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Income Inequality over Boom, Slump and Recovery : Japan 1963-2005

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Summary. Motivated by concerns expressed over a structural increase in Japanese inequality, we present unobserved-components time series models of the underlying trends in the Japanese income distribution. The evidence suggests that inequality was steady and moderate over the 80s, increased over the 90s as the Japanese economy slumped, and has been *declining* since 1999, Variations in the real economy have played a significant role in determining inequality, having their greatest effects on the bottom quintile of the income distribution. Recovery in the Japanese economy in the 2000s appears to have reversed a substantial proportion of the preceding rise in inequality.

RUNNING TITLE

Japanese Income Inequality

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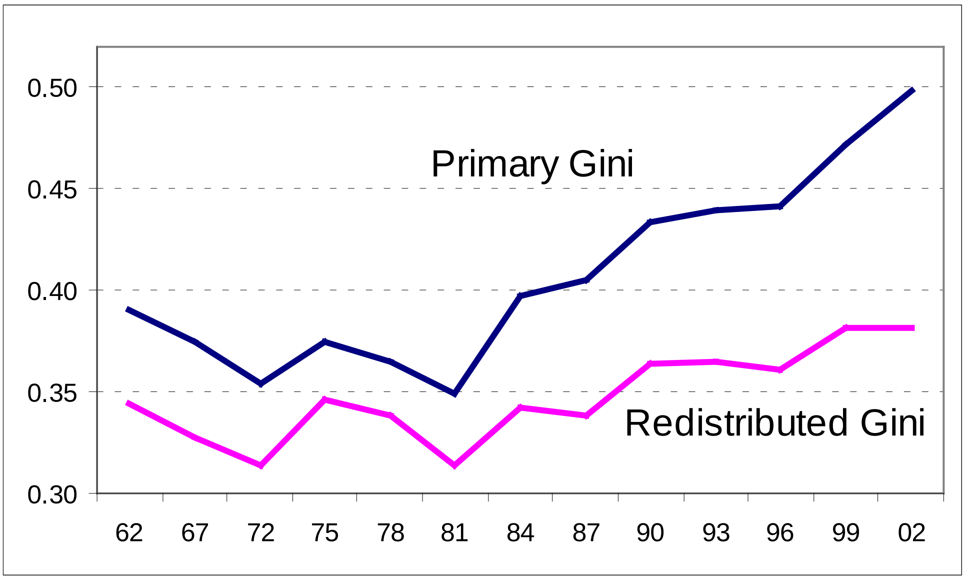
1 Introduction

Post-war Japan has traditionally been regarded, and has been happy to regard itself, as a country with a high degree of income equality, a view that largely originated with an OECD study (Sawyer 1976). Over the 80s and 90s, however, the evidence started to point to widening inequality in Japan. The Gini coefficient, as reported in the Ministry of Health, Labour and Welfare's triennial Income Redistribution Survey (IRS) has been rising since 1981, sparking a number of analyses of reasons for the trend (e.g. Kaneko 2001), and laments of the demise of Japan's all-embracing middle class and the growth of an underclass (e.g. Tachibanaki 1998; Satou 2000; Miura 2005). In terms of international comparisons, too, Japan has started to be positioned along with the US and UK as a country with relatively high inequality (Forster and Mira d'Ercole 2005). The conventional view now is that "Japan has shifted from an equal society to a differential society" (Ohtake 2005: 1; Tachibanaki 2006: 103), The issue is a highly emotive one in Japan, to the extent that the Gini coefficient has recently been discussed in the national Diet (Ohtake 2006).

As elsewhere, the most commonly cited reasons for rising inequality in Japan are: the impact of globalisation in reducing demand for unskilled workers in advanced economies; the impact of technology in allowing highly-skilled workers to leverage their advantages further; and government policies such as reductions in the tax rates applied to higher income levels.

Figure 1. Gini coefficient: Japan



Source: Income Redistribution Surveys (Ministry of Health, Labour and Welfare)
Note: Time scale distorted from 62-72 due to irregular survey dates

Tachibanaki arguably has been the most influential in bringing the issue of rising Japanese inequality to both academic and popular attention, but his conclusions are not universally accepted. There can be little doubt about the widening in primary (i.e. prior to redistribution via tax and benefits) income differentials in the IRS data. However, as noted by Ohtake (2006: 8), the definition of primary income in the IRS data excludes income from public pensions, but includes private sector retirement allowances. Individuals whose only income is their public pension are therefore recorded as having zero income in this survey, which results in large apparent inequality[3].

Inequality trends in redistributed income (net of tax, benefits and public pensions) are less marked. Forster and Mira D'Ercole (2005: 61-62) show the most recent Gini coefficient for Japan (in 'around 2000') at 0.314, against 0.326 for the United Kingdom and 0.357 for the United States, placing all three countries in the 'above average' group for inequality. While Tachibanaki characterises the rise in the Gini coefficient for redistributed income between 1981 and its recent highs as "alarmingly large" (2005: 5), this increase (of 6.7%) would be characterised as "small" under the framework used by Forster and Mira D'Ercole (2005: 12). Moriguchi and Saez (2006), using income tax data to estimate top income shares, find recent increases in inequality to be modest, even before the redistributive impact of taxation: "[O]ne of the distinct characteristics of Japan today is its low income inequality in the absence of government redistribution" (p.4). Nishizaki, Yamada et al. (1998) point out that failing to adjust the data for household size is misleading, and that inequality on an adjusted basis remains relatively low in Japan. Their argument is that while inequality has increased in the preceding decade, this is (i) because of an increase in the number of retired households, and (ii) because of a rise in the proportion of relatively low-paid young women in the workforce. They also argue, noting that the middle quintile's share of income has not notably changed, that the "hollowing out" of the middle class (polarisation) being pointed to in several countries does not appear to have happened in Japan (p. 14). One might add that not everybody thinks Japan's egalitarian society is a good thing; some scholars have argued that too much redistribution has been a problem for the economy, a view which has been cited in favour of government policies such as reducing top marginal tax rates in recent years (see for instance Kato and Moroi 1996).

In much of this debate, the impact of variations in national economic performance on inequality is downplayed[4]. Our focus in this paper is on the distributive impact of variations in the aggregate economy. It is unreasonable to expect households to move in tandem over the business cycle (see for instance Barlevy and Tsiddon 2006). Which households are most susceptible to decline in economic activity (and to recovery)? If households in different parts of the income distribution respond differently to common underlying ups and downs of aggregate economic activity, then we should expect inequality to be affected by variations in the macro economy. Deflation is also likely to affect inequality through its effect of redistributing incomes towards from persons with fixed nominal incomes, such as pensioners.

[3] Tachibanaki himself appears to have recanted from the use of the primary income numbers: "I frankly regret my carelessness" (Tachibanaki 2000)

[4] In recent years the focus in business cycle research has been on the micro adjustment behaviour of households, as well as firms, to the dynamics of the aggregate economy. This relates to the interaction of cross sectional distributions with aggregate economic variables, and how inequality and heterogeneity propagate changes in the economy, because distributional changes rather than washing out, aggregate up in driving changes in real macro variables.

Japan offers a particularly interesting test case in this respect, having had a major economic boom (the "bubble") in the late 1980s, a prolonged period of decline in the 1990s, and something of an economic recovery so far in the 2000s. In characterising the Japanese recession on the basis of various measures of the output gap, Kuttner and Posen (2001) concluded that real GDP was below potential real GDP to the order of 3 to 4 percentage points by the end of the 1990s: "No other country in the OECD has suffered such a lengthy period of unremittingly below potential growth, or even one half so long or deep" (p. 99-100). There was a clear rise in unemployment and sustained deflation. Beset by structural problems, the conventional business cycle largely disappeared in Japan in the 1990s, but the recovery that has gathered strength in the 2000s is likely to lead to a return of the economic cycle. How was income inequality affected by these variations?

This paper offers three contributions. First, we analyse income distribution in terms of decile and quintile[5] data, rather than summary measures. Some of the debate about Japanese inequality has relied on Gini coefficients estimated from limited data. Summary measures of inequality lose information about where in the income distribution changes are taking place, and therefore some of the evidence as to *why* the changes might be occurring. The Gini coefficient, in particular, is more sensitive to differences around mean income than some of the other inequality measures. So if the hypothesis is that the effects are more pronounced at the extremes of the income distribution, then the Gini coefficient may not capture this.[6] In this paper, we consider alternative measures that can be directly calculated from the available data, and easily decomposed to show which parts of the income distribution are driving changes in inequality.

Secondly, we focus on the long-run evolution of inequality, applying structural time series models to the available data. This enables us to measure the link between inequality and the macroeconomy with more precision. Structural time series models provide a flexible framework by which changes in the underlying level of a (stochastic) variable can be distinguished from purely random and cyclical fluctuations (Harvey and Bernstein 2003).

Thirdly, our analysis is focused on the responsiveness of different parts of the income distribution to the movements in the real economy, to attempt a precise characterisation of the way in which inequality is affected by macroeconomic variations.

In the following section we describe the various data sources available and their strengths and weaknesses. In section 3, we examine the decile and quintile income data from the two main data sources, going on to observe patterns after adjusting the

[5] Technically, the ith quintile of a distribution F is the value in the support of that distribution that solves the equation F(x) = 0.2i. The data used in this paper contain only average income within each quintile. We follow Castaneda, Diaz-Gimenez et al. (1998) in using the terms "quintile" and "decile" to denote average incomes within each group. The average income of the poorest 20% of households is referred to as the 'bottom quintile', the average income of the next 20% as the 'second quintile' etc.

[6] It has been held that the traditionally broad Japanese middle class is disappearing as an increasing number of households join either the top or bottom end of the distribution.

data for household size. In section 4, we outline the unobserved components time series approach, and apply it to the Family Income and Expenditure Survey data. In Section 5, we experiment with adding some cyclical explanatory variables. Section 6 considers the results, and draws some tentative conclusions.

2. The Data

It is useful to outline the sampling frames and income definitions used by the main statistical sources on the Japanese income distribution. These are:

(i) The Income Redistribution Survey (*Shotoku Saibunpai Chousa Houkoku*), published by the Ministry of Health, Labour and Welfare

As argued by Tachibanaki (2005), the Income Redistribution Survey (IRS) is the most reliable source for inequality measurement. Its primary focus is on income inequality and the extent to which this is mitigated by the effects of the tax and benefits system. According to Nishizaki, Yamada et al (1998: 19), however, it is said to have a higher weighting of low-income households than the National Survey of Family Income and Expenditure (NSFIE). Gini coefficients and income decile information are calculated directly from the original data for both “primary” and “redistributed” (i.e. after tax and benefits) income. The sample is drawn from almost all households in Japan, the only exceptions being single persons living in company or school dormitories, and those living in social welfare facilities. The survey was first carried out in 1962, and the latest data relate to 2002 (the survey is published about 18 months after the end of the year to which it relates). The sample size in 2002 was 10,125 households, with a response rate of 75.3% (7,623 households). The main drawback is that it is only published every three years (and the intervals between the first three surveys were of five years). As a result, there are only 13 data points, too few for time series analysis.

(ii) The Family Income and Expenditure Survey (*Kakei Chousa*), published by the Statistics Bureau of the Ministry of Internal Affairs and Communications

The Family Income and Expenditure Survey (FIES) appears monthly, but income on an all-household basis is measured annually. The definition of income is different from those used in the Income Redistribution Survey, since the FIES definition includes Social Security Benefits as income, but is stated on a pre-tax basis. In effect, this income measure is somewhere between the “primary” and “redistributed income” measures of the IRS data. For years covered by both, the average correlations between the FIES and IRS income quintile shares are 0.72 and 0.62 for (IRS) primary and redistributed income respectively. By contrast, the correlations for the IRS Gini coefficients against the FIES ones estimated by Ohtake (2005) are 0.78 for primary and 0.80 for redistributed income respectively. Annual income quintiles and, in recent years, income deciles, are included in the published survey, although Gini coefficients are not. The data series goes back to 1963, with longer time series available for certain sub-populations such as urban households or “workers’ households”. The major drawback of this survey is its sampling frame, which for the longer-run time series excludes single-person households.

(iii) The National Survey of Family Income and Expenditure (*Zenkoku Shouhi Jittai Chousa*), also from the Statistics Bureau as above

The National Survey of Family Income and Expenditure has a much larger sample size than the FIES, of 60,000 households, but it contains a similar sample bias to the FIES (Tachibanaki 2005: 3). It is only published at five-year intervals, so it cannot be used for time series analysis. This makes it less useful than the IRS in terms of both frequency and sample bias.

(iv) The Basic Survey on Wage Structure (*Chingin Kouzou Kihon Toukei Chousa*, also known as *Chingin Sensasu*), published by the Ministry of Health, Labour and Welfare

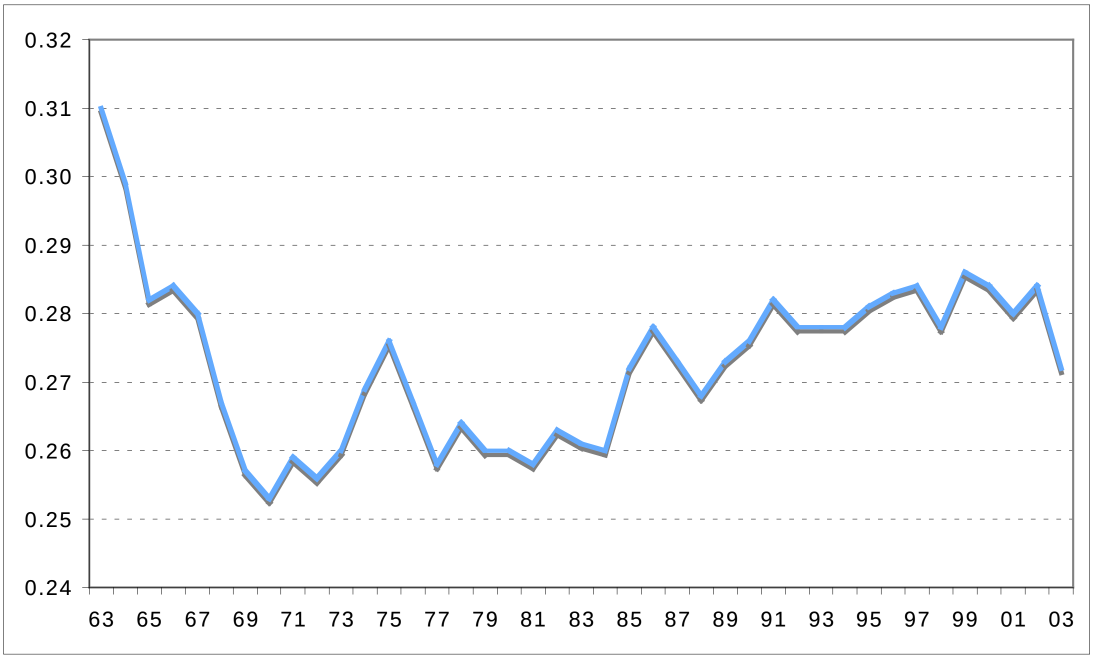
The Basic Survey on Wage Structure (BSWS) is immensely detailed, with a sample size of over one million, and contains data series going as far back as 1948. The survey unit is individuals, not households. Not only is the sample limited to wage-earners, but it only covers wage-earners at private sector companies employing ten or more people. It is thus not very useful when considering overall inequality in Japanese household incomes. It is however a rich source if the topic is more narrowly restricted to private sector wage inequality.

(v) Income tax statistics, published by the National Tax Agency (contained in the *Kokuzeichou Toukei Nenpou*)

Finally, the Income Tax data are potentially of some use in measuring inequality, but as with all tax data sources, they exclude individuals with incomes below the taxable threshold, and may be more affected than survey data by under-reporting of incomes. Their strength is that annual income bracket data is available all the way back to 1887, when income tax was first introduced in Japan. There are some other difficulties with these data: (i) The taxable unit switched in 1950 from the household to the individual. This not only makes comparisons with the period before 1950 difficult, but also raises problems thereafter, since in the context of inequality studies, the household is generally considered a more meaningful unit than the individual. (ii) A withholding tax system was introduced in 1950, since when tax data have been collected separately for individuals filling in tax returns and for withholding tax. The two sets of data are not strictly comparable, and information about payers of withholding tax is sparse, particularly in income categories other than wages, such as dividends and interest. Nevertheless, these data have been used to produce a credible series of top income shares in Japan going all the way back to the late 19th century (Moriguchi and Saez 2006).

We follow Tachibanaki in regarding the IRS and the FIES as the best sources for an analysis of inequality in household incomes. He uses the FIES only as a secondary source because of its sample bias, but he does note that "from the 1960s to the late 1990s…the time-series trend in income inequality (measured by the estimated Gini coefficient) from the Family Expenditure Survey is almost parallel with that from the Income Re-Distribution Survey" (2005: 70). His chart of the estimated Gini coefficient from the FIES only extends up to 1999, but in fact this was its recent peak. Several more years of data are available, and they show a sharp drop in 2003 (Figure 2). It is also worth noting that differences are apparent between the Gini series estimated by Tachibanaki and by Otake, even though they both derive from the same data. This is no doubt a result of the fact that there are large error margins in Gini series estimated from income quintile data.

Figure 2: Gini coefficient estimated from FIES data



Source: Ohtake (2005: 7)

2003's lower inequality level appears to have persisted in the following two years, judging from the separate inequality measure we calculate below (see Figure 12). We will devote more attention to the FIES because of its amenability to time-series analysis, but we accept that it is more useful in showing the direction of the trend rather than as a reliable indicator of inequality levels themselves.

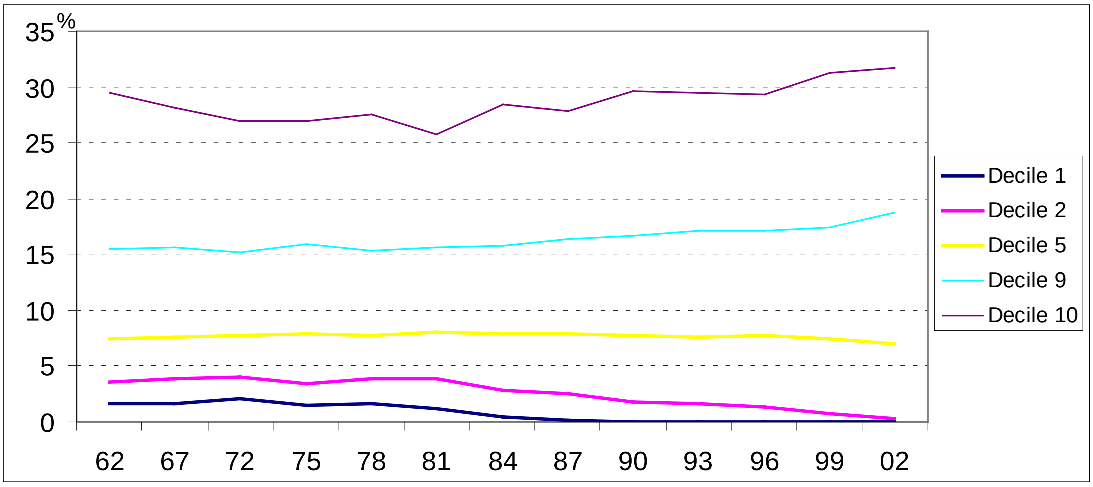
3. Summary Analysis

Deciles and Quintiles:

Income decile shares are directly available in the IRS data, and they give a more nuanced picture than summary inequality measures as to which parts of the income distribution are being affected by changing inequality. Although the inequality debate is primarily about redistributed income, looking at the primary income data helps to identify the contributors to changes in inequality.

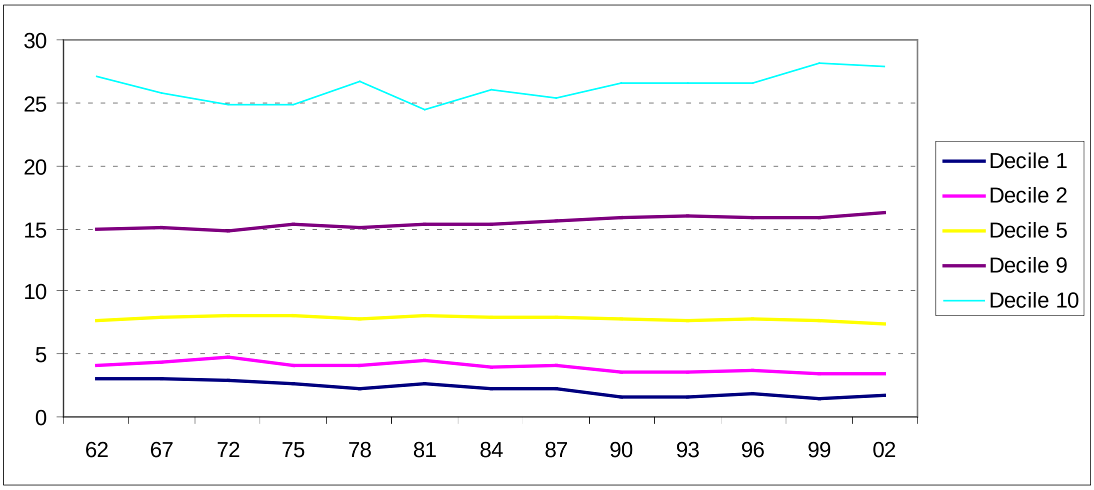
Some of the patterns in the primary income deciles are striking – in particular the speed of the deterioration at the bottom end of the distribution. The bottom decile's share of primary income, which was over 2% in 1972, fell to 0.0% (as rounded in the data) in 1990, and has remained there ever since (Figure 3). The decline in the second decile's share has also been marked. From 4.0% in 1972, it fell below 2% in 1990, and more than halved just between the 1999 and 2002 surveys, falling from 0.8% to 0.3% (Figure 3). It seems likely that the main reason for these trends is the rising proportion of households with little or no income other than their public pensions, which are not counted in primary income, as noted above. The top decile's share of primary income has been rising, but less consistently so. It remained stationary between 29.7% and 29.3% over the 1990-1996 period, for instance, before rising again to reach 31.7% in 2002 (Figure 3).

Figure 3: Selected primary income decile shares



Source: Income Redistribution Surveys (Ministry of Health, Labour and Welfare)
Note: Time scale distorted from 62-72 due to irregular survey dates

Figure 4: Selected redistributed income decile shares



Source: Income Redistribution Surveys (Ministry of Health, Labour and Welfare)
Note: Time scale distorted from 62-72 due to irregular survey dates

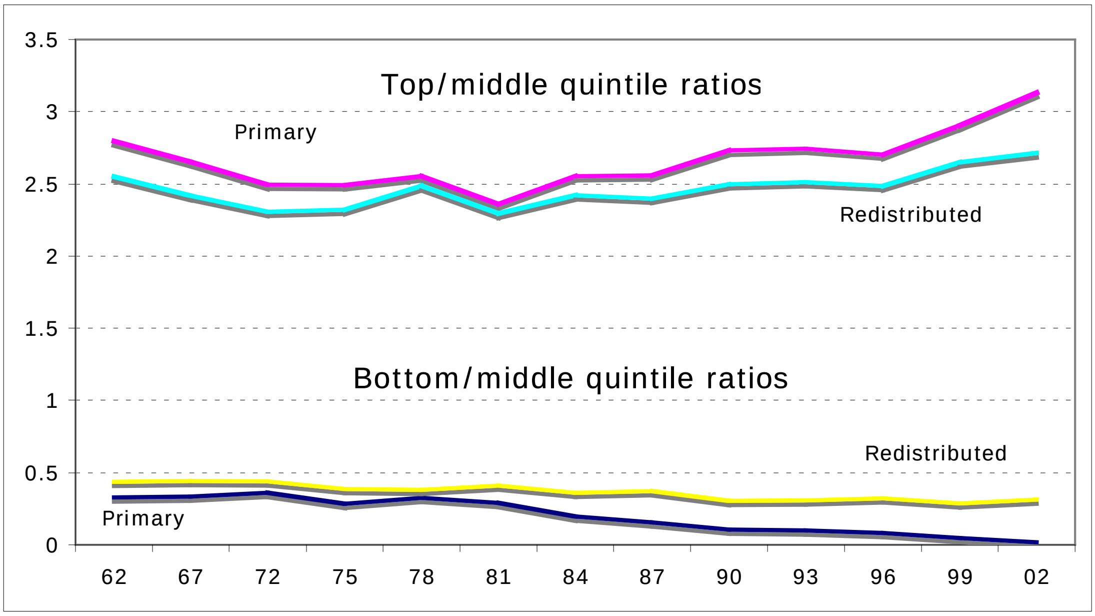
It is clear from the much flatter trends in the redistributed income deciles – as from the growing gap between the two Gini coefficients in Figure 1 - that the tax and benefits system is playing a substantial role in cushioning the effects of rising inequalities in primary income. Nevertheless, some widening of differentials has also been occurring at the redistributed level. The decile trends again reveal some nuances not apparent from the Gini coefficient. The downtrend in the bottom decile's share of redistributed income is in fact not a feature limited to the last two decades, and has persisted throughout the forty-year span of the data series (Figure 4). Since 1990, the bottom decile share has shown no clear trend in either direction. The low point (1.4%) was reached in 1999, but the 2002 data point (1.7%) puts it marginally above its early 1990s level. Slippage for the second decile is more persistent, but very gradual

(Figure 4). The data for the top decile mirror the Gini statistic more closely, with a decline to the 1981 low followed by a steady uptrend to new highs thereafter, and some decline between 1999 and 2002 (Figure 4).

If we divide the income of the top and bottom quintiles, respectively, by the income of the middle quintile, we can see that the primary income of the bottom quintile has fallen from around one-third of middle quintile income in 1978 to just 2% of it in 2002 (Figure 5). On a redistributed basis, the percentage drops from 38% to 31% over the same period, with a slight increase between the most recent two surveys, since the figure in 1999 was 29%. (This change in direction is entirely due to taxes and transfers; on a primary income basis the figure more than halved over the same three years, from 5% to 2%.)

At the upper end of the income scale, the top quintile was earning 2.8 times as much in primary income as the middle quintile in 1962. After dropping to a low of 2.4 times in 1981, this figure has now recovered to a new high of 3.1 times. After redistribution, the same trends are apparent, but they are relatively mild; the top quintile earned 2.6 times as much as the middle quintile in 1962, fell to 2.3 times in 1981 (and also in 1975), and was back to 2.7 times in the 2002 data. (Even isolating the top decile of the data only, dividing this by the middle quintile, and doubling to put it on a comparable basis, gives a similar set of figures, starting at 3.3 times, falling to lows at 3.0 times, and rising to 3.4 times currently.)

Figure 5: Top and bottom quintile incomes as ratios of middle quintile



Source: Income Redistribution Surveys (Ministry of Health, Labour and Welfare)
Note: Time scale distorted from 62-72 due to irregular survey dates

Overall, therefore, the decile and quintile data suggest some aspects not apparent from the Gini statistics. Firstly, in terms of primary income, the most striking feature is the collapse in income share of the poorest households. As discussed above, the main reason for this appears to be that public pension income is excluded from the definition of primary income.

Secondly, the tax and transfer system has acted, as it should, as a significant brake on the decline in redistributed income share among the poorest deciles. Again, the public pension system is a large part of the reason for this. Thirdly, the bottom decile's share of redistributed income has been trendless since the beginning of the 1990s, so there is little evidence here that the very poor are getting poorer.

Many of these phenomena can, to a large extent, be explained by the ageing of the population and the generosity of the state pension system. Many retired households have little or no "primary" income, relying heavily on the state pension, so as an increasing proportion of households move into retirement, the primary income of the lowest brackets has collapsed. Trends in redistributed income are much less marked because of the growing role of state pensions. Public spending on the aged accounted for only 25% of total welfare spending in 1973, but 69% in 2001, with pension spending accounting for the bulk of this. The growth is driven not only by the rising proportion of elderly in the population; per capita old age pensions have risen twice as fast as national income between 1975 and 2000 (Chopel, Kuno et al. 2005).

Adjusting for Household Size

Although income inequality has tended to increase since the 1980s, there has also been an increase in the diversity of households in terms of size, and in particular there has been a rise in the number of single-person households. Furthermore, there is a clear link between household income and household size; for every year in the FIES data (which exclude single-person households), the average household size of any income quintile is smaller than the average household size of all income quintiles above it. It is necessary to adjust for household size; the average Japanese household in the IRS data has 2.4 members, so a one-person household with below average income would not necessarily have a lower than average income in any meaningful sense.

Atkinson, Rainwater et al. (1995) offer a detailed discussion of equivalence scales that adjust for household size. One relatively simple scaling method is to divide household income by the square root of the number of members of the household. Using this method, Nishizaki, Yamada et al. (1998) found that Japanese inequalities were substantially lower after adjustment was made for household size, and also that Japan remains a relatively "equal" country by international standards. The same method is also used by Ohtake (2005).

This adjustment is made in the IRS data to calculate equivalised Gini coefficients and income deciles, but these adjusted data are only available for the last two surveys. On the equivalised basis, the most recent IRS Gini coefficients for primary and redistributed income are 0.419 and 0.322 respectively, substantially lower than the 0.498 and 0.381 respectively calculated from the unadjusted data. Households with low primary income tend to be those headed by elderly people, but these households often have relatively few members, since the children have generally set up their own households by this stage. In 2002, average primary incomes for households headed by people of 75 or over were ¥2,172,000, less than half the average of ¥5,108,000 for all households. But on an equivalised basis, this figure rises to 63% of average household income, because, calculating back from the IRS data, the average household has 2.4 members, while the average household headed by someone 75 years or over has only

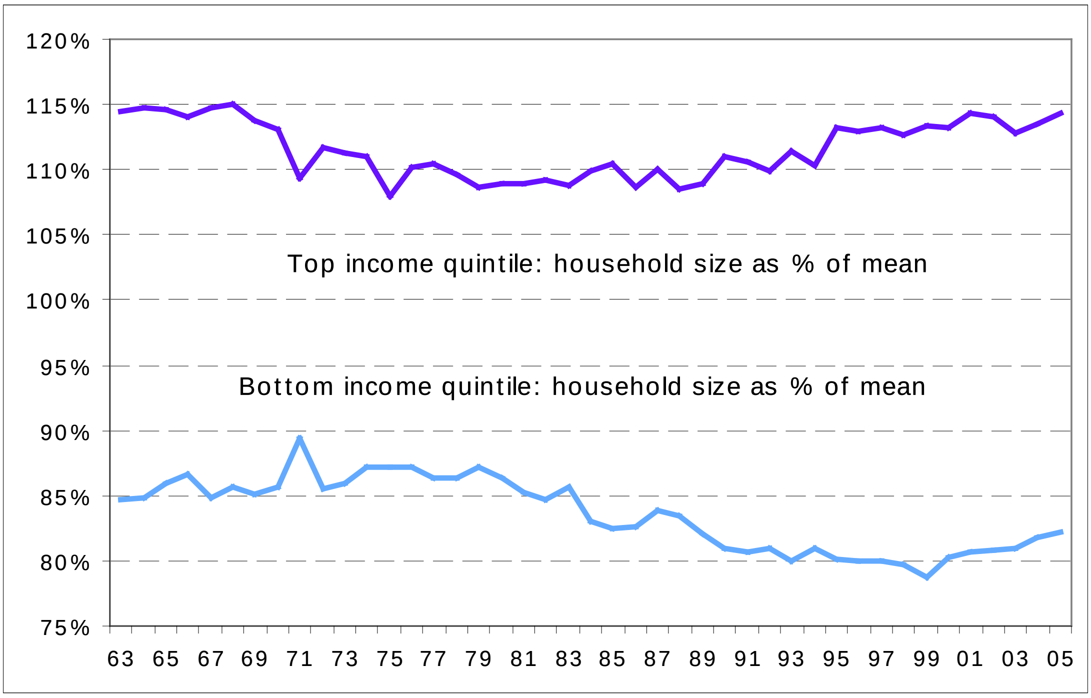
1.1 member - the majority of these households are single-person households. Other household types which tend to have low incomes even after adjustment for size, and therefore certainly before as well, (see Nishizaki, Yamada et al. 1998) are single households, and single-parent households (the latter are of course larger than average where there is more than one child).

Because the equivalised data from the IRS are only available for the last two surveys, it is impossible to draw any conclusions from them about inequality trends. But since the Gini coefficient for equivalised redistributed income shows a drop between 1999 and 2002, from 0.3326 to 0.3217, it certainly is not indicative of a rising trend.

One way to examine this issue is to use the FIES data, which have consistently contained the relevant information on household size since the survey began. (As noted above, however, these data exclude single-person households, and to the extent that the proportion of single-person households is increasing, they may underestimate the increasing dispersion of household sizes.) It can be seen from Figure 6 that there has been an increasing dispersion in household size between the top and bottom income quintiles since around the early 1980s, suggesting that this may explain part of the rise in inequality since then.

Any inequality measures calculated from this data will be "pseudo-"measures; in the absence of the full micro data the households cannot be reordered in terms of equivalised income. Since Gini coefficients based on the FIES data are already only estimates, the value of pseudo-Gini coefficients adjusted for household size would be limited. We therefore prefer to work directly with the quintile data. Again, adjusting them for household size leaves them as "pseudo-equivalised quintiles", but they nevertheless give us some information about the extent to which apparent increases in inequality are driven by changes in household size.

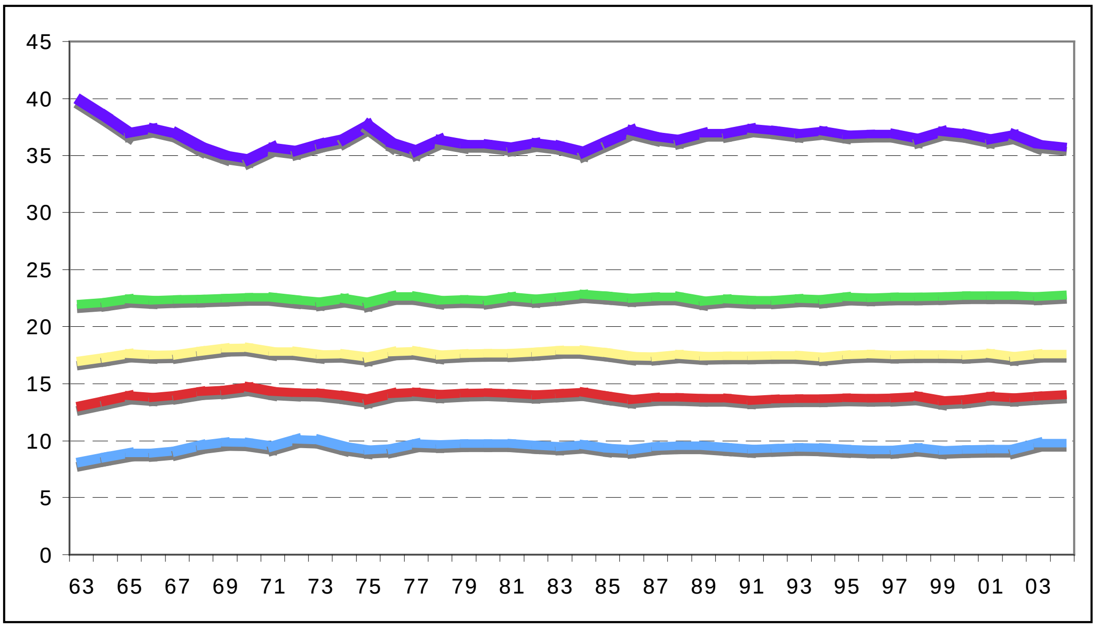
Figure 6: Trends in relative household size: top and bottom income quintiles



Source: FIES

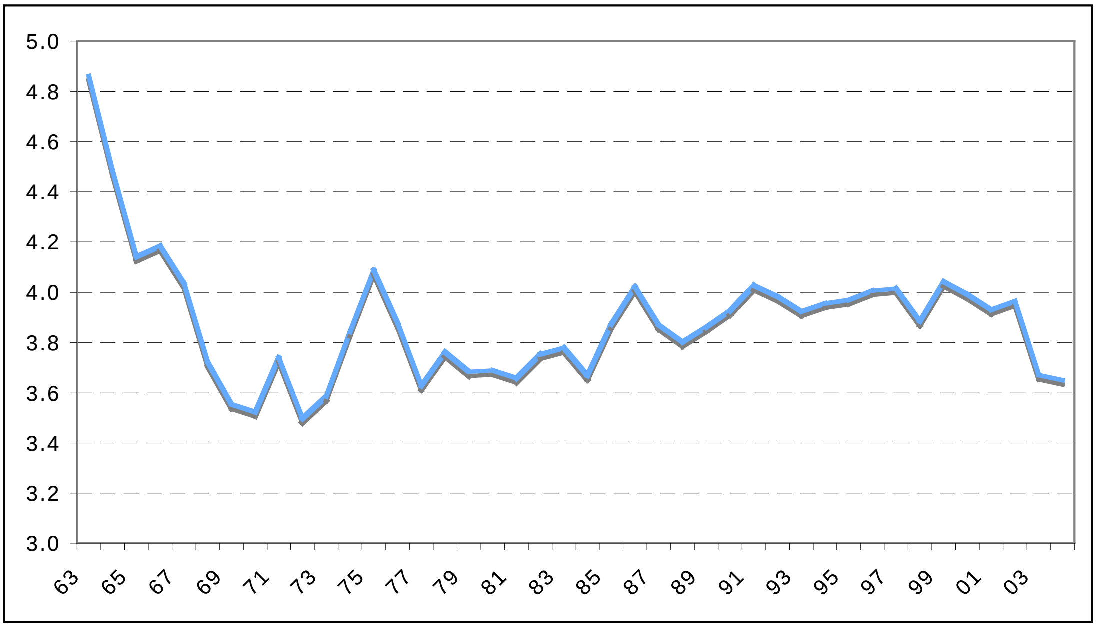
Figure 7 shows pseudo-equivalised income quintiles from the FIES data, where the scaling is by dividing each quintile's income share by the square root of its mean number of household members. To make any trend in inequality more visible, in Figure 8 we show the top (pseudo-)quintile's equivalised income share as a multiple of the bottom quintile's share. Here we can see some increase in inequality taking place between the 1970s and 1990s, roughly in line with the IRS data. However, the trend appears to have reversed since the end of the 1990s, and the figures for the last few years put inequality fully back to early 1980s levels.

Figure 7: Equivalised income: pseudo-quintiles



Source: FIES

Figure 8: Equivalised pseudo-income quintile shares – Top quintile as multiple of bottom quintile

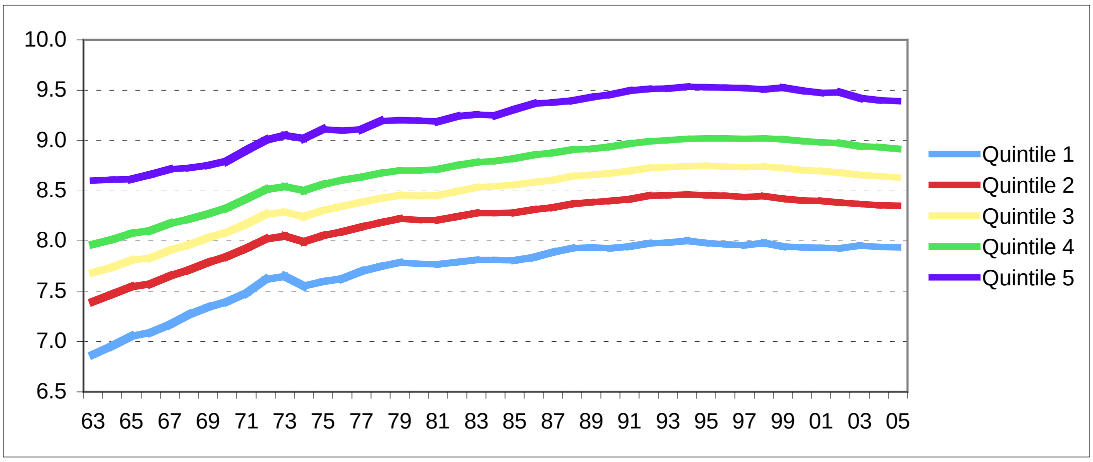


5. Unobserved components time series analyses

The fact that income quintiles in the FIES series are available annually since 1963 allows for a more systematic time series analysis. In this section we estimate unobserved-components time series models for income quintiles, following the approach taken by Harvey and Bernstein (2003) in modelling US real wage deciles.

Figure 9 shows the logs of average real annual household incomes by quintile since 1963. We use log income to focus attention on relative differences. In the Japanese case, the dominant feature is the rise in real incomes from which all quintiles benefited over the period until 1990. All quintiles have seen some weakening over the last decade.

Figure 9. – Log real annual household incomes (¥000, 2002 yen)



For each quintile, we estimate a univariate time series model, to decompose the data into components.[7]

In Structural Time Series models, the value of the variable of interest, y, is conceived of as consisting of its actual underlying level μ, plus a normally distributed error component ε, which represents sources of error such as sampling or measurement error. In the local level model, the underlying level at time t μ_t is equal to the underlying level in the previous period μ_{t-1} plus a normally-distributed shock η_t. η represents the various factors which cause the actual level of the variable to change, which are not specifically identified. In the local level model the variable is as likely to move up as to move down at any given time-point; there is no trend.

Local level model:

$$y_t = \mu_t + \varepsilon_t \sim \text{NID}(0, \sigma_\varepsilon^2), t = 1,...., T,$$
$$\mu_t = \mu_{t-1} + \eta_t, \ \eta_t \sim \text{NID}(0, \sigma_\eta^2)$$

In the local linear trend model a trend component β is added in the determination of the level. This too is subject to a normally distributed shock ζ in each period, representing the unobserved fundamental factors which cause the trend in the variable to change, but this version of the model allows for trends which persist over time. It is also possible to assume that the variable is influenced by one or more cycles, and we have generally included a cyclical component in the models discussed below. Details regarding the modelling procedures can be found in Koopman, Harvey et al. (2000).

Local linear trend model:

$$y_t = \mu_t + \varepsilon_t \sim \text{NID}(0, \sigma_\varepsilon^2), t = 1,...., T,$$
$$\mu_t = \mu_{t-1} + \beta_t + \eta_t, \ \eta_t \sim \text{NID}(0, \sigma_\eta^2),$$
$$\beta_t = \beta_{t-1} + \zeta_t, \ \zeta_t \sim \text{NID}(0, \sigma_\zeta^2)$$

Once the model has been specified in this way, parameter values are estimated by maximum likelihood. The main diagnostic statistics used in evaluating models are r(1), the first-order residual autocorrelation, and Q(P,d), the Box-Ljung statistic based on the first P residual autocorrelations, and assumed to have a χ^2_d distribution in a correctly specified model.

We have followed Harvey and Bernstein in preferring to specify a non-stochastic level, which gives a more easily identifiable trend. We have differed, however, in allowing for the inclusion of cyclical effects in real income and/or inequality measures, guided by the empirical evidence that these exist.

[7] These models were estimated using the STAMP software.

Table 1: Univariate Time Series Models Diagnostics

Quintile	S.E.	Q (P†, 6)	R(1)	Log L	Cycle Period
1	0.0327	3.44	-0.02	138.7	6.6 years
2	0.0239	6.34	-0.07	151.6	6.5 years
3	0.0216	8.84	-0.05	155.7	6.0 years
4	0.0206	6.06	-0.06	157.6	5.9 years
5	0.0316	6.25	0.00	140.1	4.9 years

† The STAMP output selects P as the lag length with highest residual autocorrelation; the value of P therefore varies by quintile.

Table 1 shows some diagnostics on the univariate time series models generated for each quintile's logged real mean income. All of the models have acceptable fits. In no case does the Box-Ljung Q statistic suggest a problem with model specification, and the estimated cycle periods are in the range of 4.9-6.6 years.

These models enable us to separate out cyclical and random effects so that we can see the underlying level of real mean income in each quintile clearly. Since the slope is an explicit component of the model, we can also see whether the real income level in any given quintile is trending upward or downward, and at what points the trend has switched in the past. Exponentiating the log variables shows, in Table 2 below, underlying real income levels and trends for each quintile as at the latest data point in 2005. Real incomes are expressed in 2002 yen.

In the case of the bottom income quintile, for instance, the underlying level of real mean income in 2005, after removing cyclical and random components, was ¥2.790mn per annum, 0.2% below the actual level of ¥2.796mn. The slope coefficient is -0.0013, suggesting that real income is falling by 0.1% per annum for this income group, though the negative slope is not statistically significant. Similar results for the other quintiles are shown in Table 2. While none of the slope coefficients are significantly different from zero, it is nevertheless suggestive that the slope coefficients are all negative, and that the rates of decline are higher for the higher quintiles. This analysis therefore tentatively suggests that (i) underlying real incomes in 2005 were trending downward for all income quintiles, and (ii) underlying income inequalities were tending to decrease.

Table 2: FIES data 2005 real income trends by quintile

Quintile	Average real income (¥mn)	Underlying real income (¥mn)	Underlying rel. to actual (%)	Slope per annum, (%)	Slope T-stat
1	2.796	2.790	-0.2%	-0.1%	-0.09
2	4.234	4.221	-0.3%	-1.1%	-0.91
3	5.612	5.603	-0.2%	-1.6%	-1.44
4	7.462	7.460	-0.0%	-1.7%	-1.65
5	11.977	11.934	-0.4%	-2.3%	-1.50

Table 3 presents models for the logarithms of the ratios of each quintile's income to the median income. Because the variations in these ratios are smaller than those in absolute real income levels, it is more difficult to generate acceptable models, and we have dropped the fixed level constraint to make this easier.

Table 3: Final state (2005) data for quintile income ratios to median income

Quintile	Ratio to median income (x)	Underlying ratio to median (x)	Underlying rel. to actual ratio (%)	Slope per annum, (%)	Slope T-stat
1	0.498	0.50	+0.5%	1.17%	1.24
2	0.754	0.756	+0.2%	0.68%	1.80
4	1.330	1.330	-0.0%	0.06%	0.31
5	2.134	2.131	-0.2%	-0.29%	-0.35

The conclusions are broadly consistent with those given above for the income quintiles themselves. An interesting feature of these models is that they suggest that inequality measures calculated from these 2005 data would be overstated relative to the underlying level, with the ratio of the bottom quintile to the median pushed below its underlying level by random and/or cyclical factors, and the reverse being the case for the top quintile. None of the slope coefficients individually is statistically significant, so one should probably accept the null hypothesis in each case that there is no trend in relative income share. It is nevertheless suggestive that the 2005 slope coefficients decrease as income increases, turning negative for the top income bracket. Although one cannot draw a firm conclusion, there is certainly no evidence here that inequalities are currently on an increasing trend, and if anything the reverse seems to be the case.

Multivariate analysis

Harvey and Bernstein (2003) use Seemingly Unrelated Time Series Equations (SUTSE) models to model all of the dependent variables jointly. Here the vector of dependent variables consists of the same four logged ratios, of different quintiles' income to the median quintile, modelled individually in the section above. The SUTSE model takes account of interactions between the variables, and since in this case the variables are the quintiles of the income distribution, one would expect intercorrelations. Results in Table 4 have low standard errors and r(1) statistics, and no evidence of mis-specification in the Box-Ljung statistics. The cycle period is estimated at 6.3 years in the combined model.

Table 4: SUTSE model diagnostics

	Ratio 1	Ratio 2	Ratio 4	Ratio 5
S.E.	0.018	0.0064	0.0062	0.0242
R(1)	-0.03	0.03	-0.05	0.02
Q(11,6)	7.03	7.93	7.71	12.31

The results are again consistent with the earlier analysis. Inequalities in 2005 are slightly overstated compared with the underlying trend, particularly at the top end of the income distribution. Again, the slope coefficients suggest that underlying inequalities are declining, with the first quintile ratio in particular showing an uptrend, significant at the 10% level.

Table 5: SUTSE model results

Quintile	Ratio to median income (X)	Underlying ratio to median (X)	Underlying rel. to actual ratio (%)	Slope per annum, (%)	Slope T-stat
1	0.498	0.499	0.1%	1.5%	1.94
2	0.754	0.754	-0.1%	0.4%	1.37
4	1.330	1.329	-0.0%	-0.1%	-0.46
5	2.134	2.120	-0.7%	-1.1%	-1.38

Equivalised household income trends

It is also interesting to look at the trends in the equivalised household income shares discussed above, i.e. adjusting household income for household size. We were not able to generate a convincing SUTSE model to explain all five of these variables jointly, but we developed models for them individually. Because the movements in these variables over time have been smaller than the movements in the raw data, we again found it easier to model them if we allowed a stochastic rather than a fixed level. We generally used a cyclical component, but for Quintile 3 the results suggested that there is no cyclicality, so we dropped the cycle from our eventual model. Although again none of the slope coefficients is statistically significant, we again find that the income shares of the bottom quintiles are trending up, while that of the top quintile is trending down, suggesting that inequality is currently declining.

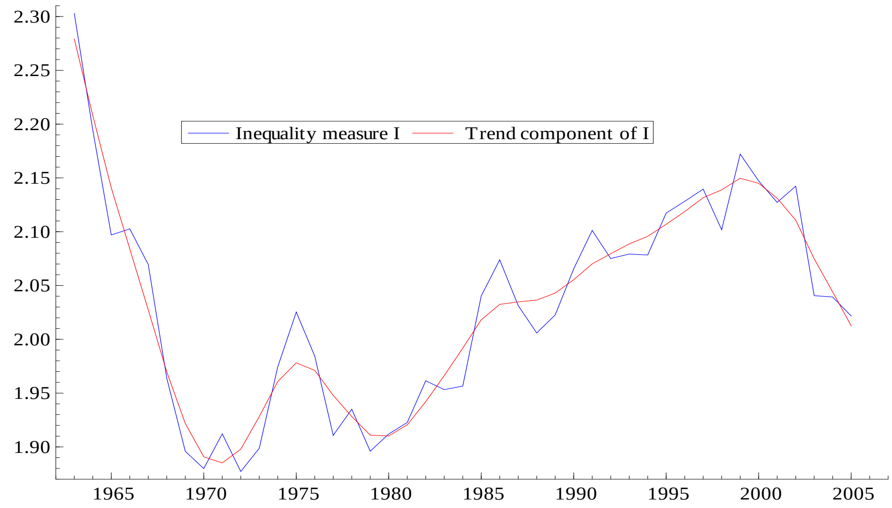
Table 6: Recent trends in equivalised quasi-income quintile shares

Quasi-income quintile	2005 slope	T-stat on slope
1	+0.7%	0.81
2	+0.4%	0.67
3 (no cycle)	+0.1%	0.52
4	+0.1%	1.08
5	-0.4%	-0.72

Overall inequality measure

A single inequality measure calculated directly from the distributional data would be useful. We estimate a measure from the quintiles equivalent to the decile-based measure used by Harvey and Bernstein (2003), defined simply as the sum of the logs of the ratios of quintiles 4 and 5 to quintile 3, minus the sum of the logs of the equivalent ratios for quintiles 1 and 2. As any quintile diverges from the median quintile, this ratio will rise, and vice versa. This measure is calculated directly from the available data and is simple to decompose into the contributions from individual income quintiles.

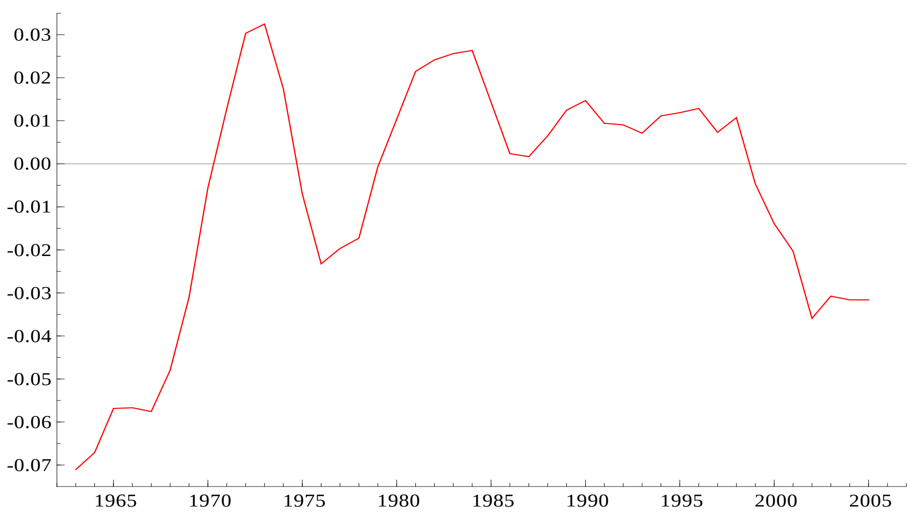
Figure 10: Trends in overall inequality measure I



Sources: FIES, STAMP Output

The chart of this inequality measure (shown with its modelled trend component in Figure 10) has some broad similarities with the IRS Gini coefficients (Figure 1), and looks closer still to the chart of the Gini coefficient estimated from the same FIES data (Figure 2). Inequality, on this measure, rose steadily through the 1980s and 1990s. But it peaked in 1999, and its recent fall has undone about half of its rise over the last two decades, returning it to around the levels of 1990. Figure 11 shows the estimated slope coefficient for this inequality measure. It is true that there was a sustained period of rising inequality which persisted through the 1980s and 1990s. But the current direction of the inequality trend is downward (-3.2% per annum) rather than upward. Once again, however, the t-statistic on this slope coefficient is too low (-1.24) for us to reject the null hypothesis that the inequality trend is currently flat. This is equally true of the whole of the last 20 years – while inequality trended up over that period, the trend was at no point strong enough to be significant in the statistical sense. However, it is probably not necessary to insist on strict statistical significance in this context.

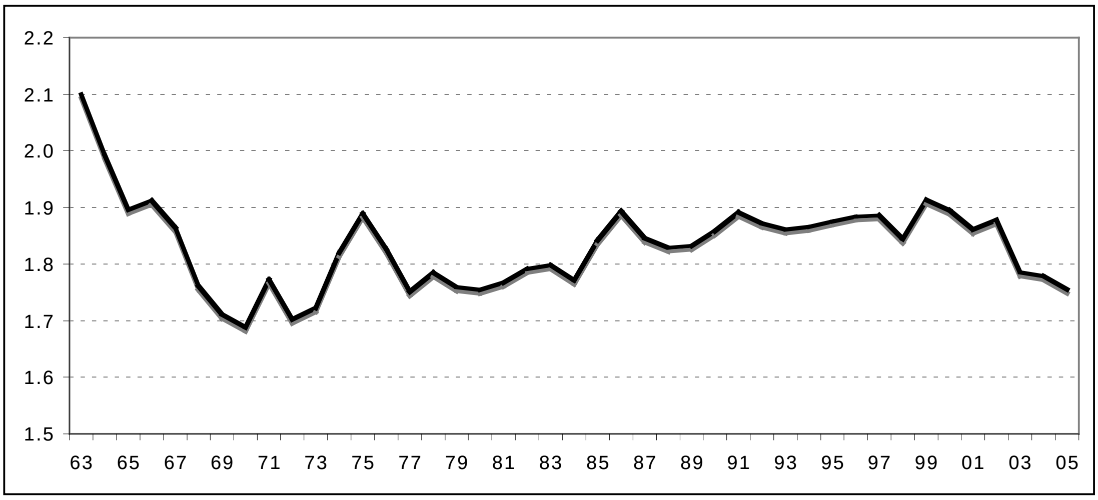
Figure 11: Slope coefficient on modelled inequality measure I



Overall inequality measure – equivalised version

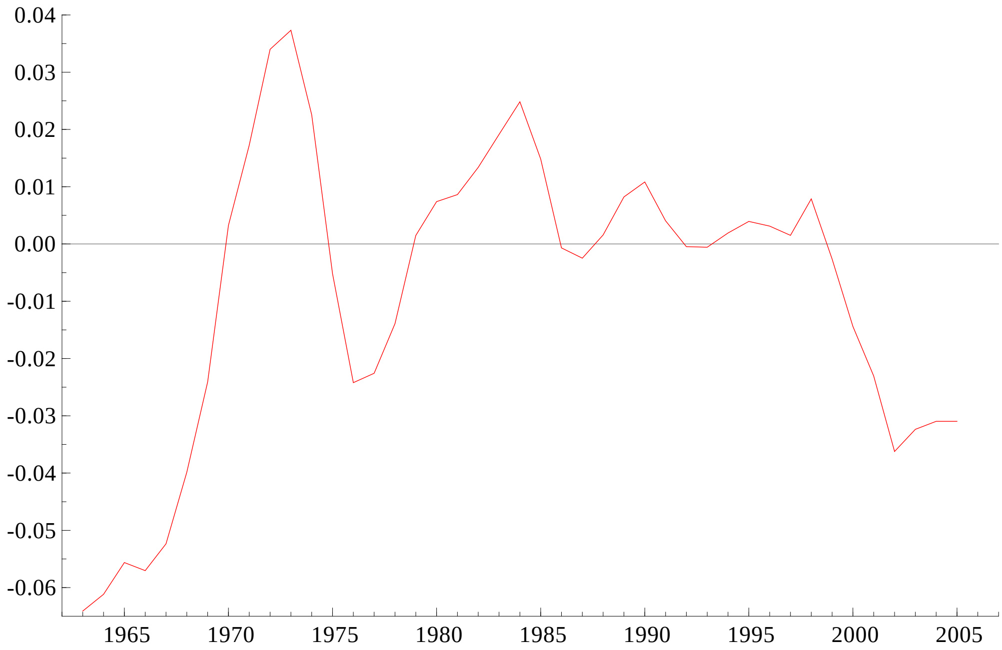
We can obtain a more meaningful indicator of inequality by recalculating the above measure based on equivalised data adjusted for household size, as discussed in Section 4. The broad picture (Figure 12) is similar to that shown by the unadjusted measure, but in this case the trend towards rising inequality appears to have been in place since the beginning of the 1970s, rather than just the beginning of the 1980s. Again, we see a reversal since 1999, and the most recent figure, for 2005, is the lowest since 1980. As expected, inequality is lower when measured on the equivalised measure than on the unadjusted measure. The most recent figure for the unadjusted measure is 2.02, while that for the adjusted measure is 1.76. Similarly, the rise in recent decades is smaller when measured on an equivalised basis; the rise in the unequivalised measure between the 1979 low and the 1999 high was 0.26 points, while it was only 0.16 points on an equivalised basis. It appears that failure to adjust for household size gives an exaggerated impression of the rise in Japanese inequality since 1979.

Figure 12: Equivalised household income inequality measure EI



Univariate time-series modeling of this inequality measure suggests some interesting conclusions. (We used our standard model with a fixed level and a cycle here.) Figure 13 shows the slope coefficient. While it was positive for most of the 1980s and 90s, it suggests that inequality recently has been falling at the fastest rate since the 1960s. The same is true for the slope on the unadjusted measure (Figure 11).

Figure 13: Slope coefficient on modelled equivalised inequality measure EI



It is a puzzle that these data suggest such a rapid fall in equality at precisely the time when rising inequality has become a major topic of discussion. But it is straightforward to decompose these inequality measures to establish which parts of the income distribution are driving recent trends. If we focus on the uptrend since the 1970s and its recent reversal, we obtain the results shown in Table 7:

Table 7: Quintile contributions to changes in equivalised inequality measure EI

Period	Quintile 1	Quintile 2	Quintile 4	Quintile 5	**Total**
1970-1999	+0.03	+0.05	+0.04	+0.10	**+0.22**
1999-2005	-0.06	-0.05	-0.00	-0.09	**-0.16**

Looking at the whole three-decade rise in the equivalised inequality measure since its 1970 low, we can see that the relative income gains of the top quintile had twice as large an impact as any other quintile, accounting for almost half of the total increase in inequality. The recent decline, however, has been driven more by improving relative income for the bottom two quintiles.

Indeed, since we have not only quintile but also decile information since 1979, we can decompose the contributions to rising and falling inequality further for the period since then. Using a similar inequality measure based on equivalised decile income data (calculated from logged ratios to median quintile) gives the following contributions by decile to the rise and fall in income inequality over the period. (The rise in this case is dated from 1980, since this marks the low for this inequality measure over the period for which data are available.)

Table 8: Decile contributions to changes in equivalised inequality measure EI

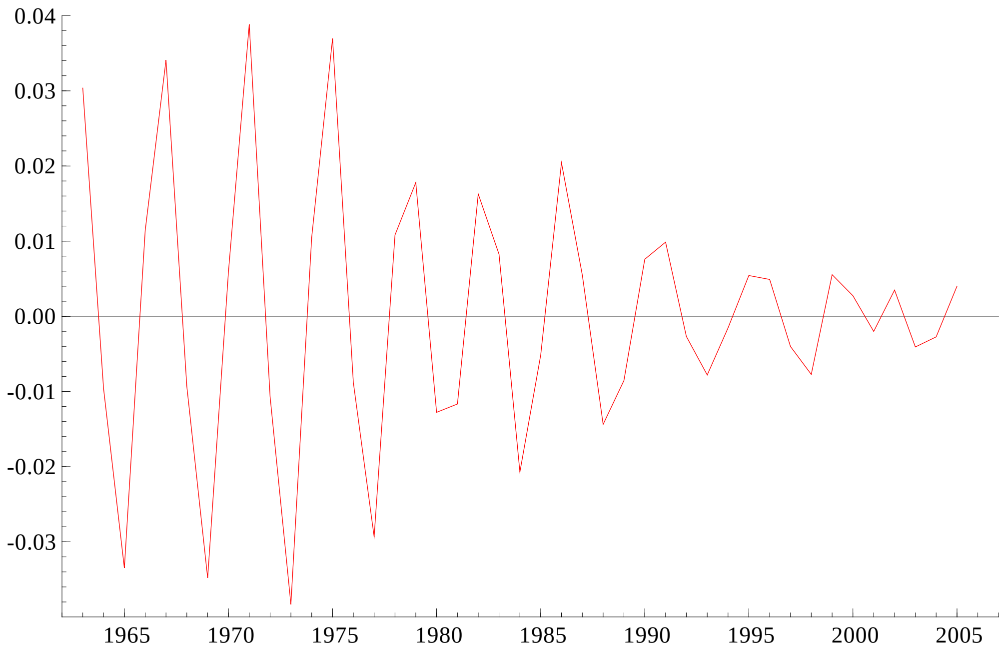
Decile	Contribution to 1980-1999 rise	Contribution to 1999-2005 fall
1	0.07	-0.10
2	0.04	-0.04
3	0.05	-0.06
4	0.04	-0.04
5	0.00	0.00
6	0.00	0.00
7	0.01	0.00
8	0.04	-0.01
9	0.03	-0.01
10	0.04	-0.06
Total	**0.32**	**-0.32**

It is apparent from this breakdown that both during the period when inequality was increasing, and during the reversal over the last six years, it has been the bottom end of the income distribution which has been the more important in driving the trend. On these figures, the trends at the bottom end of the income distribution have been roughly twice as important as those at the top in determining the overall changes in the inequality measure in recent years.

We referred in Section 1 to three commonly cited reasons for rising Japanese income inequality: (i) globalisation (impacting unskilled workers at the bottom end of the income distribution, (ii) technology (benefiting the top end), and (iii) government policies such as lowering top marginal tax rates (which would benefit the top end). Our finding that inequality changes have been primarily driven by declines in relative income at the bottom end of the income distribution would be consistent with the first of these explanations, but the conclusions from direct studies of this point are mixed, with little evidence that the premium paid to skilled workers has increased because of rising levels of trade (Yamamoto 2004). Furthermore, the globalisation explanation seems inconsistent with the reversal in the inequality trend since 1999. Given the evidence from our times series modelling, macro-economic effects appear to be a possible alternative explanation. There could potentially be a cycle-based explanation for the recent decline in inequality, for instance, given the time period over which it has occurred. Late 1998 was a low point for the Japanese economy, marked by the collapse of several major financial institutions. The accompanying economic retrenchment could well explain a reduction in relative incomes for lower income deciles, which may have been reversed by the subsequent economic recovery.

The cyclical component in our time series model of EI is charted in Figure 14. It has a period of 4.0 years, a little shorter than those identified in other models above, but still roughly consistent with a business cycle impact. What is immediately evident is that the impact of the cyclical component has in fact diminished rather than increased in recent years. This suggests that, while cyclical factors were a significant influence on inequality during the 1960s and 1970s, their impact has faded during the 1990s. This may well be because the normal business cycle largely disappeared in Japan in the 1990s as the economy became dominated by structural problems, including deflation and a long-running banking crisis. But whether we characterise them as cyclical or structural, problems like weak economic growth and rising unemployment are generally expected to have their largest impact at the bottom end of the income distribution.

Figure 14: Cycle in modelled equivalised inequality measure (EI)



6. Adding explanatory variables

The discussion above suggests that the aggregate economy, in the shape of factors like economic growth and the strength of the labour market, is likely to influence income inequality in Japan. With the exception of the third (median) quintile, we found that allowing for a cycle gave better-fitting models for quintile income shares and the inequality measures we derived from them. We also found that the biggest influence on our overall inequality measures was from changes at the bottom end of the income distribution. This is consistent with the hypothesis that it is changes in unemployment which are the largest driver of changes in inequality in Japan. It is also consistent with findings from the US, where "the income share earned by the lowest quintile is both the most volatile and the most procyclical" (Castaneda, Diaz-Gimenez et al. 1998: 94)

We tested these hypotheses by explicitly considering economic indicators relating to output, inflation, and employment. The variables used were the log of real GDP in each year, the log of the Consumer Price Index, and the offers/applicants ratio, which we preferred to the unemployment rate, since the unemployment rate in Japan typically lags overall economic performance. None of the models used in this section contained an unobserved cyclical component, since the intention is that the cyclical influence is now being observed through the explanatory variable; indeed, adding an unobserved cyclical component typically resulted in deterioration in model fit.

Table 8: Alternative models of EI with explanatory economic variables

Variable	S.E.	Q (P†, 6)	r(1)	Log L	Coefficient
Univariate models					
Ln Real GDP	0.0464	8.6	-0.00	122.3	-0.65359**
Ln CPI	0.0469	11.6	0.00	121.9	0.58544**
Off./Appl. Ratio	0.0471	7.4	-0.03	119.7	-0.074638**
Model for EI with Ln CPI and Ln Off/Appl. Ratio					
Ln CPI	0.0458	7.6	-0.03	0.0704	0.426*
Off./Appl. Ratio					-0.049

† The STAMP output selects P as the lag length with highest residual autocorrelation; the value of P therefore differs by variable.
** Significant at 5% level. * Significant at 10% level.

Table 8 shows the results of this analysis. Both the offers/applicant ratio and the log of the real GDP level have statistically significant negative effects on inequality at the 5% confidence level. Inflation, measured by the log of the CPI, has an inequality enhancing effect. This is consistent with price rises redistributing income away from persons with fixed nominal incomes. Deflation thus tends to reduce inequality. All of the explanatory variables had the expected signs. As seen in the bottom panel, a model that analyses the impact of the labour market and inflation on income inquality shows that inflation/deflation has a stronger and more significant impact in inequality

In the light of the discussion above, we would expect to find that these macro-economic explanatory variables have relatively large impacts on the bottom quintile. Since EI can be easily decomposed into its quintile contributions, we tested this by using SUTSE models of all four equivalised income pseudo-quintile ratios (logged) together, using one explanatory variable at a time.

Table 9: Coefficients of explanatory variables for each quintile (relative to third)

Variable	Quintile 1	Quintile 2	Quintile 4	Quintile 5
Univariate models				
Ln Real GDP	0.2752***	0.0996**	-0.0876***	-0.2196
Ln CPI	-0.348***	-0.097***	0.047**	0.191*
Off.-Appl. Ratio	0.0382***	0.0077	-0.0128***	-0.0238
Model with Ln CPI and Ln Off/Appl. Ratio				
Ln CPI	-0.236***	-0.115***	0.005	0.212*
Off.-Appl. Ratio	0.024*	-0.002	-0.013**	-0.004

***Significant at 1% level; ** Significant at 5% level; * Significant at 10% level.

Again, the signs were consistent with the hypothesis that economic decline tends to cause an increase in inequality, by reducing relative incomes for the bottom quintiles. Inflation tends to reduce relative incomes in the bottom two quintiles and increase them at the top of the income distribution. Looking at the relative size of the coefficients, we see that in general the magnitudes of the economy-wide effects are largest for quintile 1. It was notable and surprising that economic expansion and a stronger labour market *reduces* the relative income of the 4th quintile with such high statistical significance. The magnitudes of these effects are quite small.

In general, therefore, this analysis supports the view that the structural wave in the economy has had statistically significant effects on Japanese inequality, and that these effects are primarily felt through their impact on the relative income of the bottom quintile. The way in which real GDP and the offers/applicants ratio have significant effects on inequality is primarily through the bottom quintile, which is the most affected by variation of the aggregate economy.

7. Conclusions

In this paper we have focussed on income deciles and quintiles, and inequality measures derived directly from them, in order to clarify the patterns in Japanese income inequality trends. We have applied structural time series modelling techniques to one of the main data series, allowing a more rigorous analysis of both the long-run evolution of income inequality and recent trends.

There can be little doubt that inequality in primary income has widened sharply over the last two decades. This is primarily the result of a collapse in the income share of the bottom two deciles of Japanese households. Since the state pension is excluded from the definition of primary income, this collapse is a natural consequence of the ageing population, and hence the rising proportion of the Japanese population which has little or no "primary income" as a result of retirement. While there has also been some rise in the inequality of redistributed income, the trends here are much less clear, and what is immediately apparent is that redistribution through the tax and welfare system is playing a large and increasing role in reducing inequalities at this income level.

Focussing on the Family Income and Expenditure Data since 1963 allowed us to make some adjustment of household income for household size. Inequality is substantially lower when income is equivalised in this way, and the rise in inequality in recent decades is less marked. Secondly, the FIES's longer data series allows structural time series analyses, enabling us to distinguish the underlying trends from cyclical and random factors, and to establish statistical significance. This analysis suggests that at the most recent data point (2005), (i) average real incomes are falling for all income quintiles, (ii) real incomes are declining faster for higher earners than for lower earners, (iii) inequality is declining at the fastest rate since the 1960s, and (iv) this decline in inequality has already unwound a large part of the previous rise. The downtrend in inequality is, however, still not strong enough to be statistically significant (the same is true of the uptrend in inequality in preceding decades). Nevertheless, this evidence suggests that current concerns about rising inequality in Japanese incomes are overdone.

Looking at the drivers of change, we found that both the rise in inequality since the 1980s and the decline since the 1999 peak have been primarily driven by changes in relative income shares for the bottom two quintiles of the income distribution. Falling relative incomes at the bottom end of the distribution are consistent with the hypothesis that globalisation is causing an increase in inequalities by reducing the demand for skilled labour in advanced countries. But the reversal since 1999 is difficult to square with this explanation. We find instead that aggregate economic indices such as GDP and the offers/applicants ratio have statistically significant effects on inequality, and that these effects are largest for the bottom income quintile.

The implication is that the role in increasing inequality in Japan in recent years of factors such as globalisation, increasing use of technology and a trend towards lower top marginal tax rates has been overstated. Rather, a significant proportion of the rise was the result of the poor state of the economy during the 1990s.

If the Japanese economy has now emerged from the structural difficulties which beset it during the 1990s, the decline in inequality seen between 1999 and 2005 should turn out to be sustainable, and indeed is likely to extend further, given further improvement in the economy and labour market. As the economy returns to normal, we may also start to see the return of a cyclical component in inequality, relative to the pattern during the 1990s, dominated as they were by structural problems.

While we find that macroeconomic effects on Japanese inequality are felt most strongly at the bottom end of the income distribution, the strength of such an effect may well depend on the type of welfare system in the country concerned. As noted above, a similar pattern to the Japanese one is found to hold in the US (Castaneda, Diaz-Gimenez et al. 1998). In the UK, however, the opposite pattern, that "inequality leveled off as the recession bit" was noted by Jenkins (1996: 37), who ascribes this to the effect of the welfare system in limiting the decline in income for the unemployed. In the Japanese case, the bulk of welfare spending is directed to public pensions, which do not act as cyclical stabilisers. Indeed, Chopel, Kuno et al (2005: abstract) conclude that "the system today appears to redistribute income from people who on average have lower incomes to the aged population, which today have higher incomes." There is scope for further research to establish what type of welfare system is most effective in limiting the cycle-related variations in inequality.

References:

Atkinson, A. B., L. Rainwater, et al. (1995). Income Distribution in OECD Countries. Social Policy Studies. Paris, OECD.

Barlevy, G. and D. Tsiddon (2006). "Earnings inequality and the business cycle." European Economic Review **50**(1): 55-89.

Castaneda, A., J. Diaz-Gimenez, et al. (1998). "Exploring the income distribution business cycle dynamics." Journal of Monetary Economics **42**(1): 93-130.

Chopel, A., N. Kuno, et al. (2005). "Social Security, Taxation, and Redistribution in Japan." Public Budgeting & Finance **25**(4): 20-43.

Forster, M. and M. Mira d'Ercole (2005). Income Distribution and Poverty in OECD Countries in the Second Half of the 1990s. OECD Social Employment and Migration Working Papers. Paris, OECD.

Harvey, A. and J. Bernstein (2003). "Measurement and Testing of Inequality from Time Series of Deciles with an Application to U.S. Wages." The Review of Economics and Statistics **85**(1): 141-152.

Jenkins, S. P. (1996). "Recent Trends in the UK Income Distribution: What happened and why?" Oxford Review of Economic Policy **12**(1): 29-46.

Kaneko, Y. (2001). "The Factors of Income Inequality and the Coordination between Income Distribution Policy and Social Security." Review of Population and Social Policy **10**: 55-80.

Kato, H. and K. Moroi (1996). Akubyodo ga Kuni o Horobosu (Excessive Equality is Destroying the Country). Voice**:** December: 72-81.

Koopman, S. J., A. C. Harvey, et al. (2000). Stamp: Structural Time Series Analyser, Modeller and Predictor. London, Timberlake Consultants Press.

Kuttner, K. N. and A. S. Posen (2001). "The Great Recession: Lessons for Macroeconomic Policy from Japan." Brookings Papers on Economic Activity **2001**(2): 93-160.

Miura, A. (2005). Karyuu shakai: Arata na kaisou shuudan no shutsugen (Low-class society: The appearance of a mass new class). Tokyo, Koubunsha.

Moriguchi, C. and E. Saez (2006). The evolution of income concentration in Japan, 1886-2002: Evidence from income tax statistics. NBER Working Paper Series. Cambridge, MA, National Bureau of Economic Research.

Nishizaki, B., Y. Yamada, et al. (1998). Nihon no Shotoku Kakusa: Kokusai Hikaku no Shiten kara (Income Differentials in Japan: from an international comparative perspective). Seisaku Kenkyu no Shiten Shiriizu: 11. Tokyo, Keizai Kikakucho (Economic Planning Agency).

Ohtake, F. (2005). Nihon no Fubyoudou (Japanese inequality). Tokyo, Nihon Keizai Shinbunsha.

Ohtake, F. (2006). "Kakusa shakai" meguri ronsou (The controversy over "unequal society"): Nihon Keizai Shinbun**,** February 26: 25.

Satou, T. (2000). Fubyoudou Shakai Nihon - Sayonara Sou-Chuuryuu (Japan's Unequal Society - Farewell to the All-Embracing Middle Class). Tokyo, Chuukou Shinsho.

Sawyer, M. (1976). Income distribution in OECD countries. OECD Economic Outlook. Paris, OECD.

Tachibanaki, T. (1998). Nihon no Keizai Kakusa - Shotoku to Shisan kara kangaeru (Japan's economic gaps - from an income and asset point of view). Tokyo, Iwanami Shoten.

Tachibanaki, T. (2000). "Kekka no fubyoudou" o doko made mitomeru ka (How far should we accept "resultant inequalities"?). Chuou Kouron**:** 76-82.

Tachibanaki, T. (2005). Confronting Income Inequality in Japan: A Comparative Analysis of Causes, Consequences and Reform, The MIT Press.

Tachibanaki, T. (2006). Kakusa kakudai ga yugameru Nihon no Jinteki shigen (Japan's human capital is being distorted by widening differences). Sekai, March**:** 103-110.

Yamamoto, T. (2004). Impact of international trade on wage inequality in Japanese manufacturing industries. Seminar, Research Institute for Economics and Business Administration, Kobe University.