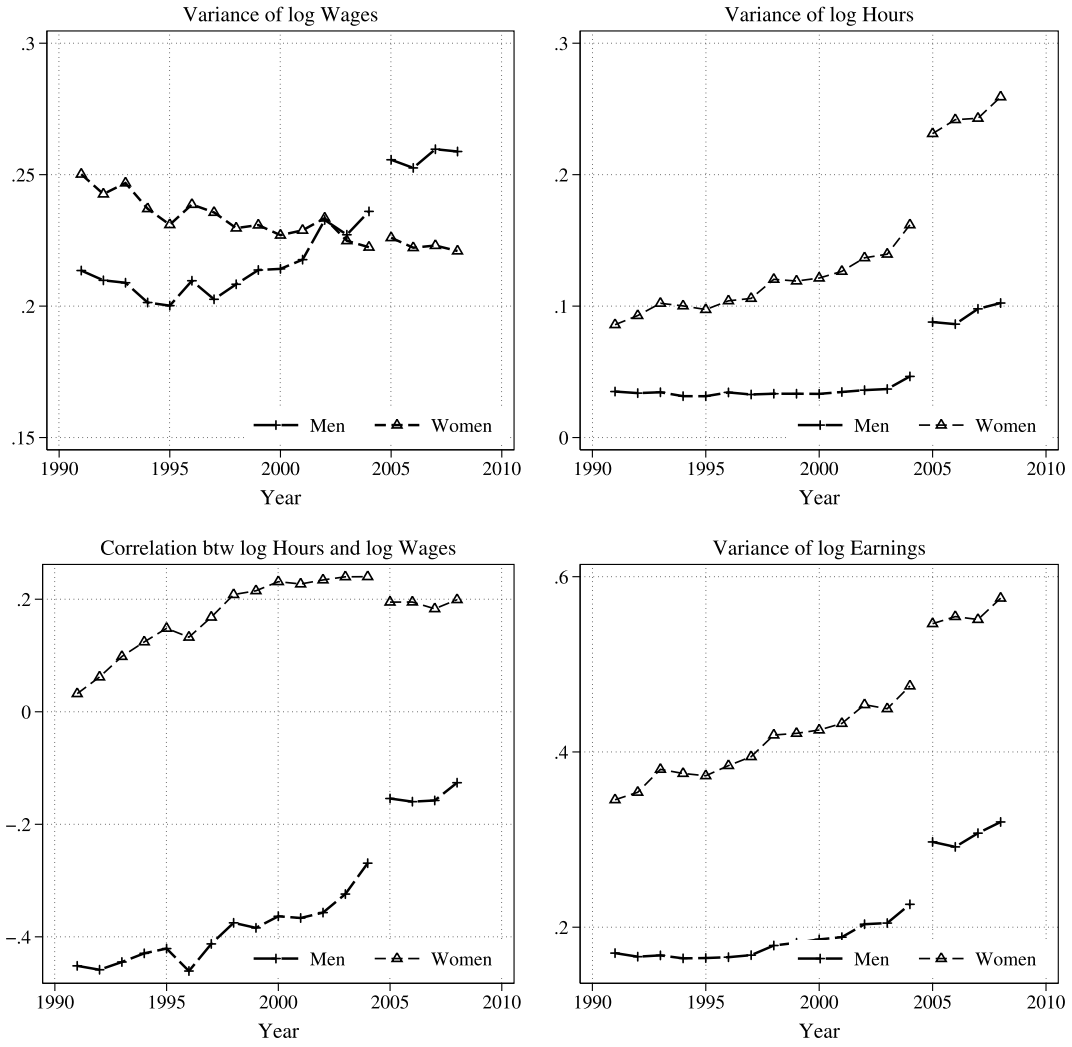

Fig. 4.3. Inequality in labor supply and earnings of men and women (BSWS).

occurred at the bottom of the earnings distribution, and is largely associated with the increased variance in hours worked. This reflects the rising share of part-time and temporary workers who act as a buffer for employment in Japan, where long-term employment is often implicitly guaranteed for full-time and regular workers (Houseman and Abraham, 1993).

4.2. Household-level inequality

For calculating measures of household-level inequality we use the FIES data which is available every year from 1981 to 2008. While we are restricted to the 1990s and 2000s when analyzing wage and hours inequality, we are able to expand the analysis back into the 1980s when considering household earnings and expenditure inequality.

4.2.1. Equivalized household earnings

In Fig. 4.5 we plot four summary measures of household earnings inequality, equivalized using the OECD scales.[9] Looking at the variance of logs and the Gini coefficient, inequality in household earnings rose in the 1980s, stayed constant in the 1990s, and rose again after 2000. Inequality in household earnings rose more steadily between 1981 and 2004 if we look at quantile ratios. Turning to Fig. 4.6 we get a clearer picture of exactly what is happening to the distribution that is not fully conveyed in the summary measures of Fig. 4.5.

In Fig. 4.6 we plot the 5, 10, 25, 50, 75, 90 and 95th percentiles of equivalized household earnings and disposable income from 1981 to 2008, each normalized to zero in 1981. Looking at the evolution of the individual percentiles we

[9] The OECD scale gives a weight of 1 to the first adult, 0.7 to all other adults, and 0.5 to children aged 16 and younger.

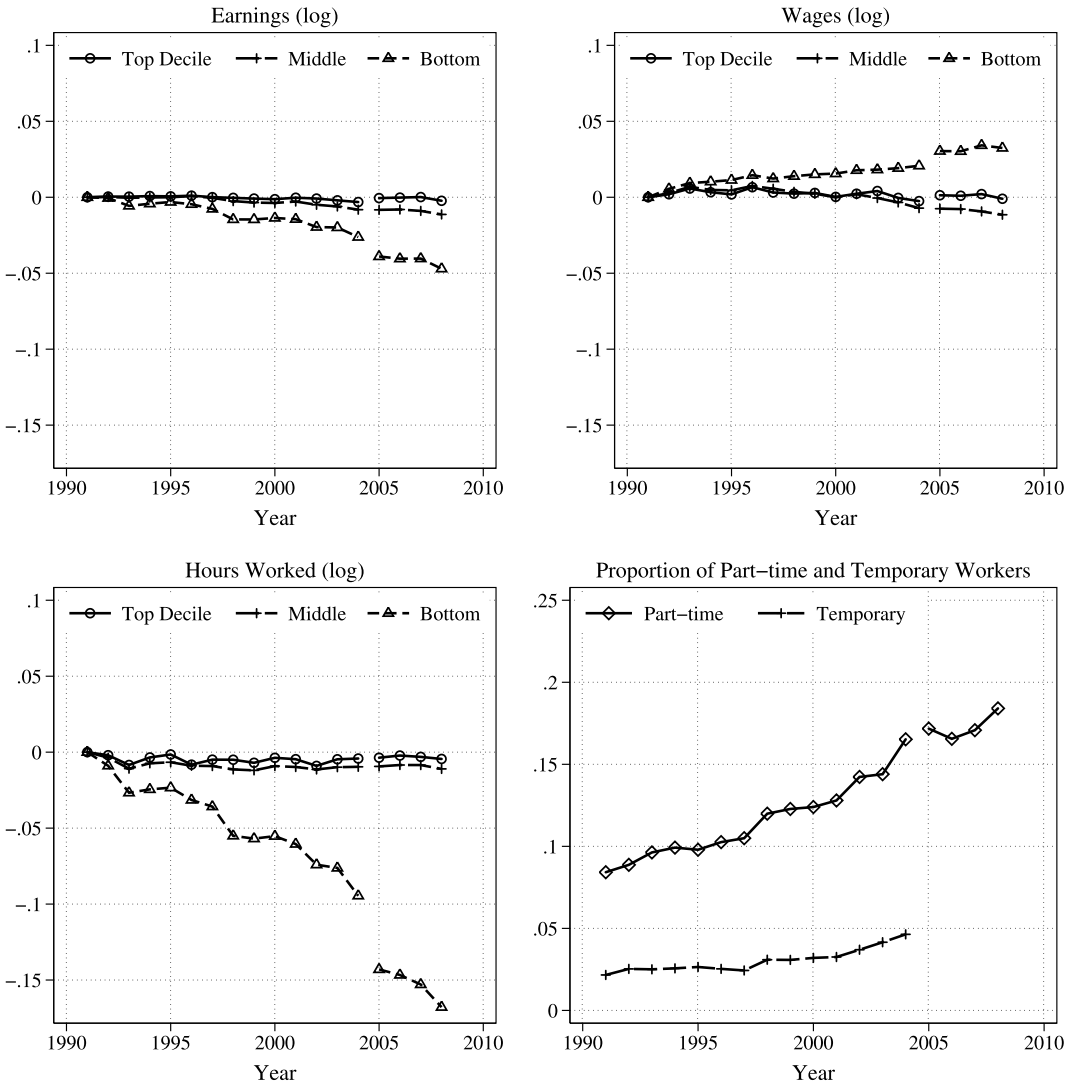

Fig. 4.4. Understanding earnings inequality (BSWS).

see that the monotonic increasing trend in inequality masks two distinct episodes. In the early period, between 1981 and 1996, real household earnings were rising at all percentiles of the distribution. However, not everyone experienced growth at the same rate. While the 95th percentile experienced real household earnings growth of 40 log points, the 5th percentile grew by just 18 log points. All incomes were rising, but those at the top experienced substantially larger gains, leading to a rise in overall inequality. The years post-1996 tell a very different story. During this period households above the median experienced zero real growth in household earnings, while those at and below the median experienced real declines. The 5th, 10th and 25th percentiles experienced declines of 10 log points, while the median experienced declines of 5 log points. Thus, the increases in inequality over this period reflects a stagnation for half the population and real declines for the other half.

To summarize, during the years 1981 to 1996, real earnings rose at all percentiles of the distribution, but not equally across the percentiles, while from 1996 to 2008 households above the median experienced no real growth, while households at and below the median experienced real declines in earnings. This important distinction is masked in the inequality summary measures presented in Fig. 4.5. It is worth noting that during the 1970s the US also experienced a prolonged period with moderate gains in real household income at and above the median and falling real incomes below, especially notable for households below the 10th percentile (see Heathcote et al., 2010, Fig. 9). Finally, it is worth noting that there does not appear to be a clear relationship between fast growth and changes in inequality across countries. Comparing the boom years in Japan to other fast growing economies we can see that fast growth was associated with rising inequality in China, India and South Africa (see OECD, 2010, Fig. 1.14), but with falling inequality in Brazil and Korea (see Kim and Topel, 1995, Table 7.5).

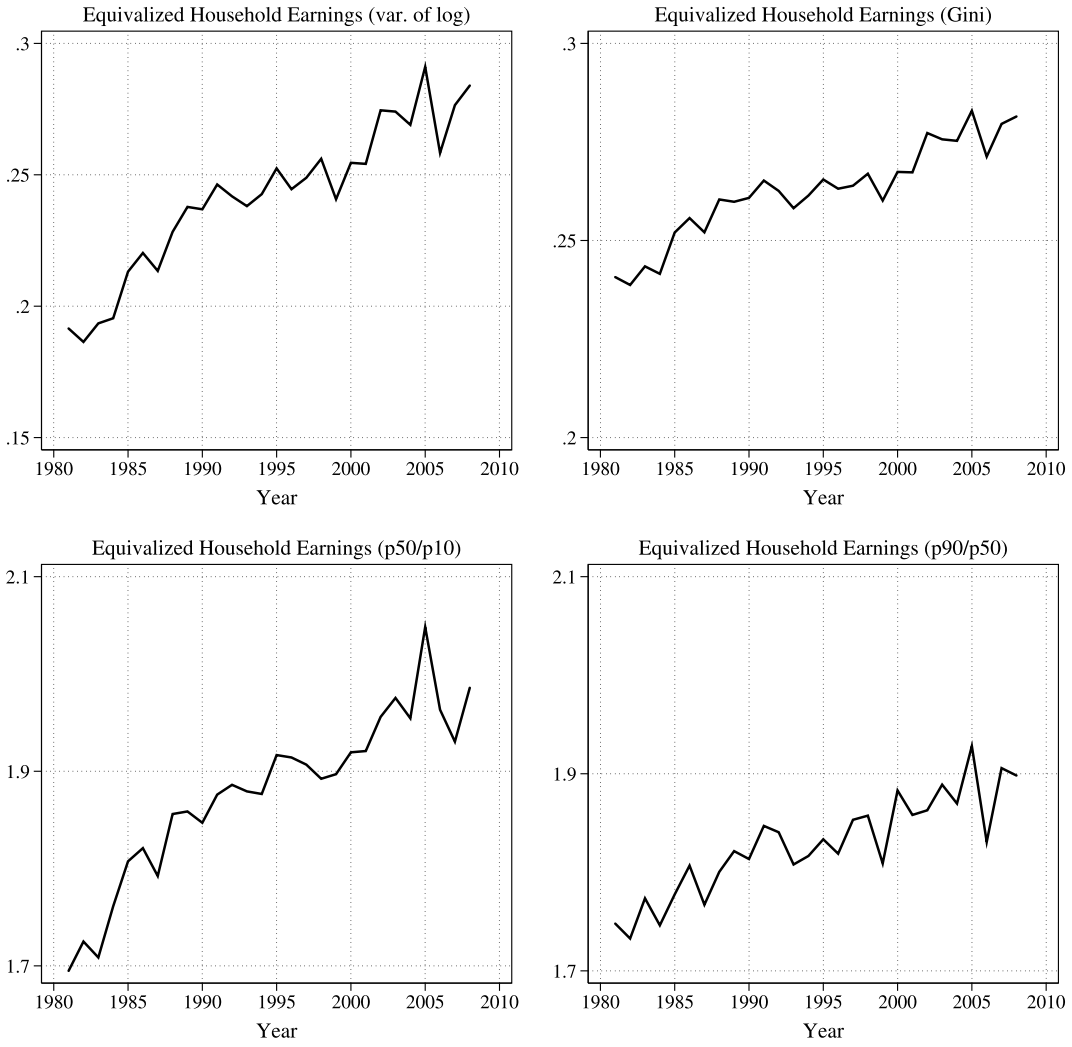

Fig. 4.5. Various measures of household earnings inequality (FIES).

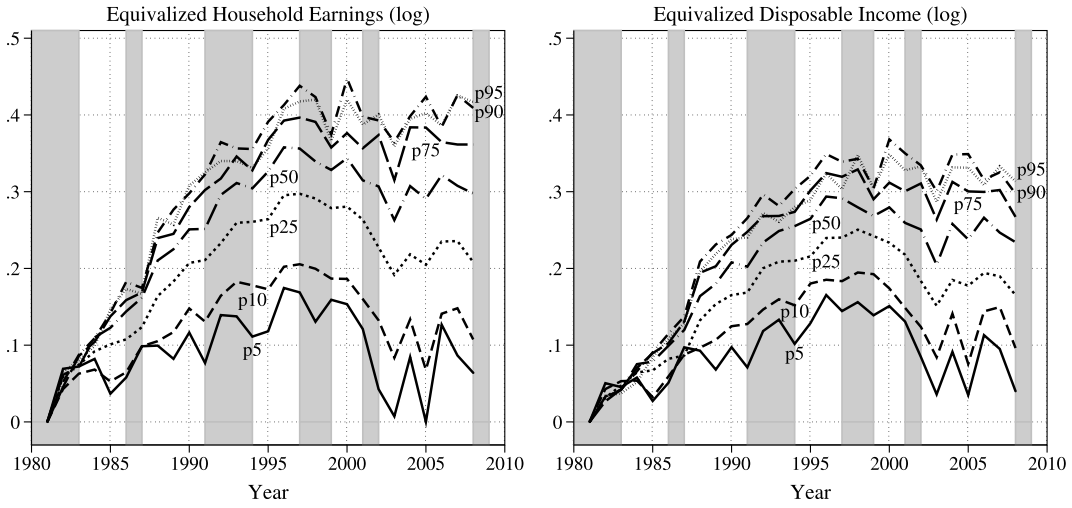

Fig. 4.6. Percentiles of the household earnings distribution (FIES). *Notes*: Shaded areas are recessions according to business cycle dating by the Japanese Cabinet Office.

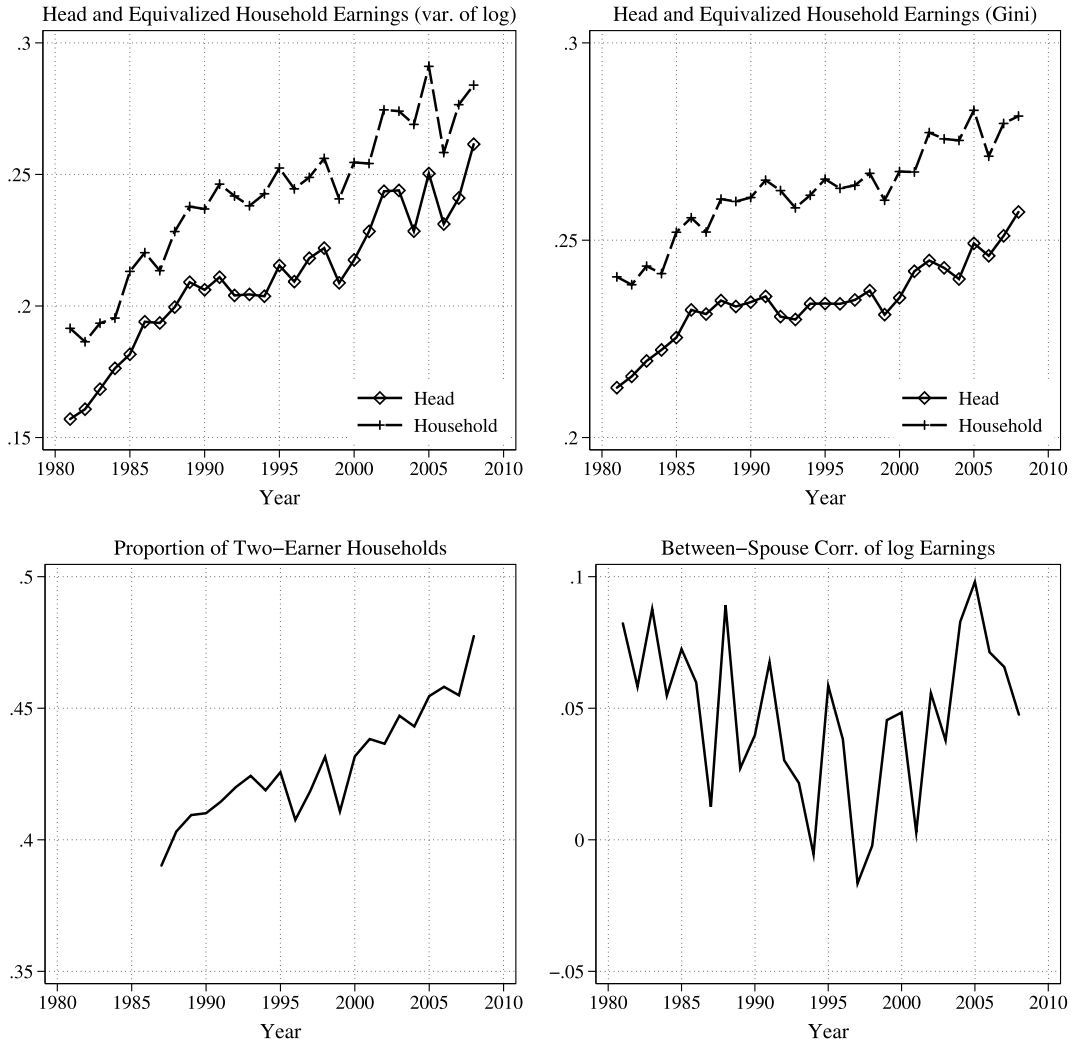

Fig. 4.7. Understanding the role of the family for earnings inequality (FIES).

4.2.2. From individual to household inequality

The top panels of Fig. 4.7 plots the evolution of inequality in earnings for the entire household and for the household head. The level of inequality is higher for (equivalized) household earnings than for earnings of the head. At least part of this is due to the fact that households comprising an extended family are quite common in Japan (see Table 2.1). With multiple adults living in the same household, the potential for inequality in earnings across households is greater, as we are pooling over households in which all the adults work and households in which only one adult works. Although the level is higher, the trend is nearly identical.

The bottom left panel of Fig. 4.7 plots the proportion of two-earner households, which has been rising continuously since 1986.[10] The bottom right panel plots the correlation in earnings between husband and wife for the period 1981 to 2008. This cross-sectional correlation is small and displays a slight U-shape over this period. The fact that the spousal correlation in earnings is so low explains why the household inequality is not rising faster than inequality in the heads earnings.

4.2.3. Government redistribution

In Fig. 4.8 we consider the impact of government transfers and taxes on inequality. In the top panel we compare households' market income (gross income defined as earnings plus private transfers and asset income) to households market income plus government transfers (pre-tax income). In the bottom panel we compare income including government transfers to income after taxes. Two interesting patterns emerge. First, government transfers appear to play only a small role in reducing household inequality during the boom period of the early-1980s. It is not until the mid- to late-1980s that

[10] Prior to 1987 the FIES did not contain information on the employment status of the spouse.

Fig. 4.8. From pre-government to disposable income (FIES).

inequality in market income drifts away from inequality in income after government transfers. Given the fact that households comprising an extended family are quite common in Japan, government transfers consist mainly of public pension benefits, making it ambiguous whether government transfers reduce inequality. The fact that the compression is larger for the variance of log income than for the Gini tells us that government transfers act to compress inequality at the bottom as the variance of log income is very sensitive to changes near zero. This finding is consistent with the results in Oshio (2006) who documents rising earnings inequality from 1980 to 2001 and finds evidence of inequality-reducing transfers across households using the Survey of Income Redistribution. Looking at the bottom panels, we see that the tax system in Japan is quite progressive, and has a much larger effect on compressing inequality than transfers (either private or public). The effect of taxes in reducing inequality is quite stable over the entire period 1981 to 2008, as there is no discernible difference in the inequality trends when comparing pre-tax and disposable household incomes.[11] The change in inequality for both pre-tax and disposable income was 0.075 between 1981 and 2008. Japan is below the US (0.11 for both) and quite similar to Italy (0.06 and 0.07) (see KPPV Table 4, reproduced as Table C.2).

Looking again at Fig. 4.6 and comparing the percentiles of household earnings to disposable income we see that taxes and benefits provide substantial redistribution over this period. Looking, for example, at 2005, government redistribution raises the disposable income of the 5th percentile 5 log points above household earnings, reduced the 95th percentile by 10 points and leaves the 10th percentile effectively unchanged from pre-government earnings.

[11] Kitamura and Miyazaki (2012, in Japanese) find that the redistributive effect of taxation is small for those aged 59 and younger, but quite strong for those aged 60 and above, who are excluded from our analysis.

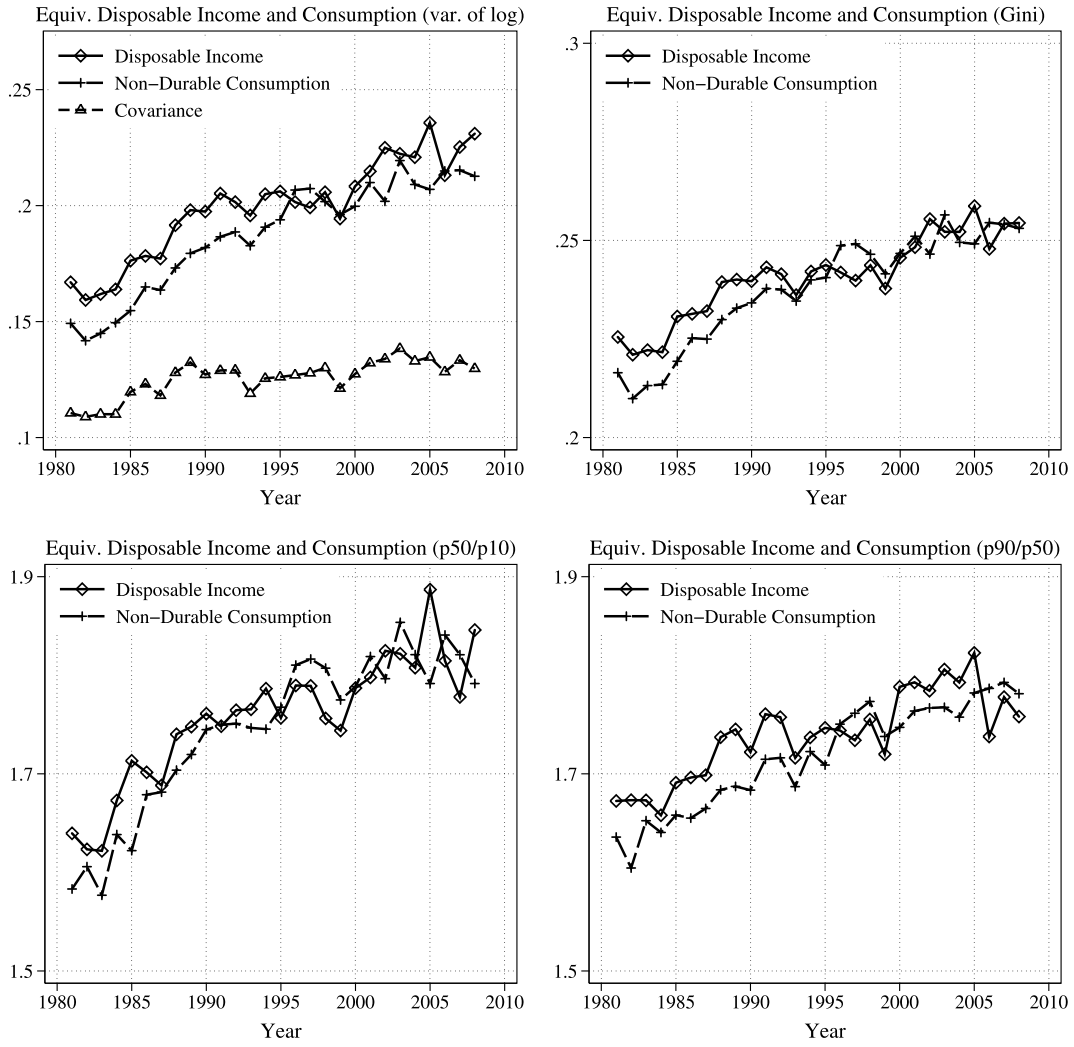

Fig. 4.9. From disposable income to consumption (FIES).

4.2.4. From disposable income to consumption

In Fig. 4.9 we explore the role of borrowing and savings as a means for households to separate consumption expenditures from income. Here we plot for disposable income and non-durable consumption expenditures the variance of logs, the Gini coefficient, the 50/10 and 90/10 ratios. There are several interesting things to note about the variance of logs. First, for the most part inequality in consumption expenditures is lower than inequality in disposable income, consistent with access to at least partial insurance at the household level. Second, when looking at the variance of logs, the trends differ somewhat between income and consumption. There are three distinctive episodes for income: rising inequality between 1981 and 1990; no change in inequality between 1990 and 2000; and then rising inequality again during the 2000s. In contrast, inequality in consumption has risen steadily during the entire period.

In the same panel we also plot the evolution of the covariance between disposable income and consumption. From 1981 to 1989 the variances of log income and consumption, as well as their covariance all increase roughly in parallel. During the 1990s, however, the variance of log consumption continues to rise, while the variance of disposable income and the covariance with consumption flattens out. Finally, during the 2000s, the variance of disposable income increases faster than consumption, which continues to rise at roughly the same rate as the previous decades, and the covariance again rises roughly in parallel with consumption.

To place the level and changes in context with the experience of other developed countries, note that in 2000 the 50/10 and 90/50 measures were both 1.79. These are well below the averages reported in KPPV (Table 5, reproduced as Table C.3) of 2.98 and 2.33. In terms of inequality in consumption the 50/10 and 90/50 are 1.79 and 1.75. Japan looks more like Germany and Sweden than the US on these dimensions. The gap between inequality in income and consumption is also quite small for Japan. In 2000 there is no difference for the bottom (50/10) and a gap of only 0.04 at the top (90/50). In the US the corresponding differences are 0.64 and 0.21.

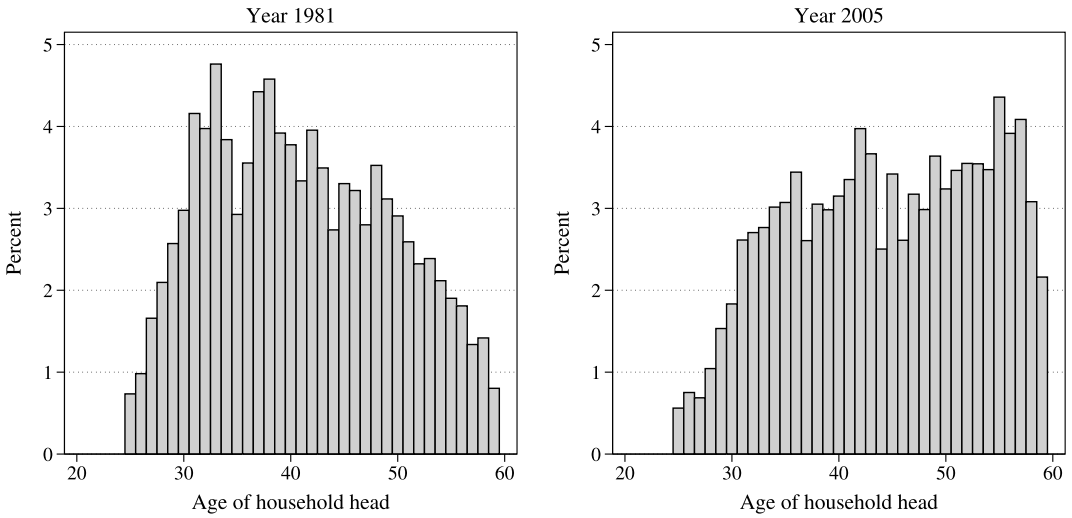

Fig. 4.10. Changing age distribution (FIES).

Table 4.1
Long-run changes in inequality, 1981–2005.

	Var of log	Gini	Bottom (50/10)	Top (90/50)
Disposable income (equivalized)	0.069	0.033	0.247	0.150
Consumption (equivalized)	0.058	0.033	0.208	0.145
Holding the age distribution constant				
Disposable income (equivalized)	0.063	0.031	0.197	0.157
Consumption (equivalized)	0.049	0.029	0.185	0.136
Percentage of change accounted for by changing age distribution				
Disposable income (equivalized)	8.7	6.1	20.2	−4.7
Consumption (equivalized)	15.5	12.1	11.1	6.2

When considering the change in inequality between 1981 and 2005 Japan stands apart from the country experiences summarized in KPPV (Table 6, reproduced as Table C.4).[12] The increase in inequality at the bottom (50/10) was 0.247 for income and 0.208 for consumption. The increase in consumption inequality is similar to Canada (0.20) and the US (0.25), however Japan did not experience the same increase in income inequality (0.38 and 0.55). The small gap of 0.039 between the two in Japan is striking; among the countries surveyed by KPPV the average gap was 0.71, with the lowest gaps observed for Russia (0.05) and Spain (−0.03). Spain is also an outlier in which inequality actually fell for both income and consumption, and inequality in income fell by more. In terms of changes in inequality at the top (90/50) in Japan, the increase for income was 0.150, the same as Germany, and 0.145 for consumption, similar to the UK (0.12) and the US (0.15). The gap between income and consumption inequality is almost zero, 0.005, this places Japan with the outliers of Russia (−0.06) and Spain (−0.17); well below the US gap of 0.25 as well as the average gap of 0.05.

4.3. The changing age structure in Japan

One striking feature of Japan is that the age structure has changed substantially between 1981 and 2005. This can be seen clearly in Fig. 4.10 where, for example, the fraction of household heads aged 33 fell from 4.8 percent to 2.8 percent while the fraction aged 55 rose from 1.9 to 4.4 percent. In Table 4.1 we present the observed change in inequality between 1981 and 2005, along with the implied changes holding the age structure constant at the 1981 distribution.[13] The aging of the population did contribute to the rise in inequality, especially at the bottom where it accounts for 20.2 percent of the increase for disposable income and 11.1 percent for consumption. At the top, a constant age distribution is associated with a larger inequality in disposable income (a change in the 90/50 ratio of 0.157 instead of the observed 0.150) and a smaller rise in the 90/50 ratio for consumption (0.136 instead of 0.145). Interestingly, holding the age structure constant narrows

[12] We select 2005 as the end date to be as comparable as possible with the other *RED* country studies summarized in KPPV. The results are slightly different if we consider 2008 as the end date. These results are presented in Table C.5 in Appendix C.

[13] We define $p_{t,a}$ as the fraction of individuals in our sample in year t who are age a. We then re-weight the 2005 data to have the age structure of 1981 by weighting each observation by $(p_{1981,a}/p_{2005,a})$, where a indexes the age of household head in the sample.

Fig. 5.1. Average employment rates by age, birth cohort, and sex (LFS).

the gap between the 50/10 ratio for income and consumption (0.012 instead of 0.039) and increases the 90/10 gap (0.021 compared to 0.005). While the changing age distribution in Japan can account for some of the rise in inequality, it does not go very far in explaining why the change in the gap between inequality in income and consumption is so small.

5. Inequality over the life-cycle

Our ultimate interest is in the life-cycle profile of inequality for households. As noted earlier we can think of households as having access to multiple forms of insurance, one of which is due to the collecting of individuals into households. Since the vast majority of households will comprise at least one man and one woman, it is worth documenting the raw differences in employment rates, wages, hours and earnings by gender, which differ strikingly in Japan. Of course these differences largely reflect the outcomes of decisions made at the household level.

5.1. Average employment, wages and hours over the life-cycle

Fig. 5.1 plots the employment rates for men and women over the life-cycle for the 10-year intervals 1975, 1985, 1995 and 2005 from the LFS. The differences by gender and the trends over time are quite striking. The employment rate for prime age (25 to 55) males in Japan ranges between 88 and 97 percent. It has been falling somewhat over time, but always remains above 92 percent for men over the age of 30. Over the same period the employment rate for women never goes above 72 percent. The life-cycle pattern of fertility is also clear. The female employment rate is high in the early 20s, falls during the late 20s, remains low during the typical childbearing years, and recovers again around age 40. While this pattern exists in all years, there is a clear time trend, the dip in employment occurs at a later age in the more recent years, is much less pronounced, and the employment rate post-childbearing ages recovers to the pre-childbearing level by 2005. It is interesting to note that the 1975 employment rates for women in Japan have a nearly identical pattern to the 1975 rates in the UK (Blundell and Etheridge, 2010); however, the childrearing dip in the UK has all but disappeared by 2005 and the employment rate reaches 80 percent in the years after childrearing. The 2005 pattern for female employment rates in Japan looks very much like the 1985 pattern in the UK.

The age profile of wages also differs markedly between men and women. In Fig. 5.2 we plot the age profile for mean wages and hours for men and women by decade of birth. For men, wages rise between the age of 25 and 50 before declining slightly. For women, wages rise mildly from age 25 but peak by age 30, at which time they begin to fall slightly. There are similar gender differences in the age pattern for mean hours worked (conditional on employment). In the bottom left panel we plot average monthly hours for men by birth cohort. In each cohort we observe a decline in average hours after age 25. The level shift down at the beginning of each age profile corresponds to the year 1993 and reflects the change in legislation governing maximum working hours. Average hours for women are everywhere lower than for men, and tend to decline faster with age.

5.2. Inequality in wages and hours over the life-cycle

Figs. 5.3 and 5.4 plot the age profile for the variance of log wages, hours, earnings and the correlation between log hours and log wages by decade of birth and separately for men and women. In the upper left panel of Fig. 5.3 we plot the age profile for the variance of log wages for men. The increase in the variance of log wages is roughly linear between ages 25

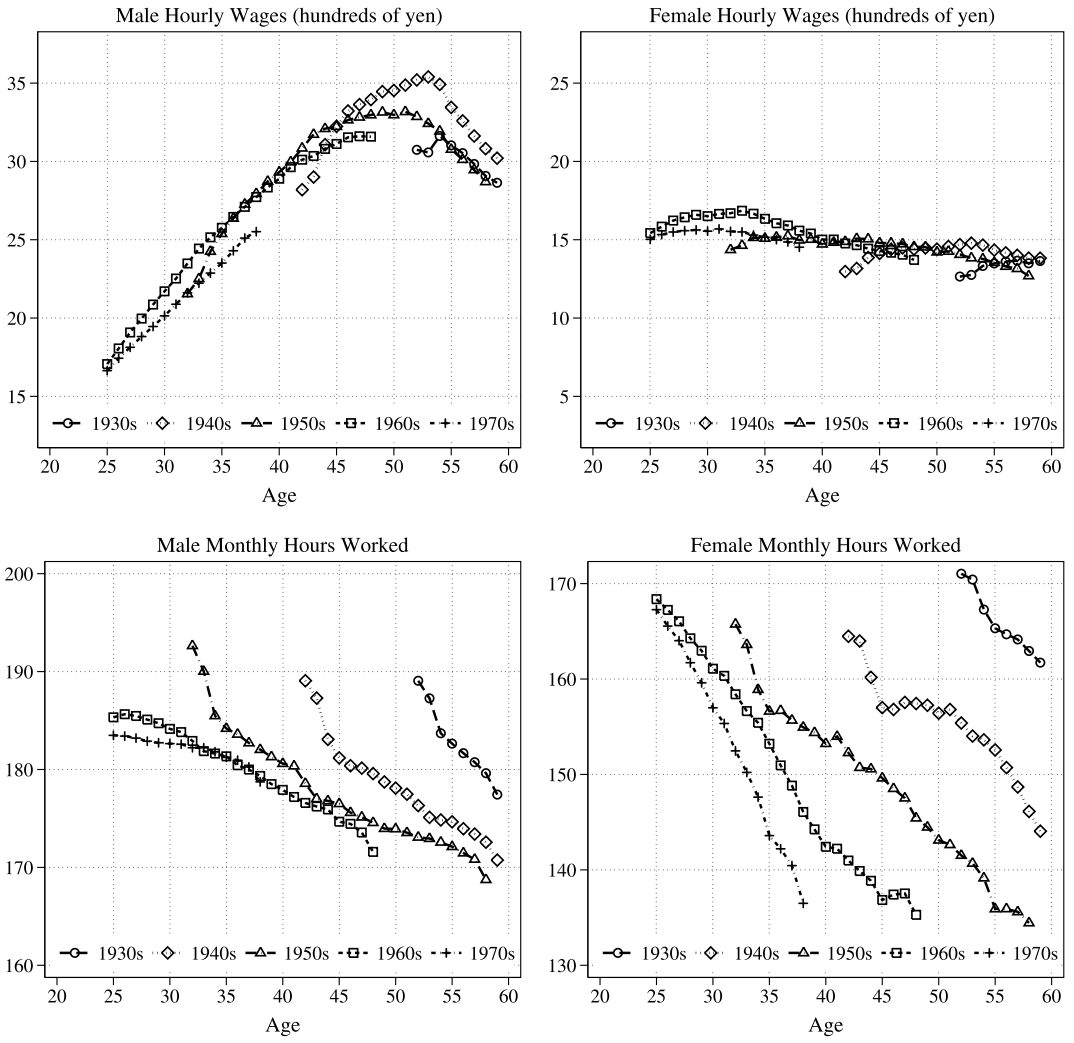

Fig. 5.2. Average wages and hours worked by age, birth cohort and sex (BSWS).

and 59. This pattern is consistent with a permanent transitory stochastic process for wages in which the variance of the permanent shock is roughly constant with age. We formally estimate such a process in Section 6 below. In the top right panel we plot the variance of log hours. The variance of log hours also rises with age. The bottom left panel plots the correlation between log hours and log wages. The correlation is everywhere negative, but becoming increasing less so with age. The combination of the age profiles of the variances of log wages and log hours and of their correlation produce the increasing age profiles for the variance of log earnings, which appear to have a slightly convex shape.

Fig. 5.4 plots the same age profiles for women. The stark gender differences in the age profiles for employment rates, average wages and average hours (Fig. 5.2) carry over to the variances. In the top left panel we plot the age profile for the variance of log wages. From age 25 to 35 we observe the same linear rise as we do with men, although much steeper. The variance then flattens out between age 35 and 40 and declines slightly through age 60. Taken at face value, this pattern is consistent with a stochastic process for wages in which the persistence of the shocks is high up to age 35, becomes less persistent during the late 30s and appears to be mostly transitory after the age of 40. It is, however, important to keep in mind that these are raw profiles and no attempt has been made to control for selection into employment. We plot the age profile for the variance of log hours in the top right panel. The rise with age is substantially greater than it is for men. The correlation between log hours and log wages is plotted in the bottom left panel. In contrast with the profile for men, the correlation for women is mostly positive after age 30 and hump-shaped. Finally, turning to the bottom right panel, we see that taking the age profiles of wages and hours together produces age profiles for earnings which are strictly increasing, and appear to be concave.

The gender difference in the age profiles for the mean and variance of wages is quite striking in Japan. These patterns can also be observed for the UK. For men, median wages increase continuously from age 24 to 58 while the 90/10 ratio

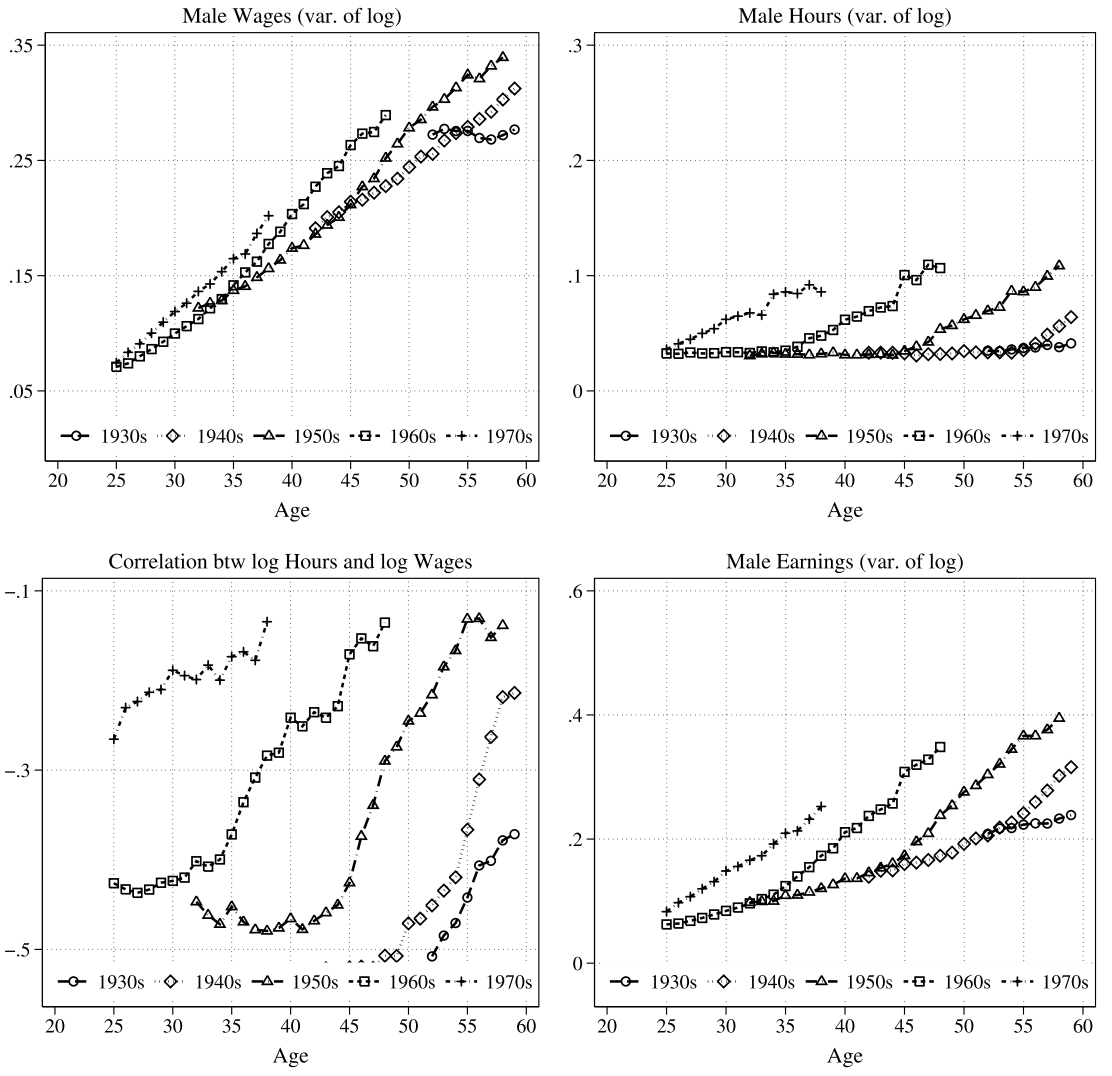

Fig. 5.3. Inequality in male wages, hours and earnings by age, birth cohort (BSWS).

increases approximately linearly over the life-cycle (see Gosling et al., 2000, Figs. 4.10–4.12). For women, mean wages rise slightly until age 30 and then become completely flat. The 90/10 ratio also increases until about age 30 and then flattens out (see Blundell et al., 2013, Figs. 3 and 4). The flattening of the wage profile does not appear to happen in the US where the mean wage displays continuous growth through age 60 (see Attanasio et al., 2008, Fig. 8).

5.3. Cohort versus time effects

Separating out cohort or year effects in the age profile is difficult given the linear dependence between age, year, and year of birth. What is clear from looking at the variance of log earnings for men and women in the bottom right panels of Figs. 5.3 and 5.4 is that younger cohorts experience higher inequality than older cohorts; the variance of log earnings is higher at every age when comparing a younger to an older cohort. Fig. 5.5 illustrates the implications for the age profile of the variance of household earnings, disposable income and consumption expenditures when controlling for either year effects or cohort effects and normalized to zero at age 25. When we control for year effects, the age-profiles are about one third less steep than when we control for cohort effects. This finding is consistent with the findings for Canada, Germany, US, Mexico and Sweden (see KPPV, p. 10).

A robust result, that is consistent will all the countries summarized by KPPV (with the exception of Mexico) is that the rise of inequality in disposable income over the life-cycle is larger than for consumption, indicating the presence of insurance against shocks.

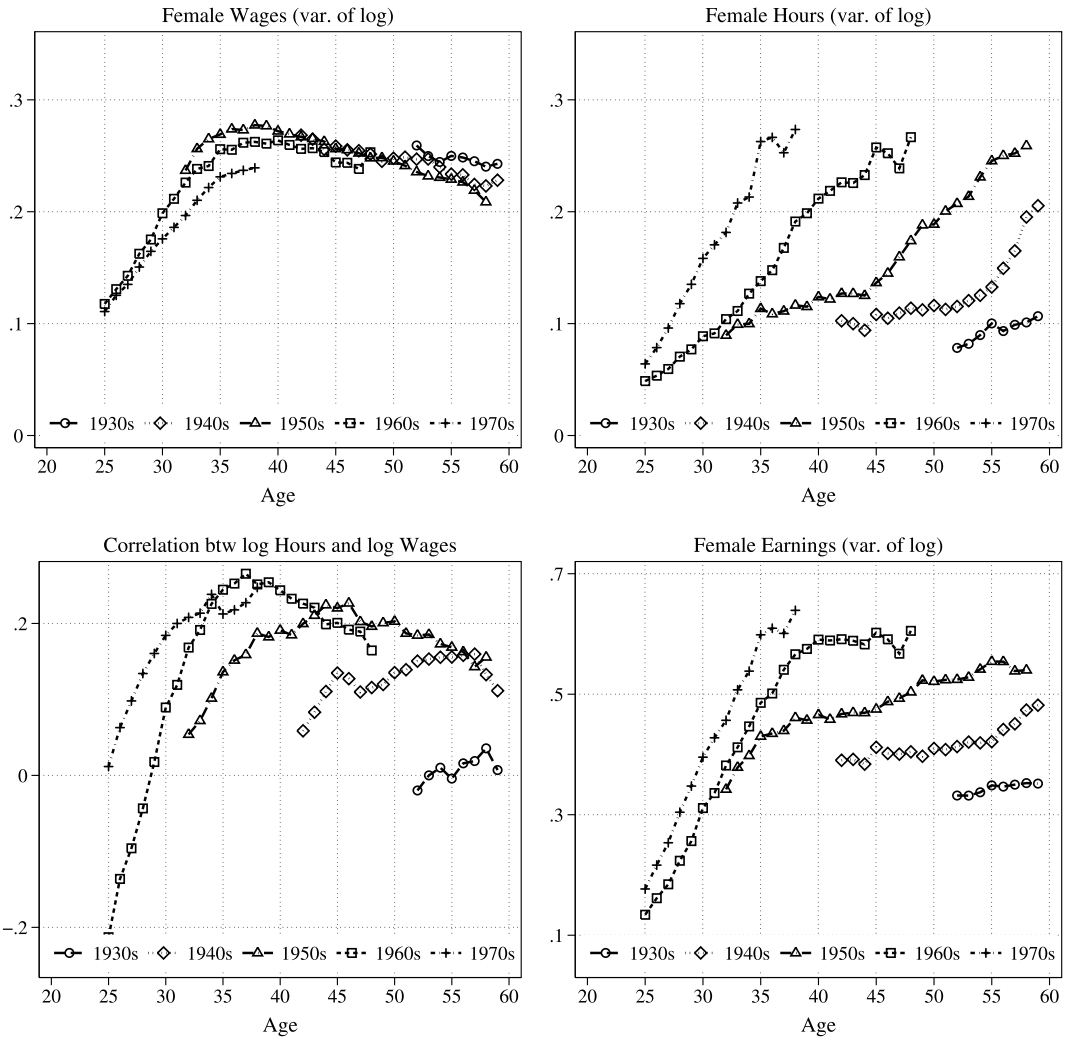

Fig. 5.4. Inequality in female wages, hours and earnings by age, birth cohort (BSWS).

5.4. Equivalizing and the curvature of age profiles

In the analysis of household-level inequality, whether or not we work with raw or equivalized household income and consumption has a major effect on both the total increase in inequality over the life-cycle and on the shape of the profile. Looking at the left hand panels, the total increase in the variance of household earnings is 20 percent higher when we do not equivalize. Additionally, the age profile for household earnings is linear (or mildly convex) when using the raw data, but becomes convex when using equivalized data. Looking at the consumption profile, when using raw household consumption expenditures the variance is essentially flat until age 40 (with a small decline between 25 and 30), then rises until age 50, and becomes flat again after age 50. When we look at equivalized consumption expenditures, the profile is slightly different. The variance declines between age 25 and 35 (during the time many individuals are getting married and having children), it then remains flat until the early- or mid-40s at which time the variance begins to rise, and continues to rise until age 55.

A striking feature of the age profile of consumption in Japan is that regardless of whether we use the raw data or equivalized data, or control for year or cohort effects, the age profile is convex. Deaton and Paxson (1994) find the same convex age profile for Taiwan up to age 60, compared to profiles that are approximately linear or concave for the US and UK. Ohtake and Saito (1998) attribute this convexity to the fact that within the traditional Japanese firm promotions occur relatively late in a worker's career so uncertainty about permanent differences is not resolved until quite late in life. This idea, however, is somewhat at odds with the evidence on wages presented in Fig. 5.3. Here the variance of log wages increases linearly with age for men, although it is worth noting that the variance of log earnings does appear to be convex. Therefore, much of the explanation for the convex age profile for the variance of consumption must come

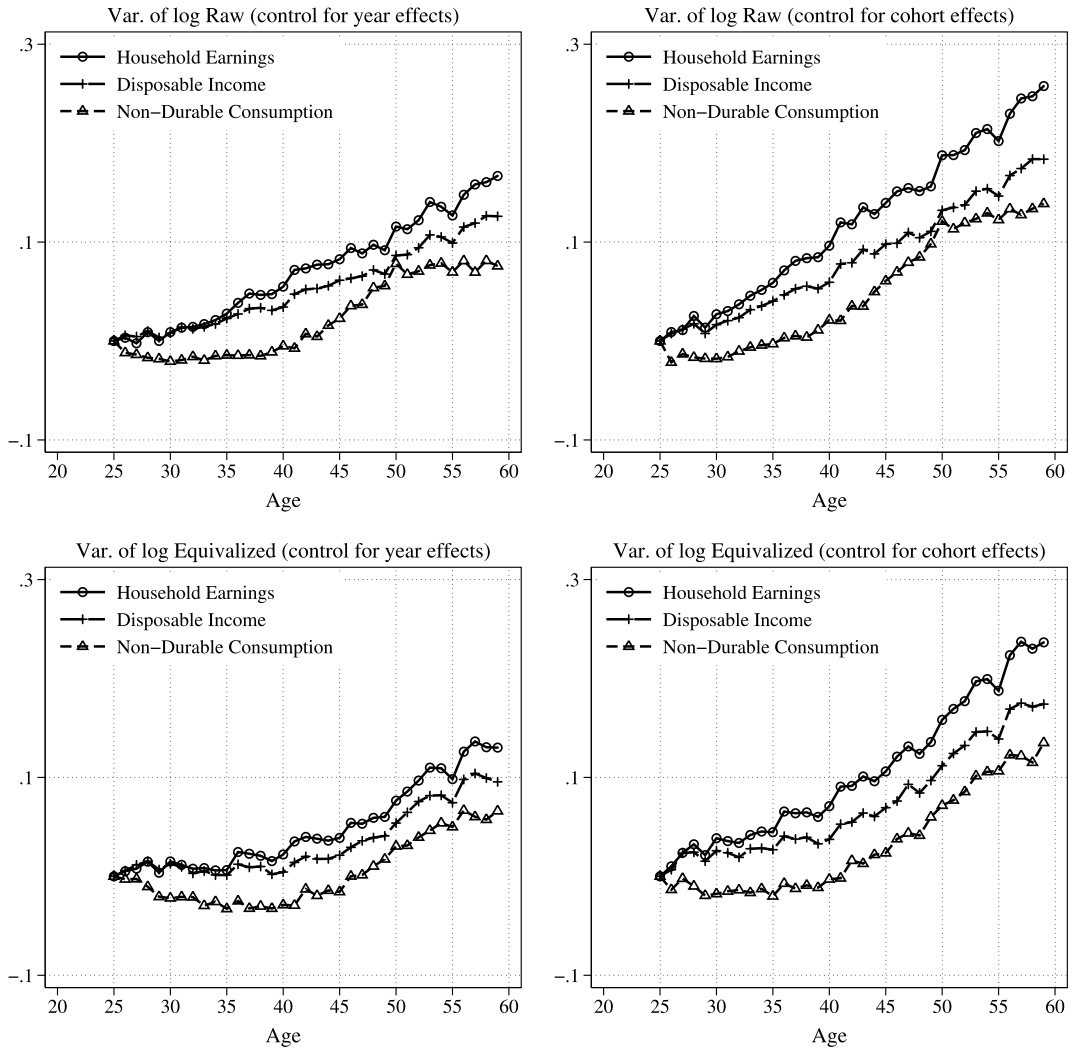

Fig. 5.5. Life-cycle inequality: controlling for time and cohort effects (FIES).

through the endogenous response of hours, combined with the earnings process for women, and the demographics in the household.

6. Wage dynamics

To shed further light on the stochastic process faced by households we specify and estimate a standard permanent-transitory income process. We focus on the process for male wages. It is reasonable to interpret the stochastic process for male wages as a close representation to the productivity process. Alternatively, we could model the stochastic process for household earnings or disposable income. However, incorporating women's complicated age profiles for employment, wages and hours as well as accounting for extended family members would add prohibitive complexity for little gain, as we have already seen that the life-cycle profile for the variance of households earnings looks very close to the profile for male earnings or wages.

6.1. Statistical model

Let w_{ict} be the residual log wage for individual i of cohort c at date t. We estimate a permanent-transitory process of the form

$$w_{ict} = z_{ict} + \varepsilon_{ict},$$
$$z_{ict} = z_{ic,t-1} + \eta_{ict},$$

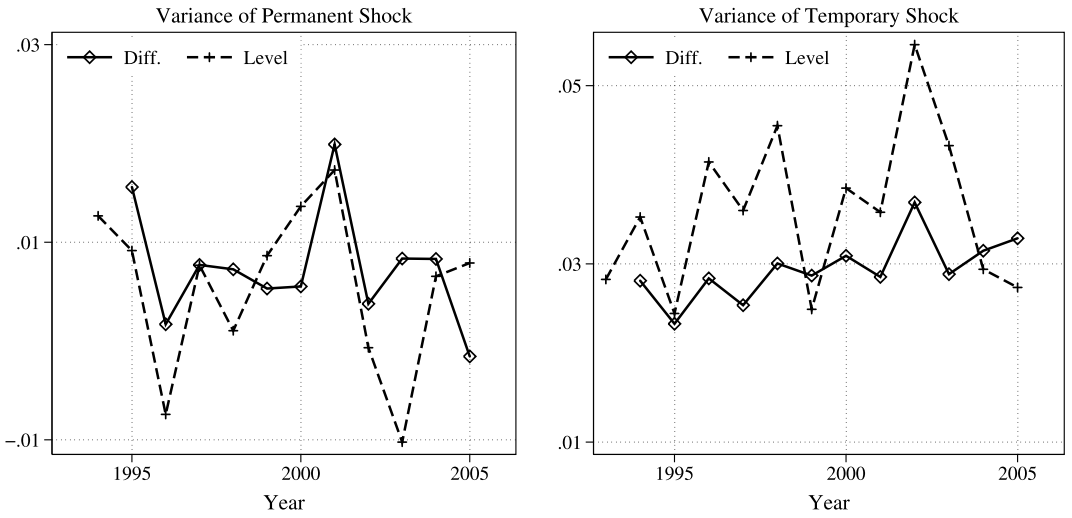

Fig. 6.1. Estimates of the variances of the transitory and permanent components (JPSC).

where ε_{ict} and η_{ict} are uncorrelated, *iid* across individuals, with mean zero and variances $\sigma_{\varepsilon t}$ and $\sigma_{\eta t}$. These variances are assumed to vary over time, but not by cohort.

6.2. Methodology

We can estimate the time-series of the variances of the permanent and the transitory shocks using either first differences or levels. In differences we have

$$\triangle w_{ict} = \eta_{ict} + \varepsilon_{ict} - \varepsilon_{ic,t-1}.$$

From this we can form the following moments:

$$\mathrm{Cov}(\triangle w_{ic,t+1}, \triangle w_{ict}) = -\sigma_{\varepsilon t},$$
$$\mathrm{Var}(\triangle w_{ict}) = \sigma_{\eta t} + \sigma_{\varepsilon t} + \sigma_{\varepsilon,t-1}.$$

Alternatively we can form moments using the level equation:

$$w_{ic,t+1} = z_{ict} + \eta_{ic,t+1} + \varepsilon_{ic,t+1},$$

and we have the following moment restrictions with which to estimate the variances of the permanent and transitory shocks:

$$\mathrm{Var}(w_{ict}) - \mathrm{Cov}(w_{ic,t+1}, w_{ict}) = \sigma_{\varepsilon t},$$
$$\mathrm{Var}(w_{ict}) - \mathrm{Cov}(w_{ict}, w_{ic,t-1}) = \sigma_{\eta t} + \sigma_{\varepsilon t}.$$

6.3. Findings

Estimating a model of wage dynamics obviously requires panel data. For this we use the JPSC, which is one of the few panel data in Japan. As discussed in Section 2.4 the JPSC started in 1993 and is available through 2007. Since the sample only began in 1993 and is based on cohorts of young women, the data will not be representative of the population. The age range of the women in the sample, looking over all years, is 25 to 48. We use data on wages of the husbands of these women where we have an age range of 25 to 57.

Fig. 6.1 plots the estimated variances of permanent and transitory shocks based on the moments in both differences and levels. There are some differences in the estimates between the two methodologies. The mean of variances of the permanent shock are estimated to be slightly higher when using differences than when using levels. Additionally, there is somewhat more year-to-year volatility in the levels estimates. Indeed, in three of the years the variance is estimated to be slightly negative using the moments in levels. That said, the time trend appears to be flat using either methodology. The rise in inequality observed in the time series does not appear to be the result of a rise in the variance of permanent shock to wages. We do not observe a substantial increase in the estimated variance of transitory shocks either, although there is a slight upward trend.

The mean of the estimated variance of permanent shocks is 0.0078 using differences and 0.0059 using levels (although there is substantial year-to-year variation). In terms of the implied rise in the variance of log earnings over a 35-year working life, these estimates correspond to a rise in the variance of log wages of 0.274 and 0.205. The rise over the life-cycle in the variance of log wages calculated using the BSWS is 0.316 when controlling for cohort effects and 0.219 when controlling for year effects (based on the data presented in Fig. 5.3). The life-cycle increase in the variance of log wages implied by our estimates of the variance of permanent shocks lie between these.[14]

Our estimates for the variance of permanent shocks to male wages in Japan are substantially lower than any of estimates presented in KPPV (Table 7A). For the countries where the shocks are estimates on wages KPPV report: US at 0.019 and 0.028, Canada at 0.055, Germany at 0.01 and 0.03, and Spain at 0.015. The estimates for Japan are substantially below all of these.

The estimates of the variance of permanent shocks presented above and the linear increase with age in the variance of log earnings both suggest that the variance of permanent shocks faced by individuals have been quite stable over this period, while the variance of the transitory shock appears to be increasing slightly. At the same time we observe a rise in the variance of earnings, disposable income, and consumption over the same period. Again, one possible explanation is the changing age distribution in Japan over this period. Between 1980s and 2000s the distribution of age of household heads moved substantially to the right (Fig. 4.10). Since the variance of log earnings is increasing linearly with age, and more weight is being given to older ages in the later years, the overall variance will naturally rise reflecting the aging of the population.[15]

7. An exploratory look at wealth

Before concluding we present some evidence on the time trends and age profiles of wealth in Japan. The wealth data is taken from the NSFIE which, while not comprehensive, provides a partial view of wealth over this period. The NSFIE has information on financial assets and liabilities. Information on real wealth is limited to the value of durable goods including furniture, electronics and automobiles, an indicator of whether a household owns their home and whether or not they have a mortgage. In the top panels of Fig. 7.1 we plot the variance of logs and the Gini coefficient for equivalized household earnings and net financial wealth, and in the bottom two panels we plot the shares held by the top and bottom deciles. The Gini for earnings increased between 1984 and 2004 by about 3 points, while it increased for net financial assets by 7.5 points. Inequality in wealth rose during the boom of the 1980s, fell after the bubble burst, and rose again after the mid 1990s. The share of earnings accounted for by the top decile remain almost constant over this period at 20 percent, while the share of net financial assets increased from 40 to 45 percent. The shares held by the bottom decile decreased slightly for both earnings and assets.

The patterns for financial wealth over this period in Japan mirror very closely the patterns observed in the US for net worth over the same time span (see Heathcote et al., 2010, Fig. 19). Both countries saw the Gini for wealth (net financial wealth in Japan and net worth in the US) rise during the late 1980s, dip in the early 1990s, and rise again through 2005. The total increase was also similar: 7.5 points in Japan and 6 points in the US. The level of inequality, however, was everywhere higher in the US than in Japan; ranging between 0.65 and 0.71 in the US compared to 0.56 and 0.64 for Japan. In terms of inequality in wealth, Japan in 2004 looks like the US in 1984. Examining the shares of total wealth held by the bottom and top 10 percent we again see a striking similarity in the patterns. The share of wealth held by the bottom 10 percent was zero in both countries 1984. In the US this remained true through 2008, while in Japan this share became slightly negative by 2004 (note, however, that our measure of wealth for Japan excludes housing and other real assets). In both countries the share of wealth held by the top 10 percent increases between 1984 and 2004 by half a percentage point. The level, however, in the US is everywhere about 10 percentage points higher than in Japan (again this comparison is between financial wealth and net worth).

8. Concluding remarks

This paper documents the various aspects of economic inequality in Japan during the boom times of the 1980s and during the 1990s and 2000s, the so called lost decades. We show that wage inequality rose for men but actually fell for women over this period. At the same time, inequality in hours worked rose substantially for women, resulting in rising earnings inequality for both men and women. This rise was mirrored by a rise in household earnings inequality.

The rise in earnings inequality is muted somewhat by the tax and transfer system, as such inequality in disposable income rose less. The rise in inequality for disposable income was further mitigated within households and we document that the rise in consumption inequality is substantially lower than earnings inequality. These same patterns are also apparent

[14] While the average variance of permanent shocks is broadly consistent when we estimate using either the levels or differences, there is evidence that the permanent-transitory process is misspecified: the estimated variance is negative for 1996, 2003, 2004 in levels and for 2005 in differences.

[15] Yamada and Kawaguchi (2012) demonstrate that a change in the composition of the workforce, as a result of progress in higher education and a decline in youth population, contributed to widening wage inequality in recent years.

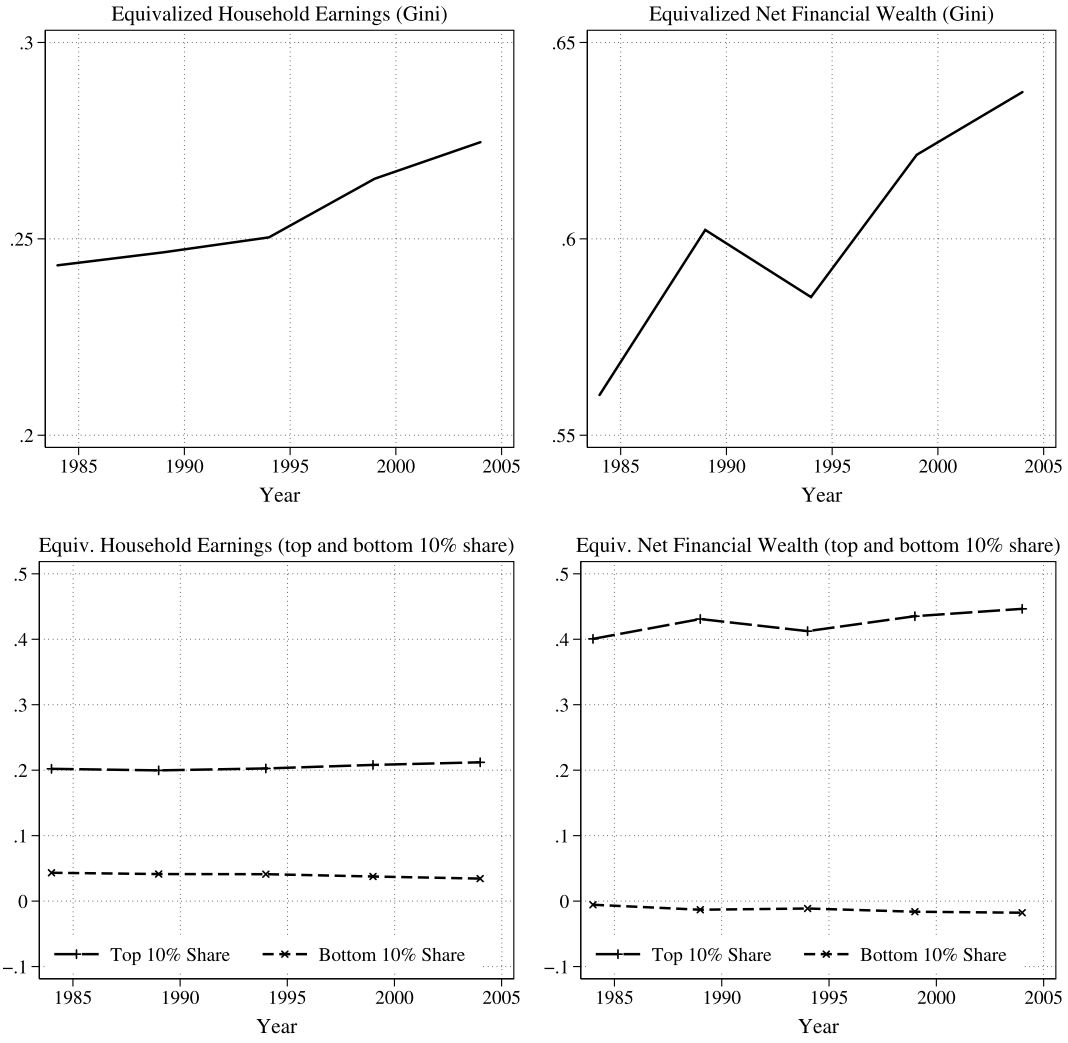

Fig. 7.1. Measures of wealth inequality (NSFIE).

when we consider the evolution of inequality over the life-cycle. The lifetime rise in consumption inequality is substantially lower than the lifetime rise in earnings inequality (although the degree of the difference depends somewhat on whether we control for year or cohort effects and whether we look at raw or equalized variables).

Finally, we note that there have been substantial differences in the trends for wage inequality for men and women, as well as substantial differences in labor supply responses. It would seem that further exploration of the interaction within these households may be fruitful in shedding additional light on the exact mechanisms individuals use to separate desired consumption from realized income shocks.

Appendix A. Data appendix

A.1. Basic Survey on Wage Structure (BSWS), 1991–2008

A.1.1. Sample

The original sample comprises 14,669,682 male workers and 8,395,396 female workers. Of them, 12,284,711 men and 6,383,622 women are aged 25 to 59. After eliminating missing values and non-positive values in wages, 12,257,638 men and 6,349,183 women remain. After trimming the top and bottom 0.25% of the wage distribution by sex and year, 12,196,312 men and 6,317,399 women remain. All observations are weighted by the sampling weight.

A.1.2. Variable definitions and construction

Earnings are regular earnings in June plus one-twelfth of annual bonuses in the previous year. Regular earnings include scheduled earnings, overtime allowance, commutation allowance, family allowance and perfect attendance allowance. Hours

worked are scheduled hours of work plus overtime work in June. Hourly wages are calculated by dividing earnings by hours worked. Earnings and wages are deflated by the consumer price index with the base year of 2010. Residual log wages are obtained from the regression of log hourly wages on dummies for education, age, sex and part-time job.

A.2. Family Income and Expenditure Survey (FIES) 1981–2008[16]

A.2.1. Sample

The original sample comprises 483,713 multiple-person households (2,667,261 household-month observations). Since single-person households are surveyed only after 2002, they are not included in the sample. For 344,110 households, the household head is aged 25 to 59. The household head is defined as a primary earner in the household. Detailed information on monthly income is collected for 266,277 households in which the household head is employed, but not for households in which the household head is non-employed, self-employed, executives, freelancers, farmers, foresters, and fishers. After eliminating missing values and non-positive values in head earnings, household earnings, disposable income, and non-durable consumption per month, 263,318 households remain. After trimming the top and bottom 0.25% of the distributions of head earnings, household earnings, disposable income, and non-durable consumption by year, 259,515 households remain. All observations are weighted by the sampling weight.

A.2.2. Variable definitions and construction

The item codes are in parentheses. Household earnings are the sum of head earnings, earnings of the spouse of the household head (013), earnings of other household members (014), and earnings from a side job at home (021). Head earnings are regular earnings (010), temporary earnings (011), and bonuses (012) of the household head. Gross income is the sum of household earnings, private transfers, and asset income. Private transfers are gifts (032) plus remittances (033). Alimony is not included in private transfers since it is not separated from other special income (039). Income from private pension and other insurance (048, 052) is not included in private transfers since it does not seem to be separated from the original principal. Asset income includes house rental income (022), property income (030), and other business income (020). Other business income is included in asset income since it was not separated from house rental income until 1994. Gain on sale of securities and real estate (045, 046) is not included in asset income since it does not seem to be separated from the original principal. Pre-tax income is the sum of gross income, public pension benefits (034), and other social security benefits (035). Disposable income is pre-tax income minus taxes. Taxes include income taxes (070), residence taxes (075), other direct taxes (071), and premiums for social security including public pension (073), public health insurance (074), public nursing care insurance (077), and other social insurance (076). Non-durable consumption is expenditure on the following items: food (1); repair and maintenance of houses (2.2); fuel, light and water charges (3); domestic utensils, non-durable goods, and services (4.4, 4.5, 4.6); clothing and footwear (5); medical care (6); transportation and communication (7), excluding purchase of vehicles and bicycles (7.2.1, 7.2.2); education (8); culture and recreation (9), excluding recreational durable goods (9.1); and other consumption expenditure (10), excluding remittance (10.4). All these variables are deflated by the consumer price index with the base year of 2010.

The survey months of the FIES can differ across households. Therefore, monthly income and consumption are calculated by taking their average over the survey period, after partialling out the effect of seasonality by running the regression on year dummies and month dummies. Household income and consumption are equivalized using the OECD scale.

A.2.3. Comparison with National Accounts

The original sample is used when compared with the National Accounts. Pre-tax income is annual household income including regular earnings, temporary earnings, and bonuses, earnings from a side job at home, business income, income from agriculture, forestry, and fisheries, social security benefits, other income, personal consumption of agricultural and other commodities of the household head and other household members. Non-durable consumption is expenditure on non-durables and services, and durable consumption is expenditure on durables and semi-durables, according to the classification by the Japanese Ministry of Internal Affairs and Communications.

For the National Accounts measures, pre-tax income is calculated by subtracting the employer's contribution to social security from the sum of wages and salaries, mixed income, property income, and social benefits other than social transfers in kind in the SNA93. Non-durable consumption is expenditure on non-durables and services minus imputed rents, and durable consumption is expenditure on durables and semi-durables in the SNA93.

A.3. National Survey of Family Income and Expenditure (NSFIE) 1984, 1989, 1994, 1999, and 2004

A.3.1. Sample

The original sample comprises 296,827 households, including both multiple-person and single-person households. Of them, 290,457 households responded the survey every month. For 208,917 households, the household head is aged 25 to

[16] Results using the FIES data are drawn from an earlier version of the paper by Sudo et al. (2012).

59. The household head is defined as a primary earner in the household. Detailed information on monthly income is collected for 161,643 households in which the household head is employed, but not for households in which the household head is non-employed, self-employed, executives, freelancers, farmers, foresters, and fishers. After eliminating missing values and non-positive values in head earnings, household earnings, disposable income, and non-durable consumption per month, 161,590 households remain. After trimming the top and bottom 0.25% of the distributions of head earnings, household earnings, disposable income, and non-durable consumption by year, 159,319 households remain. All observations are weighted by the sampling weight.

A.3.2. Variable definitions and construction

Variable definitions for income and consumption in the NSFIE are the same as in the FIES. Net financial wealth is financial assets net of liabilities, where financial assets include bank, postal and other saving accounts, insurance, stocks, trusts, bonds and gold investment and saving. All these variables are deflated by the consumer price index with the base year of 2010.

All households are surveyed in autumn in the NSFIE. Therefore, monthly income and consumption are calculated by simply taking their average over the survey period for each household. Household income, consumption, and wealth are equivalized using the OECD scale.

A.3.3. Comparison with National Accounts

The original sample is used when compared with the National Accounts. Variable definitions for income and consumption in the NSFIE are the same as in the FIES. Monthly consumption is converted to annual consumption by multiplying a factor calculated from the FIES to take into account seasonality.

A.4. Japanese Panel Survey of Consumers (JPSC) 1993–2007[17]

A.4.1. Sample

The original sample comprises 2031 men (17,211 individual-year observations) who are married with women surveyed. Of them, 1982 men were born between 1950 and 1979 and aged 25 to 59 during the survey period. After eliminating missing values and non-positive values in wages, 1697 men remain. After trimming the top and bottom 0.5% of the distributions of male earnings and wages by year, 1687 men (11,684 individual-year observations) remain.

A.4.2. Variable definitions and construction

Hourly wages are calculated by dividing annual earnings by annual hours worked and are deflated by the consumer price index with the base year of 2010. Residual log wages are obtained from the regression of log wages on a set of dummies for years, age, household size, and the number of children, and the interaction terms between these household characteristics and year dummies.

A.5. Comparability of data

The FIES and the NSFIE are household surveys that do not collect information on hours worked, while the BSWS is an establishment survey that does not collect information on employees' families. Variables that can be compared across the three data sets are limited to individual earnings. Individual earnings in the FIES and the NSFIE are the earnings of either household heads or their spouses aged 25 to 59. Since the FIES did not collect information on spousal age until 1986, female earnings can be constructed from the FIES only after 1987. The FIES and NSFIE samples include spouses of the household heads regardless of their occupation, while the BSWS sample includes workers regardless of their family structure.

Appendix B. Comparison across data sets

B.1. Earnings in the BSWS, FIES and NSFIE

The analysis in this paper has drawn on several different data sets in order to obtain a complete picture of inequality in individual wages, hours, and earnings, and in household earnings, disposable income and consumption expenditures. As discussed in Section 2 these data sets do not all cover the same time periods, and the population who is sampled differs to some extent across data sets. In addition, there is very little overlap in the information available in all three datasets. Indeed, the only variable that exists in all three data sets is individual earnings.

B.2. Life-cycle profiles of earnings

To gauge how consistent the data sets are with each other we plot in Fig. B.1 the age profile and time-series for the variance of log earnings, controlling for year or cohort effects and normalized to zero at age 25, and separately for men and

[17] All the results using the JPSC data are drawn from an earlier version of the paper by Lise and Yamada (2012).

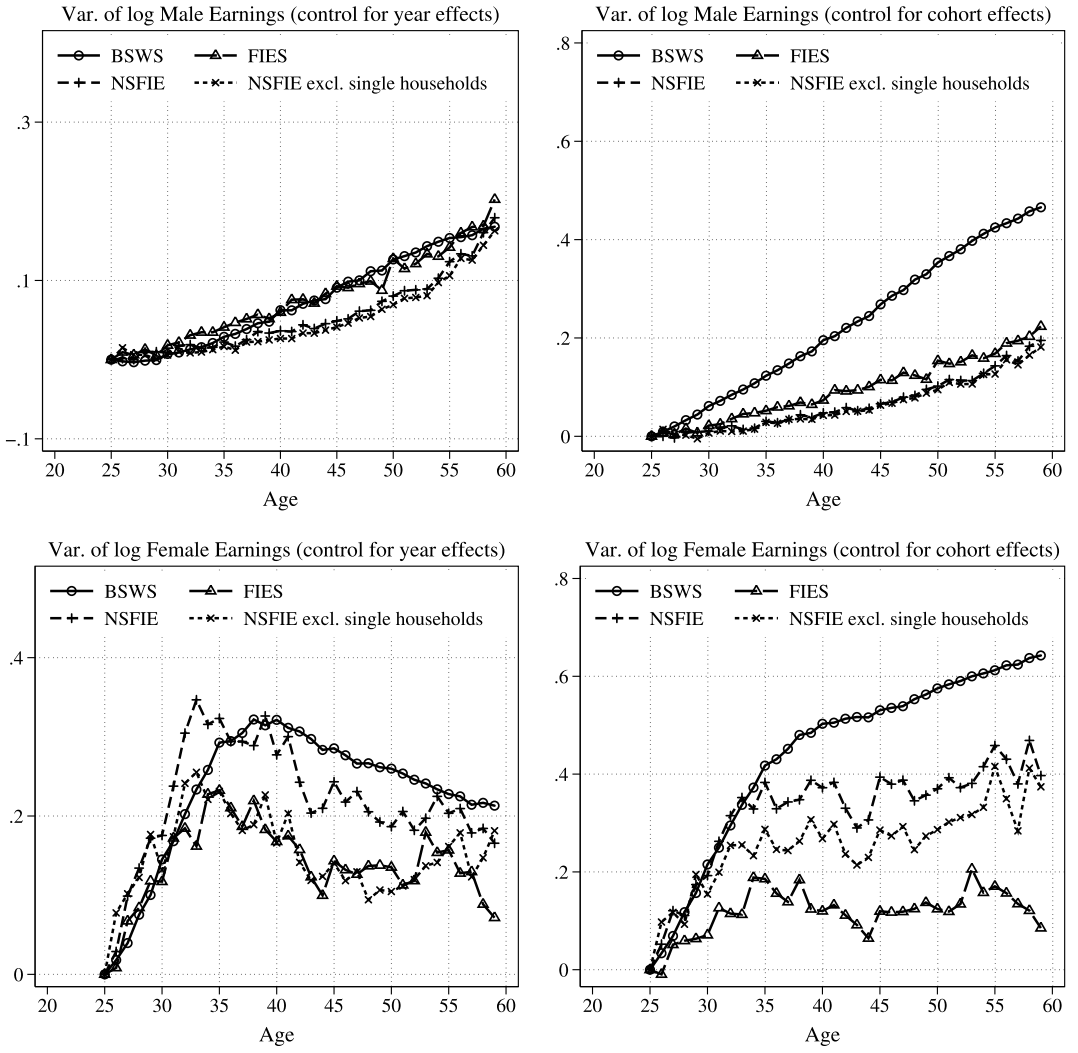

Fig. B.1. Comparing life-cycle earnings inequality across data sets.

women. Looking at the left hand panels where we control for year effects, the profiles for both men and women line up quite well in all data sets. The cumulative increase in earnings inequality for men is effectively the same when calculated on any of the three datasets. For women there is more discrepancy between the surveys. For women, the age profile based on the BSWS and the NSFIE line up very well with each other, while the profile estimated from the FIES lies well below these two. However, this discrepancy can be reconciled once we account for the different sample selection of the surveys; the FIES excludes single person households. The age profiles estimated on the FIES and the NSFIE excluding single person household line up very closely. The inclusion or exclusion of single men does not have a noticeable impact on the age profile.

The right hand panels repeat this exercise controlling for cohort effects. There are now substantial differences across datasets in terms of the estimated age profiles. The slope of the earnings profile for men based on the BSWS is more than twice that based on the NSFIE or FIES. A similar pattern holds for women. In addition, excluding single women from the NSFIE data does not reconcile the differences between the NSFIE and FIES profiles. It appears that the estimated age profiles are much more stable when we control for year rather than cohort effects. The difference between the BSWS and FIES profiles for men is quite striking, and seems to reflect the fact that the BSWS data is missing the boom period of the 1980s.

B.3. Time-series for earnings inequality

In Fig. B.2 we plot inequality in individual earnings relative to 1994 based on each data set over time. There are few discrepancies between the time-series of individual earnings inequality calculated from the three data sets. In terms of the trends, the FIES and the NSFIE display essentially the same trend, where the BSWS displays a stronger trend. The discrete jump up in 2005 in the BSWS is particularly noticeable when compared to the FIES, confirming the hypothesis that this jump is due to survey redesign in the BSWS in 2005.

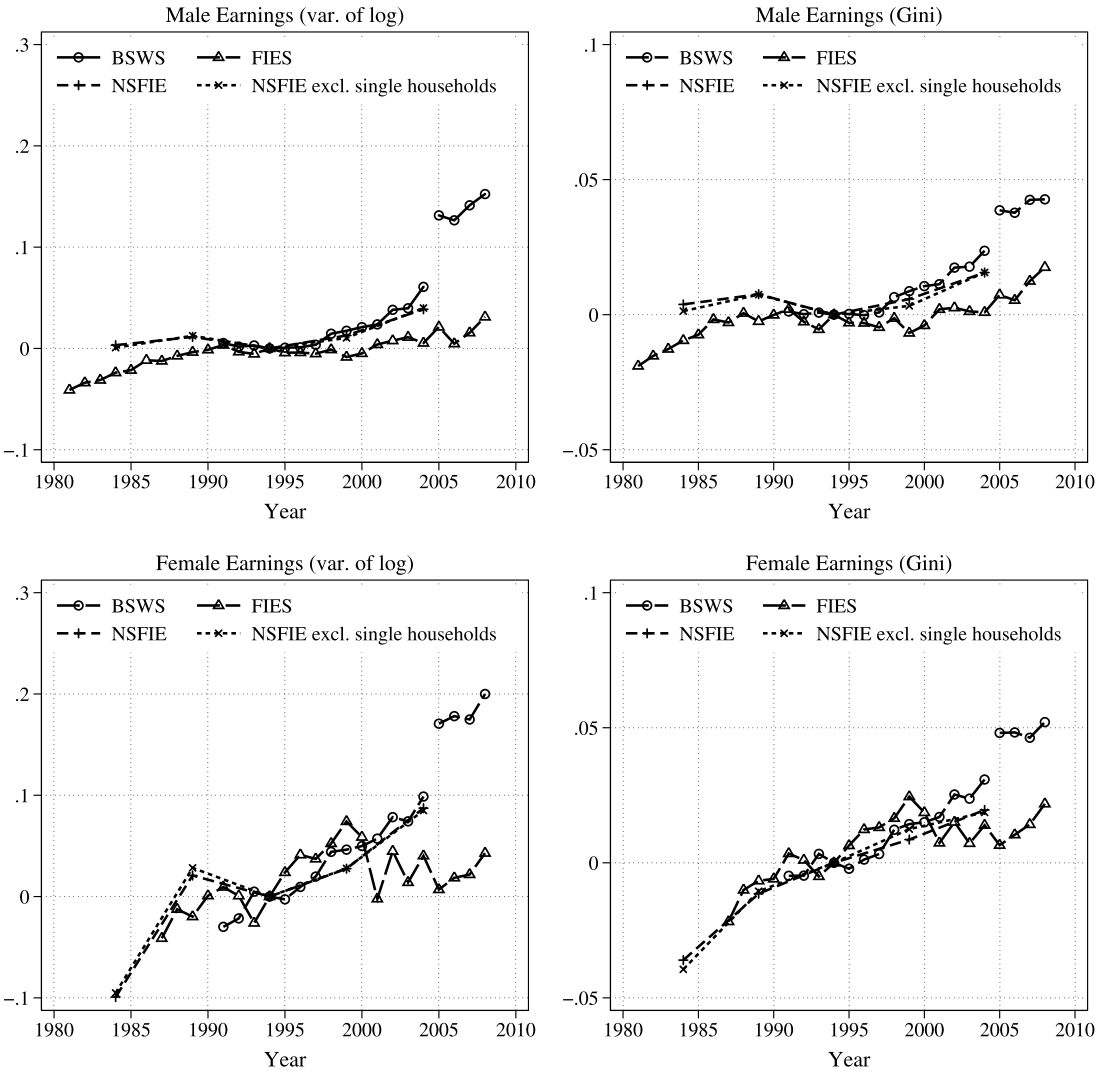

Fig. B.2. Comparing the evolution of earnings inequality across data sets.

Appendix C. Comparison across country studies

Table C.1
Wage inequality and wage premia.

Country	Level in year 2000				Change				
	Var log w	College premium	Exp premium	Gender premium	Var log w	College premium	Exp premium	Gender premium	Period
Canada	0.45	1.80	1.32	1.33	0.17	0.22	0.31	−0.11	1978–2006
Germany	0.27	1.38	1.27	1.28	0.05	−0.08	0.22	−0.15	1983–2003
Italy	0.17	1.51	1.34	1.03	0.03	−0.08	0.11	−0.05	1987–2006
Japan	**0.30**	**1.43**	**1.34**	**1.80**	**−0.01**	**0.00**	**−0.02**	**−0.14**	**1991–2008**
Mexico	0.62	1.88	1.23	1.21	0.04	0.40	0.22	−0.06	1989–2002
Russia	0.77	1.50	1.05	1.49	−0.13	−0.06	0.05	−0.07	1998–2005
Spain	0.23	1.48	1.43	1.16	−0.18	−0.33	0.07	−0.21	1985–1996
Sweden	0.18	1.61	1.20	1.22	−0.09	0.14	−0.02	−0.05	1990–2001
UK	0.33	1.62	1.25	1.32	0.10	0.12	0.20	−0.21	1978–2005
USA	0.44	1.80	1.38	1.36	0.21	0.40	0.28	−0.25	1980–2006
Average	**0.38**	**1.60**	**1.28**	**1.32**	**0.02**	**0.07**	**0.14**	**−0.13**	

Source: Krueger et al. (2010, Table 3) and authors' calculations based on BSWS.

Table C.2
Inequality in pre- and post-government household income (variance of the log).

Country	Level in year 2000		Change		Period
	Pre-gov income	Post-gov income	Pre-gov income	Post-gov income	
Canada	0.50	0.25	0.16	0.05	1978–2005
Germany	0.63	0.40	0.42	0.04	1984–2004
Italy	0.72	0.73	0.06	0.07	1987–2006
Japan	**0.24**	**0.21**	**0.07**	**0.06**	**1981–2008**
Mexico	2.10	1.70	1.15	0.75	1989–2002
Russia	0.86	0.60	−0.11	−0.09	1994–2005
Spain	0.73	0.56	−0.20	−0.09	1993–2000
Sweden	0.95	0.38	0.36	0.05	1978–2004
UK	0.55	0.32	0.22	0.13	1978–2005
USA	0.67	0.41	0.11	0.11	1979–2005
Average	**0.80**	**0.56**	**0.22**	**0.11**	

Source: Krueger et al. (2010, Table 4) and authors' calculations based on FIES.

Table C.3
Level of inequality in year 2000.

Country	Bottom (50/10)			Top (90/50)		
	Disp Inc	Cons	Gap	Disp Inc	Cons	Gap
Canada	2.21	1.95	0.26	2.00	1.85	0.15
Germany	2.05	1.70	0.35	1.80	1.81	−0.01
Italy	2.45	1.91	0.54	1.93	1.88	0.05
Japan	**1.79**	**1.79**	**0.00**	**1.79**	**1.75**	**0.04**
Mexico	8.00	5.10	2.90	4.75	4.00	0.75
Russia	3.02	2.70	0.32	2.60	2.60	0.00
Spain	2.04	1.82	0.22	2.00	1.90	0.10
Sweden	1.58	1.62	−0.04	1.64	1.73	−0.09
UK	2.82	NA	NA	2.08	NA	NA
USA	2.64	2.00	0.64	2.21	2.00	0.21
Average	**2.86**	**2.29**	**0.58**	**2.28**	**2.17**	**0.13**

Source: Krueger et al. (2010, Table 5) and authors' calculations based on FIES.

Table C.4
Long-run changes in inequality.

Country	Bottom (50/10)			Top (90/50)			Period
	Disp Inc	Cons	Gap	Disp Inc	Cons	Gap	
Canada	0.38	0.20	0.18	0.10	0.07	0.03	1978–2006
Germany	0.35	0.00	0.35	0.15	0.10	0.05	1983–2003
Italy	0.22	0.09	0.13	0.05	0.01	0.04	1980–2006
Japan	**0.25**	**0.21**	**0.04**	**0.15**	**0.15**	**0.00**	**1981–2005**
Mexico	5.81	0.80	5.01	1.12	1.08	0.04	1989–2002
Russia	0.10	0.05	0.05	−0.16	−0.10	−0.06	1994–2005
Spain	−0.16	−0.13	−0.03	−0.18	0.01	−0.17	1985–1996
Sweden	0.13	0.02	0.11	0.21	0.10	0.11	1985–1998
UK	0.86	0.58	0.28	0.27	0.12	0.15	1978–2005
USA	0.55	0.25	0.30	0.40	0.15	0.25	1980–2006
Average	**0.85**	**0.21**	**0.64**	**0.21**	**0.17**	**0.04**	

Source: Krueger et al. (2010, Table 6) and authors' calculations based on FIES.

Table C.5
Long-run changes in inequality, 1981–2008.

	Var of log	Gini	Bottom (50/10)	Top (90/50)
Disposable income (equivalized)	0.064	0.029	0.206	0.086
Consumption (equivalized)	0.063	0.037	0.208	0.145
Holding the age distribution constant				
Disposable income (equivalized)	0.057	0.025	0.173	0.079
Consumption (equivalized)	0.059	0.033	0.220	0.112
Percentage of change accounted for by changing age distribution				
Disposable income (equivalized)	10.9	13.8	16.0	8.1
Consumption (equivalized)	6.3	10.8	−5.8	22.8

Appendix D. Supplementary material

Supplementary material related to this article can be found online at http://dx.doi.org/10.1016/j.red.2014.01.001.

References

Attanasio, O., Low, H., Sanchez-Marcos, V., 2008. Explaining changes in female labor supply in a life-cycle model. The American Economic Review 98 (4), 1517–1552.

Binelli, C., Attanasio, O., 2010. Mexico in the 1990s: The main cross-sectional facts. Review of Economic Dynamics 13 (1), 238–264.

Blau, F.D., Kahn, L., 1995. The gender earnings gap: Some international evidence. In: Freeman, R., Katz, L. (Eds.), Differences and Changes in Wage Structures. University of Chicago Press, pp. 105–144. Chap. 3.

Blundell, R., Costa Dias, M., Meghir, C., Shaw, J., 2013. Female labour supply, human capital and welfare reform. NBER working paper 19007.

Blundell, R., Etheridge, B., 2010. Consumption, income and earnings inequality in Britain. Review of Economic Dynamics 13 (1), 76–102.

Brzozowski, M., Gervais, M., Klein, P., Suzuki, M., 2010. Consumption, income, and wealth inequality in Canada. Review of Economic Dynamics 13 (1), 52–75.

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

Domeij, D., Floden, M., 2010. Inequality trends in Sweden 1978–2004. Review of Economic Dynamics 13 (1), 179–208.

Fuchs-Schuendeln, N., Krueger, D., Sommer, M., 2010. Inequality trends for Germany in the last two decades: A tale of two countries. Review of Economic Dynamics 13 (1), 103–132.

Gorodnichenko, Y., Peter, K.S., Stolyarov, D., 2010. Inequality and volatility moderation in Russia: Evidence from micro-level panel data on consumption and income. Review of Economic Dynamics 13 (1), 209–237.

Gosling, A., Machin, S., Meghir, C., 2000. The changing distribution of male wages in the UK. Review of Economic Studies 67 (4), 635–666.

Hayashi, F., Prescott, E., 2002. The 1990s in Japan: A lost decade. Review of Economic Dynamics 5 (1), 206–235.

Hayashi, F., Ando, A., Ferris, R., 1988. Life cycle and bequest savings: A study of Japanese and US households based on data from the 1984 NSFIE and the 1983 Survey of Consumer Finances. Journal of the Japanese and International Economies 2 (4), 450–491.

Heathcote, J., Perri, F., Violante, G.L., 2010. Unequal we stand: An empirical analysis of economic inequality in the United States, 1967–2006. Review of Economic Dynamics 13 (1), 15–51.

Houseman, S.N., Abraham, K.G., 1993. Female workers as a buffer in the Japanese economy. American Economic Review Papers and Proceedings 83 (2), 45–51.

Jappelli, T., Pistaferri, L., 2010. Does consumption inequality track income inequality in Italy? Review of Economic Dynamics 13 (1), 133–153.

Kambayashi, R., Kawaguchi, D., Yamada, K., 2013. Minimum wage in a deflationary economy: The Japanese experience, 1994–2003. Labour Economics 24, 264–276.

Kim, D.-I., Topel, R., 1995. Labor markets and economic growth: Lessons from Korea's industrialization, 1970–1990. In: Freeman, R., Katz, L. (Eds.), Differences and Changes in Wage Structures. University of Chicago Press, pp. 227–264. Chap. 7.

Kitamura, Y., Miyazaki, T., 2012. Income inequality and evaluation of tax effect on redistribution of income in Japan 1984–2004. Unpublished manuscript, in Japanese.

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

Lee, J., Kawaguchi, D., Hamermesh, D., 2012. Aggregate impacts of a gift of time. American Economic Review Papers and Proceedings 102 (3), 612–616.

Lise, J., Yamada, K., 2012. Wage, income and consumption inequality in Japan. Unpublished.

OECD, 2010. Tackling inequalities in Brazil, China, India and South Africa: The role of labour market and social policies. Discussion paper, OECD.

Ohtake, F., Saito, M., 1998. Population aging and consumption inequality in Japan. The Review of Income and Wealth 44 (3), 361–381.

Oshio, T., 2006. Income inequality and redistribution policies in Japan during the 1980s and 1990s. Journal of Income Distribution 15, 119–146.

Pijoan-Mas, J., Sanchez-Marcos, V., 2010. Spain is different: Falling trends of inequality. Review of Economic Dynamics 13 (1), 154–178.

Sudo, N., Suzuki, M., Yamada, T., 2012. Inequalities in Japanese economy during the lost decades. CIRJE discussion paper, CIRJE-F-856.

Yamada, K., Kawaguchi, D., 2012. Changing unchanged inequality: Higher education, youth population, and Japan's seniority wages. Unpublished manuscript.