Understanding the Decline in Japan's Saving Rate
in the New Millennium

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Abstract

The decline in Japan's household saving rate accelerated sharply after 1998, but then decelerated again from 2003. Such nonlinear movement in the saving rate cannot be explained by the monotonic trend of population aging alone. According to the life cycle model of consumption and saving, population aging will increase short-run fluctuations in the saving rate, because the consumption of older households is less sensitive to income shocks. Analyzing income and spending data for different age groups, we argue that this is exactly what happened during the recession following the banking panic of 1997/98. Two important changes in income distribution are associated with this mechanism. First, the negative labor income shock, which in the initial stages of the "lost decade" was mostly borne by the younger generation, spread to older working households in the late 1990s and early 2000s. Second, there was a significant income shift from labor to shareholders associated with the corporate restructuring being undertaken during this time. This resulted in a decline in the wage share, so that the increase in corporate saving offset the decline in household saving.

JEL classification: E2; E6; J4
Keywords: Japan's saving rate; household saving; life cycle model; corporate saving; 'Lost Decade'.

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1 Introduction

More than twenty years have passed since Fumio Hayashi attempted to explain Japan's apparently high saving rate in his seminal article (Hayashi 1986). Today, Japan is widely recognized as a country with a declining saving rate. As shown in Figure 1, Japan's household saving rate was around 18% at the beginning of the 1980s, but has been declining ever since, falling to 2.3% in 2007. The total decline is now about 15 percentage points, taking place over a space of little more than a quarter of a century. The existing consensus seems to be that most of this decline is explained by the aging of Japan's population (Horioka 1997, 2009; Dekle 2005; Chen, İmrohoroğlu, and İmrohoroğlu 2006; Braun, Ikeda, and Joines 2008).

[Insert Figure 1 here]

While the importance of the effect of aging on the household saving rate is undeniable, we think previous studies exaggerate its quantitative impact. As can be seen in Figure 1, there was a significant acceleration of the decline in the saving rate in the late 1990s/early 2000s. In 1998, the household saving rate was still 11.4%, but it then experienced a sharp drop of more than 7 percentage points over the next five years, reaching 3.9% in 2003. However, from the end of 2003 until 2008, the saving rate fluctuated in a narrow range between 2.5% and 4%. It is difficult to explain such a nonlinear movement of the saving rate by the almost deterministic trend of population aging alone. In this paper, we argue that the distribution of aggregate income shocks across different age groups significantly changed during the period around the turn of the millennium. This structural change in the distribution of income shocks, as well as differences in the consumption response among different age groups, are key to understanding the nonlinear movement of Japan's household saving rate in the 1990s and 2000s.

The life cycle/permanent income hypothesis generally implies that the consumption response to an income shock will be less pronounced as an individual gets older and accumulates more physical wealth relative to human wealth. This means that the ratio of current consumption to current income, and hence the saving rate as well, will be more sensitive to income fluctuations as the individual grows older. Hence, the aggregate saving rate will be more unstable in the short-run and more sensitive to the business cycle as the aging of society progresses. In this paper, we argue that this short-run instability of the saving rate as a result of population aging has been further amplified in Japan in recent years, because older working households have become more exposed to income shocks. The prolonged economic stagnation known as the "lost decade" (Hayashi and Prescott 2002) , which soon

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should be called the "two lost decades" can be divided into two stages ? that before and that after the financial crisis in the late 1990s. During the initial stage, attempts by Japanese firms to cut labor costs was limited to reducing the new hiring of young workers. During the second stage after the banking crisis in 1997/98, however, Japanese firms started to make serious cuts among their existing labor force, so that the decline in labor income spread to older cohorts. How the resulting increase in short-run instability due to both the advance of population aging and this structural change helps to explain the nonlinear movement in Japan's household saving rate in recent years is addressed in the first part of this paper, using income and spending data for different age groups.

However, corporate restructuring after the banking crisis of 1997/98 had another consequence that affected household saving in Japan. Namely, as we will argue, there was a significant shift of income from labor to shareholders, which meant that the decline in household saving was largely offset by an increase in corporate saving during this period. As a result, aggregate private sector saving as a fraction of GDP remained mostly unchanged from the burst of the bubble at the beginning of 1990s to the start of the recovery in the middle of 2000s.

The remainder of this paper is organized as follows. Section 2 considers the aggregate data on output, household income, and consumption in the System of National Accounts (SNA) statistics and uses these to highlight the problems that we investigate. Section 3 examines the income, consumption, and saving of different age groups. The analysis shows that the decline in income after the 1997 financial crisis is concentrated among older working households and that this resulted in a decline in the saving rate of this group, which is likely to have contributed to the acceleration of the decline in the household saving rate in the new millennium. Section 4 then discusses the decline in labor income. We emphasize two changes in income distribution underlying this decline: a shift in income from older to younger households, and one from labor to shareholders. Section 5 concludes.

2   Output, Income, and Consumption in the GDP Data

In this section, we examine the aggregate data to highlight the problems we are considering in this paper and to provide a preview of the discussion in the following sections. Table 1 provides the growth rates of real output, income, and consumption expenditure from the GDP statistics. We split

the 16-year period we consider into two sub-periods, the period before and the period after 1997/98, because there was a series of banking panics in the second half of 1997 and early 1998, which created enormous uncertainty for households and set the stage for the prolonged stagnation of the Japanese economy from 1998. [1] We use the sub-periods of before and after 1997/98 throughout the analyses in the remainder of this paper.

[Insert Table 1 here]

As observed in Figure 1, there was a small hike in the saving rate in 1998 and a rapid decline from 1999 onward. One interpretation of this hike is that households decreased their consumption because they anticipated the future decline in income that the financial crisis was going to cause, as implied by the permanent income hypothesis. Another, perhaps more common, interpretation is that the 1998 increase is a temporary increase in precautionary saving, a rational response by households to the uncertainty and anxiety created by the financial crisis in late 1997 (Doi 2001; Murata 2003).

The numbers reported in Table 1 highlight several interesting points. In 1991–97, household income and GDP exhibited similar growth rates, while consumption grew a little faster than these two. At the same time, whereas the average GDP growth rate declined by only 0.6 percentage points in the sub-period after 1997/98, the drop in household disposable income growth was considerably more pronounced (1.4 percentage points). Consumption growth was also lower in the second sub-period, although the difference between the two sub-periods is smaller than in the case of income growth.

These observations lead to the following hypotheses. First, the fact that the growth of household income significantly slowed from the first sub-period to the second suggests that there were significant labor adjustments after the financial crisis of 1997/98, implying that Japanese firms had been holding on to excess workers in the early stage of the "lost decade". Second, during the second sub-period, consumption was weak, but the saving rate nevertheless declined. At first sight, this may appear contradictory. The main reason why consumption was weak is that household income was growing at a slower rate than output, as pointed out by Horioka (2006). Therefore, the size of the income 'pie' available for Japanese households out of total output was decreasing. At the same time, though, consumption growth was higher than

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[1] For the first time in postwar Japanese economic history, there was a failure of major financial institutions, Yamaichi Securities and Hokkaido Takushoku Bank, in November 1997. See Hoshi and Kashyap (2001, Chapter 8; 2005) for details on the banking panics in Japan in the late 1990s.

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income growth, meaning that households were consuming an increasingly larger fraction of the pie in the second sub-period. In other words, if the household saving rate had not decreased so sharply, consumption growth would have been even weaker and output growth much lower in the first half of the 2000s.

3   The Effect of Aging on the Short-run Behavior of the Saving Rate

The discussion of the aggregate data in the previous section suggests that there are two questions to be addressed in attempting to understand the sharp drop in the saving rate in the late 1990s and early 2000s. The first puzzle is why consumption growth did not decline as much as household income growth in this period. Population aging explains why Japan's household saving rate is declining in the long-run. However, since aging follows a very monotonic trend, it is difficult to explain why the decline in the saving rate suddenly accelerated in the late 1990s and then stopped around 2003 and 2004. The second question is why household income growth was much lower than GDP growth during this period. In this section, we mainly focus on the first question and argue that explanations based on the conventional life cycle model can provide a satisfactory answer.

3.1   The Effect of Aging on the Stability of the Saving Rate and on Its Sensitivity to Income Shocks

In the life cycle model, consumers do not increase consumption if he (or she) considers a current increase in income to be a temporary shock. Consequently, given a positive income shock, the ratio of consumption relative to income, that is, the average propensity to consume, typically decreases and hence the saving rate increases. Moreover, the model explicitly considers the decumulation of human wealth and the accumulation of physical wealth over the life cycle, which enables us to consider the relationship between the age of the hypothetical consumer and short-run movements in his saving rate.

As the consumer ages, the share of human wealth — the present value of the future labor income stream — in his total wealth becomes smaller. Since existing empirical studies suggest that income shocks are more or less persistent, the consumer's current income will be more correlated with his human wealth than with his physical wealth, such as financial and real estate assets. Since consumption is a function of total wealth and the fraction

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of human wealth in total wealth decreases with age, this implies that consumption becomes less dependent on current income, so that the saving rate will be more unstable as the consumer ages. Furthermore, if the precautionary saving motive is important and/or liquidity constraints are binding for the consumer, his consumption will be more closely tied to movements in current income in earlier stages of his life by limiting his ability to borrow to finance current consumption (Carroll 1997, 2001; Hubbard, Skinner, and Zeldes 1995).

Our conjecture in this paper is that the household saving rate becomes less stable and more strongly correlated with household income as the proportion of older households increases. Another conjecture, which is almost identical to the first one, is that the aggregate saving rate will be less stable and procyclical if aggregate income shocks are more concentrated among older households. The remainder of this subsection provides a more detailed explanation of these conjectures.

Let us start with the basic forward-looking consumption function taken from standard macroeconomics textbooks (e.g., Blanchard 2008; Romer 1996):

$$C_t = C(TW_t) = C(A_t + H_t) \tag{1}$$

$$H_t \equiv E_t \sum_{s=1}^{T} \left(\frac{1}{1 + i_{t+s}} \right)^s Y_{t+s}, \tag{2}$$

where TW_t is a consumer's total wealth. The second equality in (1) means that total wealth is the sum of physical nonhuman wealth A_t and human wealth H_t, where A_t typically consists of financial and housing wealth. Equation (2) defines human wealth H_t as the expected present value of the future labor income stream at time t.

Empirically, C_t, A_t, and Y_t are observable at the household level, but H_t is not. However, we know that aggregate Y_t is a highly persistent time series. [2] Hence, we may approximate human wealth H_t by a linear function of current income Y_t, as in Laibson (2000) and Lettau and Ludvigson (2001, 2004).[3] Because of the persistence of Y_t, other things being equal, the correlation of current income with human wealth, $\text{Corr}(Y_t, H_t)$ should be much

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[2] For a summary of the empirical literature on persistence in aggregate income data, see chapter 4 of Deaton (1992). However, the microeconomic evidence seems to be far from conclusive. For example, in line with earlier studies, Meghir and Pistaferri (2004) found that household earnings are best described as being driven by permanent income shocks and serially correlated transitory shocks. Guvenen (2007), on the other hand, questions if labor income shocks are really very persistent.

[3] If we assume a constant growth rate of income g and a constant discount rate i, we obtain the approximation formula $H_t \simeq Y_t/(i - g)$. Laibson (2000) used this equation, carefully choosing the parameter values for i and g. Lettau and Ludvigson (2001), on the

higher than the correlation of current income with current financial wealth, $\text{Corr}(Y_t, A_t)$.

Next, let us consider how physical wealth and human wealth evolve over the life cycle. A young consumer that has just commenced working typically has very little financial/housing wealth A_t, but has a lot of human wealth H_t. During his working years, the consumer exchanges his human wealth for consumption in each period and new additions to physical wealth (Carroll and Samwick 1997; Hubbard, Skinner, and Zeldes 1995). Because Y_t and H_t are more strongly correlated with each other than are Y_t and A_t, we expect that unobservable TW_t becomes less correlated with current income Y_t as the consumer ages. As consumption is a function of the consumer's total wealth, this implies that the correlation between Y_t and $C_t = C(A_t + H_t)$ will be weaker as the consumer ages. In other words, the consumption of older households is relatively more independent of labor income fluctuations than is the consumption of younger households.

If consumers engage in precautionary saving and/or face liquidity constraints, this relationship will be much stronger. Precautionary saving models imply that labor income uncertainty prevents young consumers from borrowing because of uncertainty with respect to their future labor income. As a result, consumption and income move closely together while a consumer is at an early stage of life. Based on simulation studies using parameters matched to US household data, Carroll (1997, 2001) argues that consumers only start to behave as suggested by the certainty-equivalent model of life cycle consumption (Hall 1978) after they reach the age of 50.

Our explanation for recent movements in Japan's saving rate is a straightforward application of the discussion above. Let us recall the definition of the household saving rate:

$$s_t = 1 - \frac{C_t}{Y_t} = 1 - \frac{C(A_t + H_t)}{Y_t}.$$

As the population ages, the ratio of aggregate consumption to income, C_t/Y_t, naturally increases so that s_t decreases. However, aging will also make aggregate consumption less responsive to income shocks. Thus, the ratio of aggregate consumption to income, and hence the aggregate household saving rate, will be more volatile. Therefore, as the aging of the population progresses, the household saving rate s_t becomes more unstable and more strongly correlated with aggregate labor income, as stated in our first conjecture. Although the deterministic effect of aging on the saving rate has received much attention in recent studies on Japan's saving rate, aging also

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other hand, simply modeled the log of human wealth as a linear function of the log of current labor income.

has a significant effect on the short-run stochastic behavior of the household saving rate. Based on the same logic, the saving rate will be more sensitive to aggregate income shocks if these become more concentrated among the older sections of society, as suggested in our second conjecture.

3.2 Analysis of the Aggregate Data

First, we examine the aggregate data to see if our conjectures fit the data. Before getting into the details, two issues should be noted about the empirical analyses in this subsection. The first is that instead of examining the saving rate, we focus on consumption growth and the (log of the) consumption-income ratio. The reason is that these variables correspond more directly to our theoretical discussion in Section 3.1. While the household saving rate has received much attention in recent policy discussions in Japan, the main focus of academic research has been on consumption growth or consumption relative to income and/or wealth, especially when researchers are interested in the short-run dynamics of consumption. Hence, we examine whether the consumption–income ratio became more unstable and more sensitive to income shocks after the banking panic of 1997/98. The second issue to note is that our conjectures suggest that population aging will cause an upward shift of the time trend in the consumption-income ratio and, at the same time, increase the short-run volatility of the ratio. Empirically distinguishing these two effects in a sample period as short as the one considered in this paper is rather difficult. The empirical evidence in the following discussion therefore should be considered with caution.

In Table 2, we examine whether the log of the consumption–income ratio, $c_t - y_t$, became more volatile after the financial crisis in the late 1990s, dividing the periods at the end of the third quarter of 1997. The results in Table 2 show that the estimated coefficients on the lagged consumption–income ratio are larger in the sub-period after the banking panic, presented in columns (4) and (5), than in the sub-period prior to the banking panic, presented in columns (1), (2), and (3). This confirms the first part of our conjecture that the consumption–income ratio has become more volatile in the sense that it became more dependent on its own lagged value, so that any shocks to the consumption–income ratio tend to have more persistent effects than before. Comparing columns (3) and (5), which include current income growth among the explanatory variables, confirms that the estimated coefficient on Δy_t is larger in absolute value for the more recent sub-period and that the difference is statistically significant. Hence, we also find clear evidence for the increased sensitivity of $c_t - y_t$ to income shocks.

[Insert Table 2 here]

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To look at the same problem from a slightly different perspective, we next consider the simple aggregate consumption function. The theoretical discussion in Section 3.1 suggests that the correlation between current income and total wealth will be smaller and the precautionary saving motive and liquidity constraints weaker as the aging of the population progresses. This implies that the life-cycle/permanent income hypothesis à la Hall (1978) will become more applicable to aggregate consumption behavior. Hence, we would expect that consumption will be closer to a random walk and the effect of labor income shocks will be less pronounced in the more recent sub-period.

In Table 3, we estimate the aggregate consumption function with an error-correction term. We first calculate the error-correction term cay_t by obtaining the residuals from regressing consumption on contemporaneous income and financial wealth. In the second step, current consumption growth is regressed on current income and financial growth, lagged consumption, and lagged cay. The idea is that including the cay variable here can be considered as an extension of Cochrane (1994), who estimated a VAR system consisting of consumption and GDP with the lagged consumption-GDP ratio. The cay variable directly corresponds to the consumption-wealth ratio proposed by Lettau and Ludvigson, which they used in their consumption-based asset pricing model (Lettau and Ludvigson 2001) and in their study on the wealth effect in the consumption function (Lettau and Ludvigson 2004).[4]

[Insert Table 3 here]

Comparing the results for the two sub-periods, we find that these are mostly consistent with our hypothesis. That is, while Δy_t has a clear positive effect on Δc_t in the earlier sub-period, the effect disappears after the banking panic. The adjusted R^2 is also much lower for the regression for the later period. Moreover, the error-correction term cay_{t-1} has explanatory power only in the earlier sub-period and has the expected sign. There are two possible interpretations of the results for cay_{t-1}. First, because of the way the variable is constructed, cay_t will be strongly affected by, and will move closely with, the log of the consumption-income ratio. Since, as seen in Table 2, $c_t - y_t$ became relatively unstable after the banking crisis, it is likely that cay_t also became more volatile, so that it contains more noise as an explanatory variable in the later sub-period. Second, the

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[4]To keep the sample length as long as possible, we use a simpler calculation of the cay variable in this paper than Lettau and Ludvigson in their original studies on the United States and Aono and Iwaisako (2008) on Japan.

life-cycle/permanent income hypothesis suggests that consumption is an exogenous variable in the cointegration relationship, because consumption responds only to permanent income shocks, so that it is mostly income that will adjust toward its long-run relationship with consumption. Hence, unlike in the result for the earlier sub-period in Table 3, the lagged cay_t will predict current y_t, but will not predict c_t. If we were able to confirm the second interpretation, this would provide strong support for our conjecture that the life-cycle/permanent income hypothesis à la Hall (1978) became more applicable to aggregate consumption behavior in the later sub-period. However, the results in Table 2 do not allow us to distinguish which of the two interpretations is correct.

Next, let us describe the fluctuations in consumption around its long-run equilibrium with income, using the estimated error-correction model. Let ac_t be the residual series from the full sample consumption function estimate in Table 3 and cac_t be the accumulated ac_t series, starting from the first quarter of 1991:

$$ac_t \equiv \Delta c_t - \widehat{\Delta c_t} \qquad cac_t \equiv \sum_{j=1991:Q1}^{t} ac_j.$$

Figure 2 plots the cac_t series together with the annualized real GDP growth rate. The figure suggests that consumptions shocks through the 1990s were generally positive. Moreover, during this period, cac_t tended to increase when GDP growth was low. This suggests that even after controlling for current income and wealth shocks, consumption remained strong during periods of negative GDP growth. cac_t also increased during the recession of 2001-2002, but the response is much smaller than during the 1990s. And after 2002, this relationship disappears. In fact, cac_t turns negative and monotonically declines. This timing is consistent with the deceleration in the decline in the saving rate from 2003 onward shown in Figure 1. The analysis thus suggests that the economic mechanisms that generated the large decline in the household saving rate around the turn of the millennium appear to have disappeared by around 2003.

[Insert Figure 2 here]

3.3   Analysis of the Age Group Data

Next, we examine microeconomic data to assess how important the increased saving rate instability is in explaining the decline in the household saving rate at the aggregate level in addition to the pure demographic effect. For

this purpose, we use age group data on income and consumption from the Family Income and Expenditure Survey (FIES). Panel A of Figure 3 shows two saving rates from FIES data, "FIES: employed only" and "FIES: all households," as well as the saving rate in GDP data. "FIES: employed only" is the saving rate of employed households, which excludes the unemployed, retired, and self-employed. Most previous analyses examining Japan's household saving rate using the FIES data focused on this saving rate series because it has the longest history. The "FIES: employed only" saving rate has been consistently higher than the aggregate saving rate in the GDP data. It started to decline mildly in the late 1990s, while the saving rate in the GDP data has already been decreasing since the early 1980s. So the difference between two saving rates has kept increasing since the early 1980s. This discrepancy between the saving rates in the GDP statistics and the FIES is well known and has been examined in previous studies such as those by Ueda and Ohno (1993) and Iwamoto et.al., (1995a, 1995b).

[Insert Figure 3 here]

Hence, before starting our actual analysis, we need to make adjustments to the FIES data so that the saving rate becomes more consistent with that in the GDP data. We basically adopt the adjustments suggested by Unayama (2008), who shows that the two saving rates are reasonably close to each other after making the appropriate changes utilizing detailed data and making some simplifying assumptions. However, while Unayama makes changes to the definitions of the saving rate in both the FIES data and the GDP data, we leave the GDP data series unchanged since the movement in the saving rate in the GDP data is something we want to explain in this paper. Consequently, we only adopt Unayama's adjustments to the definition of the saving rate in the FIES data. Among such adjustments to the FIES data he proposes, the quantitatively most important one is the inclusion of data on non-employed households, which include both self-employed and unemployed households, and of households with household heads aged 60 and over. Although these adjustments due to data availability limit the sample to the period from the second half of the 1980s onward, this is an acceptable trade-off for us, since we are interested in the behavior of the household saving rate since the 1990s. Other adjustments of the FIES data Unayama proposed have a much smaller impact on the saving rate values and are arguably based on bold assumptions. We therefore did not incorporate these adjustments.

The saving rate calculated in this way is shown as "FIES: all households" in Panel A of Figure 3.[5] This saving rate is lower than the more commonly

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[5]The original FIES data set provides the average income and consumption expenditure per household for five-year age groups from 25 to 65. Households with a head under the age

used "employed only" saving rate. Moreover, like the saving rate for the "employed only," that for "FIES: all households" declined after 1999, but did so much more clearly. Furthermore, as shown in Table 4, the saving rate for "FIES: all households" saving rate decreased from 24.4% in 1997 to 16.0% in 2008 (Table 4, iii), a drop of 8.4 percentage points. The magnitude thus is comparable to the 8.0 percentage-point decline in the aggregate saving rate in the GDP data from 10.3% to 2.3% (Table 4, i). On the other hand, the saving rate for "FIES: employed households only" declined only by 2.6 percentage points in the same period (Table 4, ii).

[Insert Table 4 here]

Next, Panel B of Figure 3 shows the demographic trend for the households in "FIES: all households" data. The smooth aging trend shown Panel B stands in stark contrast to the rather large swings in the saving rate in Panel A. The demographic trend is obvious: the percentage of households with a head aged 60 and over doubled in the period from 1986 to 2008, growing from a little less than 20% to more than 40%. However, this trend is monotonic and very smooth. Hence, it is difficult to see how the demographic change alone could have generated the large fluctuations in the saving rate for "FIES: all households." In fact, if we take the relationship between age and saving rates from the 1997 data and use this to calculate what the saving rate should have been in 2008 based on the demographic data for that year, we arrive at a saving rate of 21.9%, a decline of 2.5 percentage points, leaving the remaining 5.9 percentage point decline in the actual saving rate unexplained. This suggests that the dominant force underlying the fluctuations and decline in the in the aggregate saving rate from the late 1990s to the first of the 2000s is changes in the saving rates of individual age groups.

Note that Panel B, Figure 3 reveals an important limitation of FIES data. The "non-employed" households under age 60, shown at the bottom of the bar graph, constitute about 2% in 1986 and 1.5% in 2008 of the corresponding year's "FIES: all households" sample. On the other hand, the data in the recent Labour Force Survey suggest that the fractions of the "employed" households is about 85% and pure "business owner" is about 10% of the Japanese labor force. As we wrote above, the "non-employed" in FIES data includes the group whose household heads are "unemployed" and

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of 25 are pooled into one group, as are households with a head over the age of 65. These age groups are further broken down to into "employed" and "non-employed" groups. The latter groups includes both the "unemployed" and the "self-employed." We multiply the age group data by the number of observations to obtain aggregate income and consumption data, from which we calculate the aggregate saving rate for "FIES: all households."

"retired (not in labor force)", as well as self-employed. Hence, self-employed and/or business owners in FIES data are seriously underrepresented.

Figure 4 presents the saving rate behaviors of the 5-year age groups from which we calculated the saving rate for "FIES: all households." In Panel A, the saving rates of the groups aged 30–34, 35–39, and 40–44 are shown. Despite the decline of the aggregate saving rate in FIES data, the saving rates of these age groups have generally increased during our observation period. This monotonic upward trend implies that the saving rates of other age groups must have declined more sharply than the aggregate saving rate. Since the saving rates of these three age groups behave in a relatively similar fashion, we merged them into one group, which we use as the benchmark in the following discussion.

[Insert Figure 4 here]

Panel B plots the youngest group, those under the age of 30, against the average of the benchmark group of those aged 30-44. As the population of this age group is relatively small, the saving rate exhibits significant ups and downs. However, the global peak for the saving rate of those under 30 was in 1998 and their saving rate has declined by about 10 percentage points since then.

Next, Panel C shows the saving rates for the three older groups of working age, i.e., those aged 45-49, 50-54, and 55-59. The saving rates of these age groups had increased throughout the 1980s and peaked sometime between 1994 and 1999. After bottoming out in 2004-2005, the saving rates picked up again in 2005–2008. This time-variation in the saving rate is most pronounced for oldest group of those aged 55-59. These findings are consistent with our conjecture in Section 3.1 that the saving rate becomes more unstable as household gets older.

Panel D plots the average saving rate of the non-employed households under the age of 60. The fact that the saving rate is consistently negative and sharply declining after 1997/98 suggests that the majority of those in this group are unemployed rather than self-employed. The decline of the saving rate also suggests that there was a sharp increase in unemployed households from the late 1990s. However, as seen in Panel B of Figure 3, the population of this group is very small, so that the recent increase in unemployment among those under the age of 60 plays a marginal role in explaining the change in the saving rate in the FIES data.

Finally, Panel E shows the saving rate for households aged 60 and over, both for employed and non-employed households. The saving rates of this

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age group also started to decline after 1997/98. The substantial drop in the saving rate by nearly 20 percentage points from 1997 to 2008, combined with the large increase in the population of this age group shown in Panel B of Figure 3, suggest that this age group is quantitatively important in explaining the sharp decline in the aggregate saving rate. To illustrate this point, we construct a hypothetical age-saving rate profile by combining the age group saving rates in 1997 for households under 60 and the saving rate in 2008 for those 60 and over. We then calculate the aggregate saving rate by weighting this age-saving rate profile with the 2008 demographic data. The resulting saving rate is 18.0%, so that the decline is 6.4 percentage points (Table 4, iii-B). This is much larger than the 2.5 percentage-point decline when we use the 1997 saving rate for all age groups (Table 4, iii-A).

We have to be careful in interpreting the saving rate decline for the 60 and over age group. It is possible that part of the saving rate decline among this age group was caused by the progress in aging within the age group. If we assume the entire saving rate decline for this age group is explained by aging, then 6.4 percentage points out of the total 8.4 percentage-point decline in the aggregate saving rate is attributable to the pure aging effect. However, as we argued in the discussion of the aggregate data, if the demographic factor was the dominant force behind the decline in the saving rate, this decline should be smooth and monotonic. However, as Panel E of Figure 4 shows, the saving rate of those 60 and over increased until 1992-93 and then started to decrease in the late 1990s after the financial crisis of 1997/98. Such significant nonlinearity suggests that the aging effect played a relatively limited role in the decline in the saving rate of those aged 60 and over.

To examine the mechanism behind the fluctuations in the age group saving rates, we plot the income and consumption expenditure of each age group in Figure 5.[6] The notable common feature for all age groups is a plateau in the income trend during the mid-1990s, with increases in disposable income coming to a halt as early as 1992/93. This implies that household income in the FIES data has actually been declining since the late 1990s. On the other hand, as shown in Table 1, in the GDP data for the same period, income was still increasing, although at a considerably slower rate. Therefore, despite the adjustments we made, important discrepancies remain between the aggregate data (GDP statistics) and the micro survey data (FIES).

[Insert Figure 5 here]

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[6]Some economists have provided similar analyses to those presented in Figure 5, emphasizing the increase in income inequality and the dispersion in saving rates (see, e.g., Sadahiro 2005).

However, the timing of the beginning of the decline in the FIES household income and the substantial slowdown in the substantial slowdown in income growth in the GDP data is almost the same. Even though Japan's "lost decade" started around 1993/94, the decline/growth slowdown in household income did not commence until the late 1990s or early 2000s, i.e., after the 1997/98 financial crisis. Another notable feature is the parallel movements of consumption and income for the younger age groups, that is, up to and including the 50–54 age group. For the age groups 55-59 and 60 and over, and the non-employed under 60, the fluctuations in consumption are relatively limited compared with the fluctuations in income. This relationship between age and consumption/income is consistent with the predictions of, and empirical evidence in, the precautionary saving literature (e.g., Carroll and Summers 1991; and Carroll 2001). Overall, the graphs in Figure 5 suggest that the saving rate decline among older households and among non-employed households since the late 1990s is mostly explained by the decline in the income of such income, perhaps through a combination of a decline in labor income, lower returns on their financial wealth, and a decrease of pension benefits. However, the nonlinear movement of income and the fact that the start of the decline coincides with the financial crisis in the late 1990s again suggest that demographic trends cannot be the major reason for the sharp decline in the income of older households.

In Table 5, we statistically examine our observations regarding the graphs in Figure 5, concentrating on the periods before and after the financial crisis. We find the following. First, while the rate of income growth slowed down significantly and actually turned negative for all age groups during the post-1998 period, the decline in income growth is more pronounced for the older age groups, that is, those aged 50–54 (from 1.75% to -0.95%, i.e., minus 2.7 percentage points), those aged 55–59 (from 1.75% to -1.53%, i.e., minus 3.3 percentage points), and those aged 60 and over (from 0.68% to -1.75%, i.e., minus 2.4 percentage points for the employed and 0.66% to -1.24%, i.e., minus 1.9 percentage points for the non-employed). On the other hand, the average income of those aged 30–44 declined only by 1.7 percentage points, from 0.82% to -0.83%. Second, the standard deviation for the growth rate of income is lower for younger age groups, which are more likely to have stable jobs. The standard deviation of Δy is minimum for the age group between 30 and 44, at 1.4 percentage points. For age groups between 45 and 54, the standard deviation of Δy is about 2.5 percentage points. On the other hand, the standard deviations for the youngest age group (those under 30), the 55-59 age group, and the employed aged 60 and over are above 3 percentage points. These two observations indicate the income shock after the financial crisis of 1997/98 was concentrated mainly among older households. Third, the correlation between income growth and the consumption–income ratio (C/Y) is negative for the youngest group and

the age groups over 50.

[Insert Table 5 here]

In summary, the microeconomic evidence in this subsection suggest that the changes in the saving rates of individual age groups are the dominant factor in explaining the nonlinear movement of the aggregate saving rate in recent years. This result is similar to the point made by Bosworth et.al. (1991) regarding the decline in the U.S. household saving rate in the 1980s. These results provide support for our conjectures stated in Section 3.1. As the first conjecture suggests, the correlation between income and consumption is lower for older households in the FIES data. Thus, the advance in population aging will make aggregate consumption and saving less responsive, so that the saving rate will be more responsive to aggregate income shocks. At the same time, the decline in income after the banking panic of 1997/98 was more pronounced for older households. This implies that part of the aggregate saving decline from the late 1990s to the early 2000s can be explain by the mechanism suggested by our second conjecture that the decline in the aggregate saving rate will be larger when an adverse income shock is concentrated among older sections of society.

The remaining question is why the banking panic in the late 1990s seems to prompted a significant slowdown in household income growth (or actually income "decline" in FIES data). This will be the subject of our analysis in the next section.

4   Understanding the Household Income Decline in the New Millennium

In this section, we examine the second question posited at the beginning of Section 3 and explore why growth rate of household income was much lower than GDP growth in the late 1990s and early 2000s.

4.1   Substitution between Household and Corporate Saving

National income identities imply that the current account surplus CA must be equal to the sum of the fiscal surplus $(T - G)$ and the saving-investment balance of the private sector $(S - I)$. Let us consider the behavior of these variables in Japan one by one. Figure 6 shows the budget balance of the general government and the current account from 1980 to 2008. Since the

fiscal expansion by the Obuchi administration in the late 1990s in response to the recession triggered by the banking panic in 1997/98, the Japanese government has been running large budget deficits. Hence, $(T - G)$ has been negative. On the other hand, Japan's current account has continued recording a surplus since the early 1980s, i.e., for nearly thirty years. In particular, from 1996 until mid-2007, Japan's current account surplus was on a mild upward trend. The persistent and increasing current account surplus, coupled with large government deficits, implies that the private sector saving-investment balance must have been positive and large during this period.

[Insert Figure 6]

However, as we saw earlier, the household saving rate declined very sharply in the late 1990s and early 2000s. This means that for the current account surplus to increase in the face of large fiscal deficits, either investment must have declined more dramatically than household saving, or that corporate saving must have increased. Since no significant decline in private sector investment can be observed, only one explanation remains: corporate saving must have increased, thereby offsetting the decline in household saving.[7] Figure 7 confirms that this is exactly what happened. Household saving and corporate saving started to move in opposite directions, with household saving moving downward and corporate saving moving upward, as early as 1992. These trends accelerated around the turn of the millennium, but have more or less subsided since around 2004. The apparent substitution between household saving and corporate saving during this period provides evidence of a significant shift in the distribution of income from labor to shareholders.[8]

[Insert Figure 7]

Figure 8 provides more evidence on the redistribution of income, showing that the wage share in the Japanese economy peaked around 1998-2001 and subsequently declined. Other measures of the wage share in Japan, such as by the Japan Institute for Labor Policy and Training (2008), exhibit a similar hump-shaped pattern. This pattern is consistent with the argument

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[7]This apparent substitution between corporate and household saving in Japan seen in recent data has been highlighted in a previous paper by the authors (Iwaisako and Okada 2008) and by Matsubayashi (2008).

[8]This shift in saving corresponds to the phenomenon highlighted by Saito (2007) of a substation between household consumption and corporate investment."

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in the preceding sections that the adjustment of employment was delayed during the initial phase of the "lost decade" and that real wages had become too high. From the late 1990s, Japanese corporations increased their saving by drastically cutting labor costs, as shown in Figures 7 and 8. These developments explain why, despite the decline in the saving rate due to the sharp decline in household income, the corporate sector recovered as restructuring progressed, so that GDP growth was relatively strong in the first half of the 2000s.

[Insert Figure 8]

When the restructuring of Japanese corporations finally picked up in the late 1990s and early 2000s, a significant change in the income distribution occurred among stakeholders: labor income declined, whereas shareholder income increased. Combined with the fact that the aging of the population made household consumption relatively insensitive to income shocks, this explains why Japanese household saving fell so rapidly in the early 2000s. Another aspect of the change in the income distribution at this time is that older workers in their late 50s and 60s bore the brunt of the labor adjustment. This development, which corresponds to our second conjecture in Section 3, is another important reason why aggregate household saving declined in the early 2000s and then stopped declining when the economy started to recover. In sum, incorporating changes in the income distribution into the analysis is important in gaining a better understanding of the consumption/saving and macroeconomic dynamics in Japan over the last 20 years.

4.2   Household, Private, and National Saving

The economic interpretation of the recent increase in corporate saving requires a careful discussion of the assumptions underlying any such interpretation.[9] From an extreme neoclassical viewpoint, assets on private corporations' balance sheets are ultimately held by households, so that corporate wealth and household wealth are different "purses" belonging to the same person. If we adopt this "corporate veil view," there was no significant decline in private sector saving throughout the 1990s and 2000s. Therefore, no explanation is required. In his discussion of the Japanese current account during this period, Matsubayashi (2008) argues that Japan does not need to worry about the decline in the household saving rate, that is, he implicitly subscribes to the "corporate veil view." There is some justification to this view since households' losses in labor income were partially offset by the

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[9]See Poterba (1987) for an economic interpretation of corporate saving in a more general context.

increase of stock prices if they were stockholders. However, given that even in developed economies, shareholding is concentrated among wealthy households, it is doubtful that corporate wealth and household wealth are perfect substitutes for a representative consumer/investor. Moreover, a certain proportion of Japanese stocks is held by foreign investors. In particular, in the case of Japanese corporations that undertook successful restructuring in recent years, this was often achieved by foreign restructuring funds or under the pressure from large foreign shareholders. Hence, a certain amount of the increased shareholder wealth created through such corporate restructuring must have flowed overseas.

A similar argument can be made with respect to the relationship between private sector and public sector saving. If we take the Ricardian equivalence theorem at face value, government saving and household saving are perfect substitutes. As in the case of corporate saving, we think that it is not realistic to assume that government wealth and private sector saving are perfect substitutes for households. However, recent studies employing dynamic general equilibrium models and focusing on the decline in productivity in explaining the recent drop in Japan's saving rate, such as Chen et al. (2006) and Braun et al. (2008), implicitly take this view by discussing national saving rather than household or private sector saving.

As discussed in the introduction, neoclassical analyses of Japan's saving rate will have a difficulties in explaining the nonlinear movement of saving rate around the turn of the millennium by almost deterministic trend of population aging. Recent studies mentioned above such as those by Chen et al. (2006) and Braun et al. (2008) may be able to accommodate such short-run dynamics by emphasizing the role of productivity shocks, though the actual data they consider end in the early 2000s, so that they do not include the halt in the decline in the saving rate after 2003/2004. However, they would still face problems in explaining the fact that the dominant force behind the aggregate saving rate decline in the late 1990s and the first few years of the 2000s is the changes in the saving rates of individual age groups, especially the saving rates of older households. If the decline in the aggregate saving rate is caused by a decline in productivity, the absolute amount saved by young households has to decrease. The reason is that the decline in productivity growth lowers their life-time earnings and possibly decreases their saving rate, too, by persistently lowering the interest rate (Summers 1981). Accordingly, the saving rate of young households should either decline or stay the same. However, as shown in Figure 4, younger households actually *increased* their saving over the past 20 years, so that the saving rate profile became more downward sloping with age in the cross-section data.[10]

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[10] At least in a steady-state analysis, such a cross-sectional pattern is inconsistent with a

The preceding considerations suggest that the recent dynamics of consumption and saving in Japan cannot be fully comprehended by adopting an extreme neoclassical viewpoint. Instead, it is important to pay attention to changes in the distribution of income, such as between labor and shareholders and among different age groups.

5   Conclusions

This paper examined why Japan's household saving rate fell so significantly in the late 1990s and early 2000s and then suddenly stopped declining around 2003/2004. It is clear that population aging underlies the long-term declining trend in the saving rate. However, an important side effect of this population aging is that the aggregate saving rate has become more unstable and more sensitive to income shocks, since the consumption of older households tends to be less sensitive to income shocks. Based on the analysis of income and spending data for different age groups, we argued that the combination of this side effect of population aging and the large decline in labor income in the recession prompted by the 1997/98 banking panic, explains the sudden acceleration in the decline of the saving rate in the approximately five-year span around the turn of the millennium.

Two important changes in income distribution in this period also contributed to the sudden decline in the saving rate. First, in the initial stages of the "lost decade," the decline in labor income was mostly borne by younger generations, who responded it by considerably decreasing their current consumption. As a result, the ratio of their current consumption to income, and hence their saving rate, remained relatively unchanged.

However, during the recession triggered by the banking panic in 1997/98, the decline in labor income started to also spread to older working households. Unlike young households, they reduced their saving rather than decreasing consumption in response to negative income shocks. This further accelerated the decline in the aggregate saving rate by causing a sharp decline in the saving rates of older working households. Second, there was a significant shift of income from labor to shareholders during the course of the corporate restructuring in the early 2000s. This explains why consumption growth slowed in this period even though the saving rate was declining at the same time. The findings in this paper have some general

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productivity-based explanation of the saving rate decline. It might be possible to generate consumption-saving dynamics at the cohort level resulting from a productivity shock that are consistent with the microeconomic evidence in this paper by considering the transition dynamics. Such an analysis, however, would inevitably be extremely complicated.

implications. First, because the saving rate has become unstable and more sensitive to business cycles in recent years, deterministic simulations based on a life cycle/overlapping generations model such as those widely used in policy research related to population aging result in a potential overfitting of the data. This means caution needs to be exercised when extrapolating trends observed in the late 1990s/early 2000s to simulate the future path of household consumption/saving decisions in Japan.

Second, the theoretical prediction that older working households do not change their consumption as much as younger households suggests that expansionary policies directly affecting household income, such as tax cuts or the distribution of coupons, will be less effective in an economy experiencing rapid population aging. Third, the fact that the wage share in Japan has fluctuated so much in recent years has important implications for various issues related to household consumption/saving decision. For example, the consumption-based asset pricing model perhaps provides a good approximation if the wage share is stable over time. However, if the wage share fluctuates over time, then unless all stocks are held by workers and all workers hold identical portfolios, the labor/shareholder distinction will matter for the pricing of financial assets. The model may have to be modified to incorporate a time-varying distribution of income between labor and stockholders. This argument is closely related to the stockholder/nonstockholder distinction in asset pricing and household portfolio choice models (Mankiw and Zeldes 1991; Vissing-Jorgensen 2002; Ameriks and Zeldes 2004; Lustig and Van Nieuwerburgh 2006; Aono and Iwaisako 2008, Iwaisako 2009a) and will add some important insights to such research.

A number of important issues have remained unexplored here and are left for future research. First, we did not investigate which Japanese firms increased their saving in the early 2000s and what they did with their increased saving — that is, whether they increased their asset holdings or wrote off nonperforming loans and/or lowered their level of outstanding debt. Another closely related question is whether the same firms/industries both increased their corporate saving and reduced employment simultaneously. Preliminary analysis by Iwaisako (2009b) suggests that the increase in corporate saving is concentrated in the non-manufacturing sector, while the reduction of employment is concentrated in the manufacturing sector. However, a more thorough analysis of the details of the processes of recent restructuring efforts by Japanese firms based on microeconomic data is needed. Second, it is widely speculated that the increase in inequality observed since the beginning of the "lost decade" is also affecting the aggregate saving rate. Thus, examining the effect of heterogeneous income shocks within the same cohort remains another important task for the future.

Although we suggested that previous studies based on deterministic sim-

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ulations potentially exaggerate the long-run effect of population aging on the household saving rate, we intentionally couched the discussion in this paper within the framework of the life cycle model to focus on our main arguments.[11] However, the microeconomic evidence based on the FIES data presented in Section 3.3 suggests that the dominant force behind the decline in the aggregate saving rate in the late 1990s/early 2000s is changes in the saving rates of individual age groups, not the demographic change. This result is analogous to what Bosworth et.al. (1991) pointed out in their analysis of the decline of the saving rate in the United States. While the analyses in this paper provides important insights for a better understanding of recent movements in Japan's saving rate, it is probably necessary to explore explanations beyond the conventional life cycle model to fully comprehend the dynamics of households' consumption/saving decisions. Carroll et.al. (2000), for example, introduced habit formation in a growth model to explain the growth-saving causality found in recent empirical studies. Incorporating unconventional and/or behavioral elements into the empirical analysis of household consumption/saving decisions is an important direction for future research.

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[11] We are grateful to Chris Carroll for alerting us to the point made here.

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Table 1
Growth of GDP, household income, and consumption before and after the banking panic

Average growth rates of real GDP (ΔGDP), disposable income (Δy), and total consumption expenditure (Δc) of the household sector in the 16-year period before and after the banking panic of 1997/98. Total consumption expenditure is consists of the expenditures on "nondurables and services" (nondurables), "durable goods" (durables) and "semi durable goods (not reported)." The data source is the SNA statistics on the Japanese Government (Cabinet Office) web site: http://www.esri.cao.go.jp/en/sna/menu.html.

	1991–1997	1998–2006
ΔGDP	1.8(%)	1.2
Δy	1.7	0.3
Δc (total)	2.0	1.1
Δc(nondurables)	1.9	0.9
Δc(durables)	4.6	4.8
$\Delta GDP - \Delta y$	0.1	0.9
$\Delta GDP - \Delta c$	−0.2	0.1
$\Delta y - \Delta c$	−0.3	−0.8

Table 2
Stability of the aggregate consumption–income ratio

Log consumption–income ratio is regressed on its own lagged value, log current income growth, and dummy variables.

$$c_t - y_t = \alpha + \beta_1(c_{t-1} - y_{t-1}) + \beta_2 \Delta y_t + \beta_3 \cdot D90$$

where y_t is adjusted household disposable income (chosei kashobun shotoku) and c_t is household expenditure on nondurables and services, excluding shoes and clothing, from the GDP statistics. Both variables are in natural log. See the note for Table 1 for details on the data source. The sub-period "**Before crisis**" comprises 1980:Q4–1997:Q3 (71 observations), while the sub-period "**After crisis**" comprises 1997:Q4–2007:Q4 (41 observations). All regressions for the first sub-period include a dummy for 1997:Q1 to capture the effect of the consumption hike in April 1997. $D90$ is a dummy variable used for the first sub-period which takes zero until 1989:Q4 and one for 1990:Q1–1997:Q3.

	Before crisis			After crisis	
	(1)	(2)	(3)	(4)	(5)
$c_{t-1} - y_{t-1}$	0.520**	0.311**	0.658**	0.891**	0.974**
	[0.058]	[0.093]	[0.044]	[0.074]	[0.027]
Δy_t			−0.907**		−1.004**
			[0.081]		[0.033]
$D90$		−0.018**	−0.012**		
		[0.027]	[0.003]		
$constant$	−0.195**	−0.271**	−0.126**	−0.043	−0.007
	[0.023]	[0.036]	[0.017]	[0.029]	[0.011]
R^2	0.38	0.50	0.81	0.76	0.96
$Adj.R^2$	0.37	0.48	0.8	0.76	0.96

Table 3
**Consumption function with error-correction term before and
after the banking crisis of 1997/98**

In the first step, consumption c_t is regressed on contemporaneous income y_t
and financial wealth a_t to obtain cay_t, i.e., the deviations from the long-run
equilibrium, used as an error-correction term In the second step. In the
second step, then regressed on current growth rates of income and financial
wealth, and current consumption growth is regressed on current income and
financial growth, and cay_t. The actual regression also includes the lagged
growth rates of income and financial wealth and is estimated for the two
sub-periods (split at the third and fourth quarter of 1997). The source for
the consumption and income data is the same as in Tables 1 and 2, but
y_t here is adjusted household disposable income (chosei kashobun shotoku)
excluding financial income. a_t is the household net financial wealth in the
Bank of Japan flow of funds data. All variables are seasonally adjusted real
variables deflated using the GDP deflator and in natural log.

Panel A: Cointegration regression

$$c_t = \underset{[0.361]}{3.447} + \underset{[0.080]}{0.350}y_t + \underset{[0.040]}{0.250}a_t \qquad \text{adj}R^2 = 0.992$$

Quarterly data from 1980 to 2007. In parentheses under the estimated
coefficients are Newey-West standard errors with three lags.

Table 3 (continued)

Panel B: Consumption function with error-correction term

$$\Delta c_t = \beta_0 + \beta_1 \Delta y_t + \Delta \beta_2 a_t + \beta_3 cay_{t-1}$$

where $cay_t \equiv c_t - \widehat{c}_t$ and $\widehat{c}_t$ is the fitted value from the cointegration regression reported in Panel A.

	Whole period	**Before crisis**	**After crisis**
	1981:Q1-2007:Q4	1981:Q1-1997:Q3	1997:Q4-2007:Q4
Δy_t	0.1434*	0.1325*	−0.0217
	[0.0562]	[0.0675]	[0.0367]
Δy_{t-1}	0.1098*	0.1049	−0.1033
	[0.0502]	[0.0706]	[0.0609]
Δa_t	0.0120	−0.1001	0.0174
	[0.0585]	[0.0911]	[0.0443]
Δa_{t-1}	0.1243**	−0.0100	0.1321
	[0.0469]	[0.0620]	[0.0760]
Δa_{t-1}	−0.2319*	−0.2720**	−0.0394
	[0.0930]	[0.0947]	[0.1362]
cay_{t-1}	−0.0839	−0.1974**	−0.0037
	[0.0488]	[0.0404]	[0.0403]
adjR^2	0.13	0.18	0.028
No of obs.	108	67	41

In parentheses under the estimated coefficients are Newey-West standard errors with three lags. (**) and (*) indicate that the coefficients are statistically significant at the 1% and the 5% level, respectively.

Table 4
**Comparison of the saving rate decline from 1997 to 2008 in the
GDP data and the FIES data with different definitions**

The aggregate saving rate $s_{i,j}$ is calculated using the age group data for
year i of income (Y_i) and saving (S_i), and the demographic data of year j
(N_j). $s^*_{97,08}$ uses 1997 age group data for households under 60 $(S^{-60}_{1997}, Y^{-60}_{1997})$,
2008 age group data for households 60 and over $(S^{+60}_{2008}, Y^{+60}_{2008})$, and 2008
demographic data $(N^{-60}_{2008}, N^{+60}_{2008})$.

$$s_{i,j} = \frac{S_i N_j}{Y_i N_j}, \quad s^*_{97,08} = \frac{S^{-60}_{1997} N^{-60}_{2008} + S^{+60}_{2008} N^{+60}_{2008}}{Y^{-60}_{1997} N^{-60}_{2008} + Y^{+60}_{2008} N^{+60}_{2008}}.$$

	1997	2008	difference
(i) **GDP**	10.3%	2.3%	$-\Delta 8.0\%$
(ii) **FIES: employed only**	28.0%	25.4%	$-\Delta 2.6\%$
$(s_{97,97} \Longrightarrow s_{08,08})$			
(iii) **FIES: all households**	24.4%	16.0%	$-\Delta 8.4\%$
$(s_{97,97} \Longrightarrow s_{08,08})$			
(iii-A) $s_{97,97} \Longrightarrow s_{97,08}$	-	21.9%	$-\Delta 2.5\%$
(iii-B) $s_{97,97} \Longrightarrow s^*_{97,08}$	-	18.0%	$-\Delta 6.4\%$

Notes: The calculations are based on data from the *Family Income and Expenditure Survey* (two or more family members). See the notes for Figure 3 for the definitions of the saving rates of "**FIES: employed only**" and "**FIES: all households.**" The data were retrieved from the website of the Statistics Bureau: http://www.stat.go.jp/english/index.htm.

Table 5
**Income growth and the propensity to consume of different age
groups before and after the financial crisis of 1997/98**

The following statistics are calculated from the "**FIES: all households**"
data set.

Δy : Average annual growth rate of household disposable income (percent).
C/Y : Consumption expenditure divided by disposable income (percent).
$S.D.$: Standard deviation in 1991–2008.
$\rho(\Delta y, c/y)$: Correlation in 1991–2008.

	Under 30		Average of Age 30–44		Age 45–49	
	Δy	C/Y	Δy	C/Y	Δy	C/Y
$1991 - 1997$	2.00	72.2	0.82	71.2	1.30	76.4
$1998 - 2008$	−0.89	73.5	−0.83	68.2	−0.63	73.8
$S.D.$	3.7	2.2	1.4	1.8	2.4	1.6
$\rho(\Delta y, c/y)$	−0.17		0.43		0.22	

	Age 50–54		Age 55-59		Non-employed (Under 60)	
	Δy	C/Y	Δy	C/Y	Δy	C/Y
$1991 - 1997$	1.75	73.9	1.75	67.7	2.35	164.3
$1998 - 2008$	−0.95	74.6	−1.53	72.2	−6.76	221.3
$S.D.$	2.5	1.8	3.4	3.6	18.4	42.2
$\rho(\Delta y, c/y)$	−0.20		−0.18		−0.58	

	Employed (60 and over)		Non-employed (60 and over)	
	Δy	C/Y	Δy	C/Y
$1991 - 1997$	0.68	78.3	0.66	111.0
$1998 - 2008$	−1.75	85.6	−1.24	123.9
$S.D.$	3.2	5.4	2.4	7.9
$\rho(\Delta y, c/y)$	−0.28		−0.34	

Notes: The calculations are based on data from the *Family Income and Expenditure
Survey* (two or more family members). The data were retrieved from the website
of the Statistics Bureau: http://www.stat.go.jp/english/index.htm.

Figure 1
Japan's household saving rate: 1980–2008

The net household saving rate from the Annual Reports on the National Accounts is shown. The 1995 benchmark data are from the 2005 Annual Report and the 2000 benchmark data are from the 2008 Annual Report. The data were retrieved from the website of the Cabinet Office: http://www.esri.cao.go.jp/en/sna/menu.html.
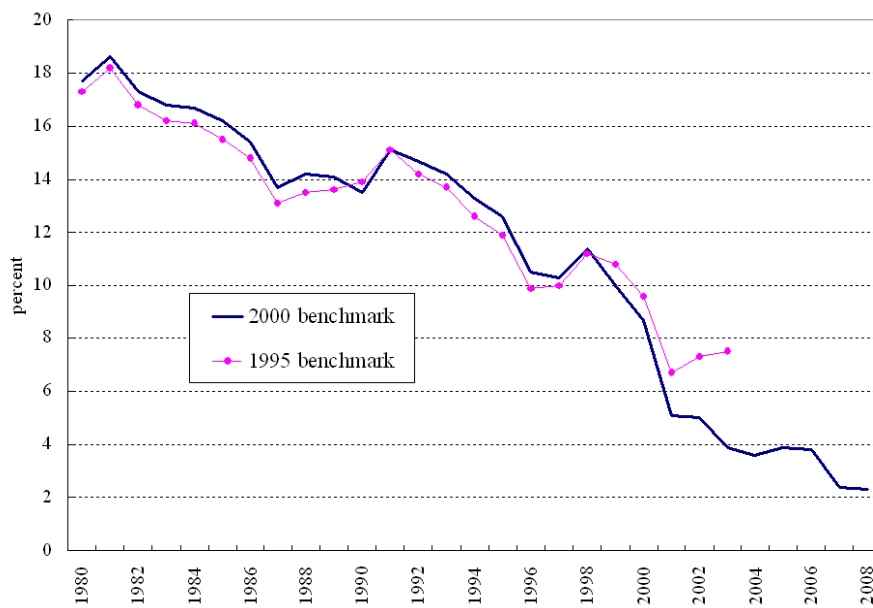
Figure 2
Cumulative consumption growth shock and GDP growth

The cumulative residual series from the full sample consumption function estimation (1981:Q1-2007:Q4) in Table 3, "cac_t" (right axis), starting from 1991:Q1, and annualized quarterly GDP growth (left axis) are shown.
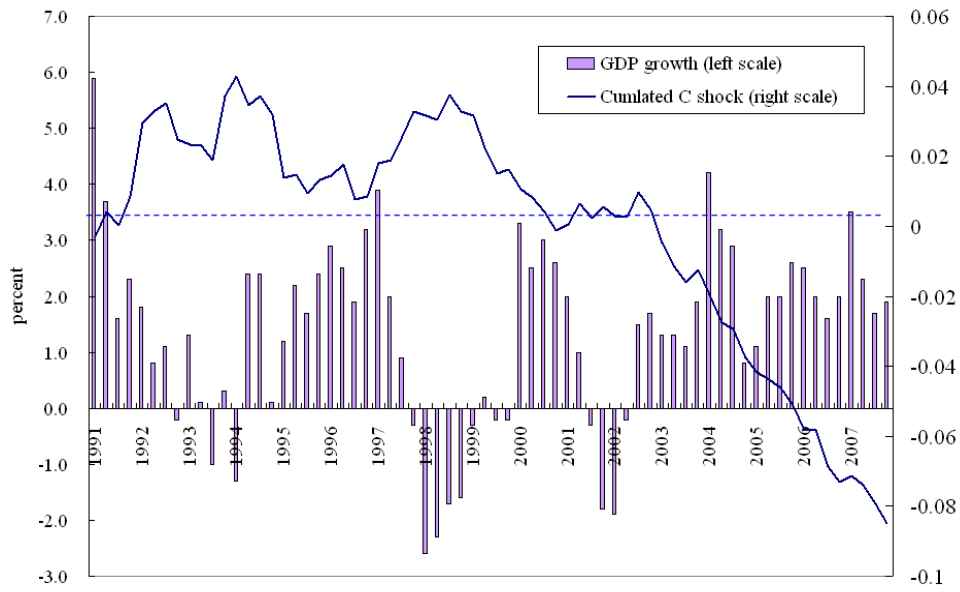
Figure 3
Aggregate household saving rates in the FIES data and the GDP data: 1980–2008

Aggregate saving rates and saving rates by age group calculated from the Family Income and Expenditure Survey (**FIES**) data are shown. The **FIES** data set used in the following graphs is based on survey results for households that have two or more family members; data before 2000 do not include agricultural households. The data were retrieved from the website of the Statistics Bureau: http://www.stat.go.jp/english/index.htm.

Panel A shows two saving rates calculated from the **FIES** data along with the household saving rate in the GDP statistics (labeled "**SNA**"), which is identical to the series shown in Figure 1. The series labeled "**FIES: employed households only**" is the aggregate saving rate of currently employed households and the "**FIES: all households**" is the saving rate of both employed and non-employed working. The latter starts from 1986, because household income data for non-employed households are not available for earlier years.

Panel A: Aggregate saving rates in the FIES data and household saving rate the in GDP data
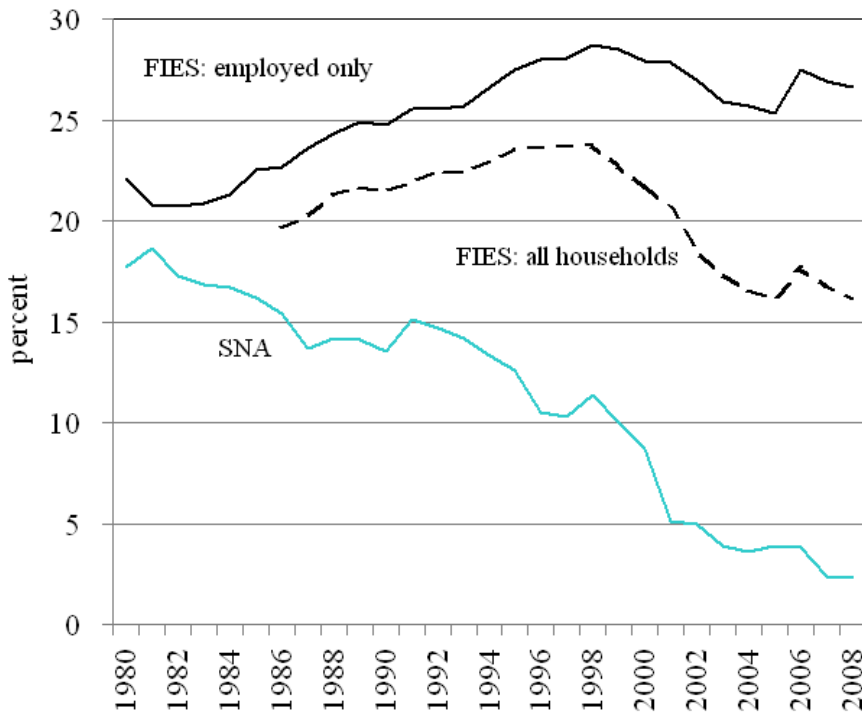
Figure 3 (continued)

Panel B: Demographic change in the FIES data: All households
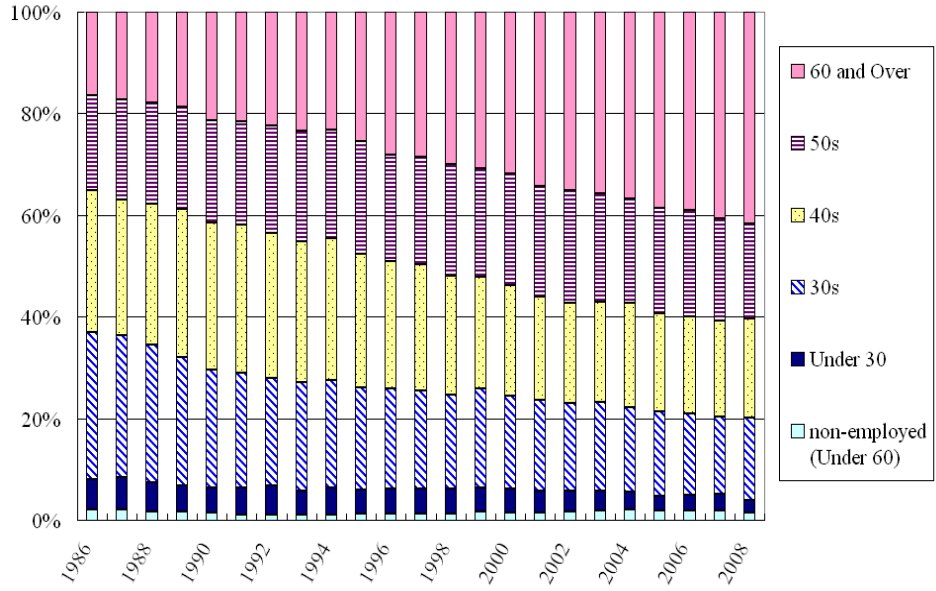
Figure 4
Saving rates by age groups in the FIES data

Saving rates by age group in the Family Income and Expenditure Survey (**FIES**) data, from which the "**FIES: all households**" saving rate in Figure 3 is calculated, are shown. Panels A trough C present the saving rates of "employed" households under 60 for different age groups. Panel D shows the saving rate for non-employed households under 60. Panel E is for households aged 60 and over, including both employed and non-employed households.

Panel A: Saving rate of the benchmark age group
(Ages 30–34, 35–39, and 40–44)
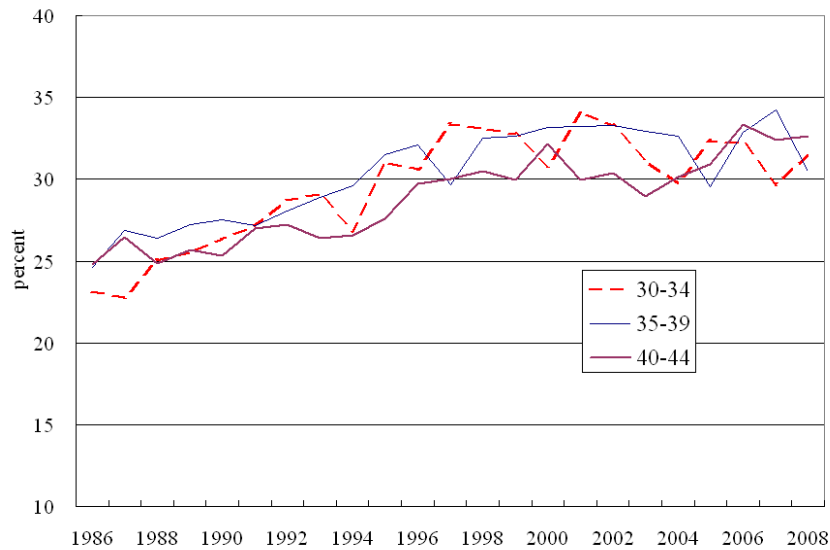
Figure 4 (continued)

Panel B: Under Age 30
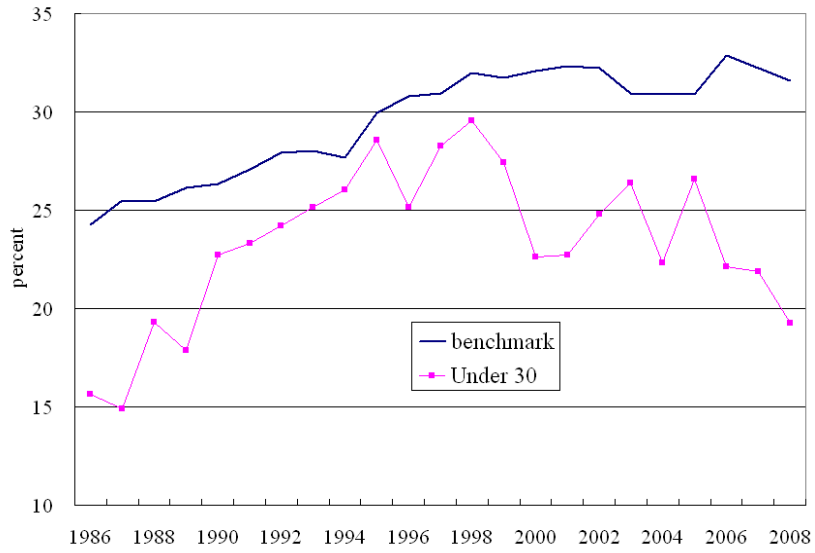
Panel C Ages 45–49, 50–54, and 55–59
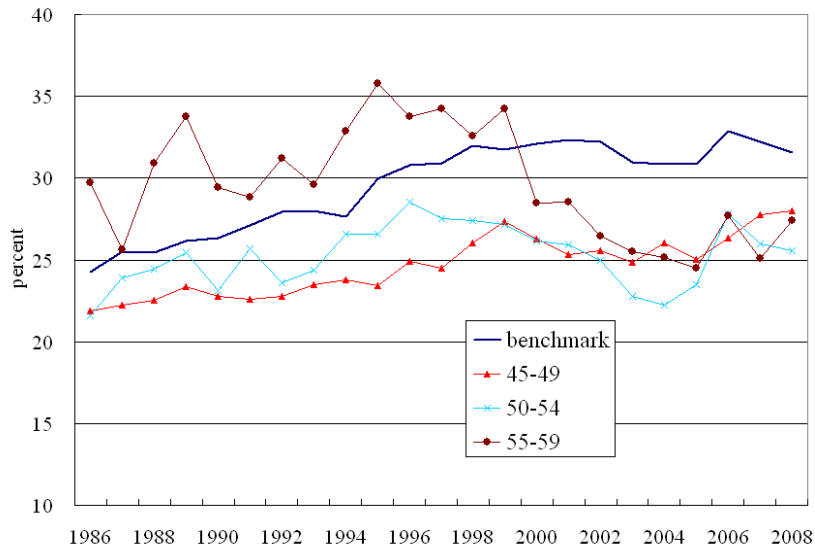
Figure 4 (continued)

Panel D: Non-employed households under Age 60
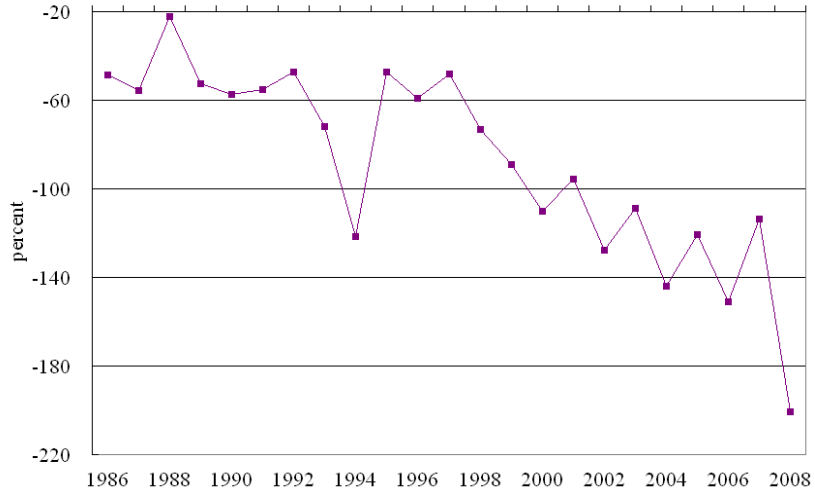
Panel E: Age 60 and Over (both employed and non-employed households)
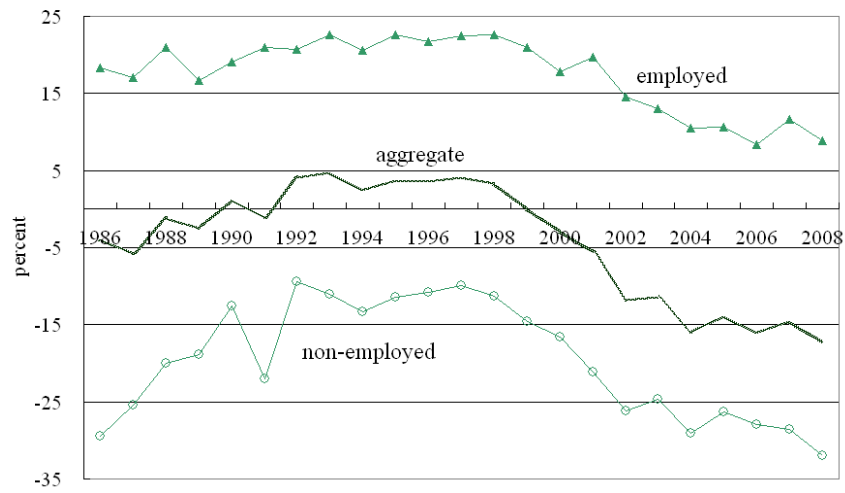
Figure 5

Figure 5
The Income and Consumption of Different Age Groups:
19861–2008

The real income and consumption expenditure by five-year age group in FIES data are shown. See the notes for Figure 2 about the data source. Nominal series are normalized by the CPI (general, excluding imputed rent; 2005=100).

Under Age 30

Age 30-34
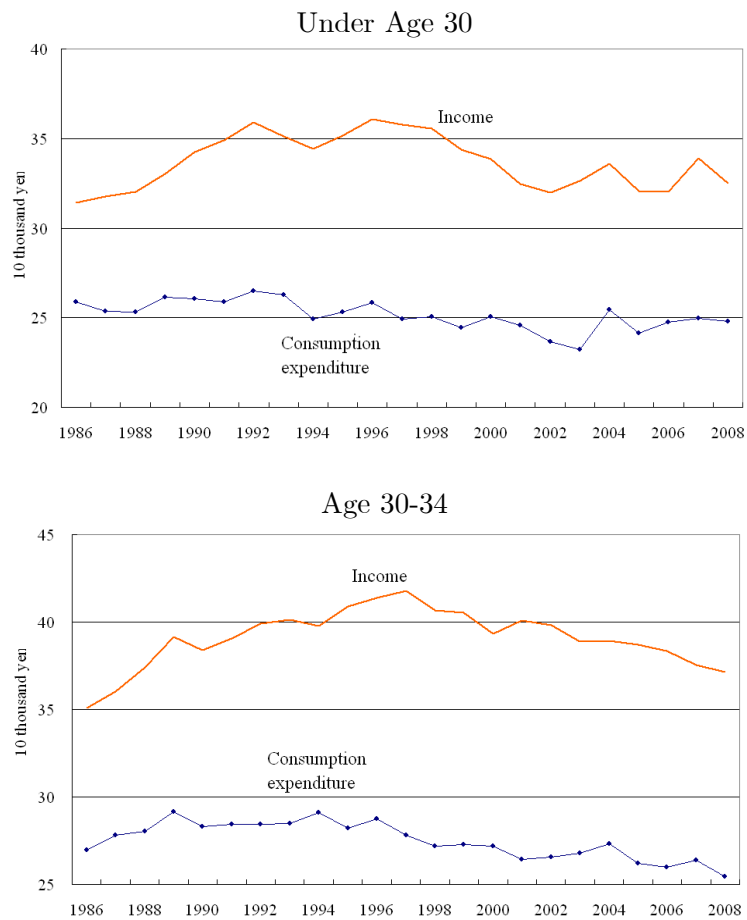
Figure 5 (continued)

Age 35-39

Age 40-44

Age 45-49

41
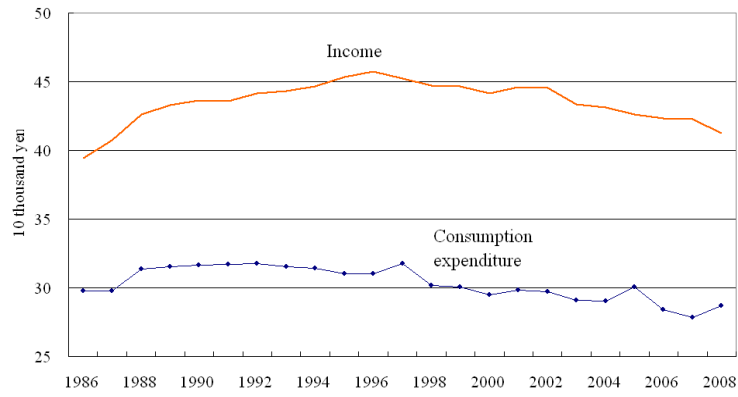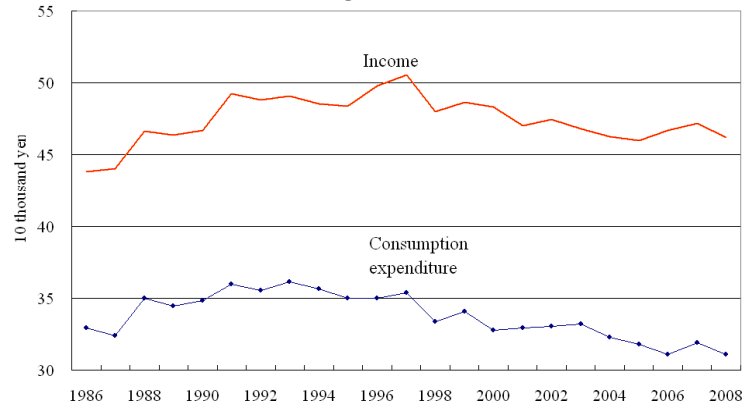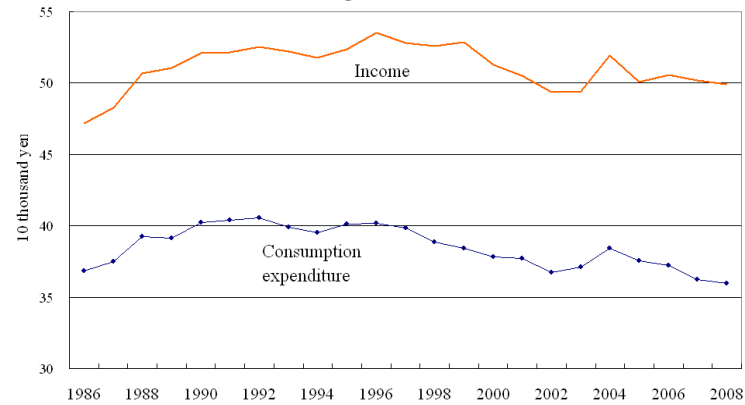
Figure 5 (continued)

Age 50-54
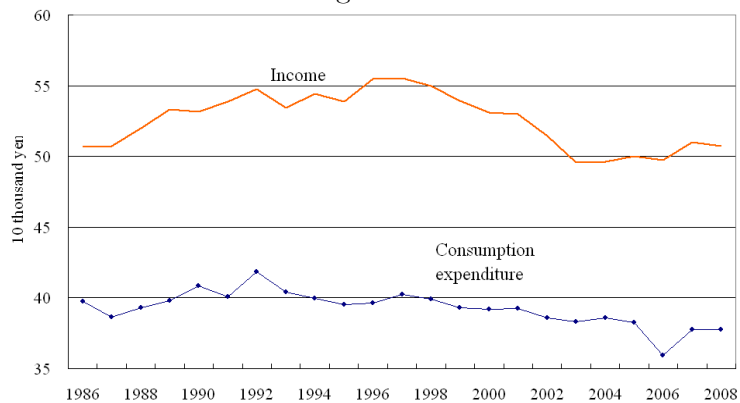
Age55-59
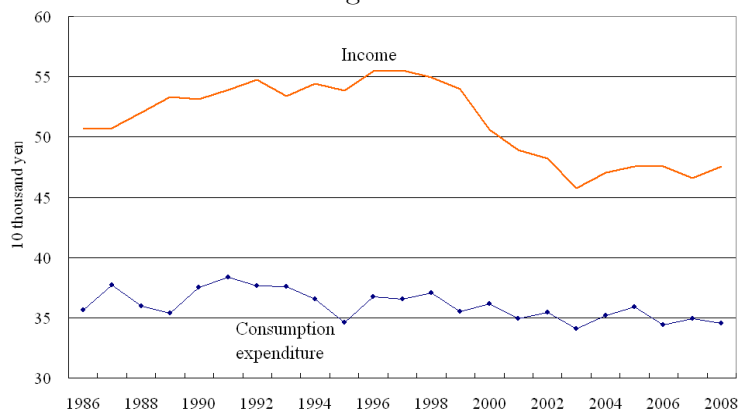
Non-employed households under Age 60
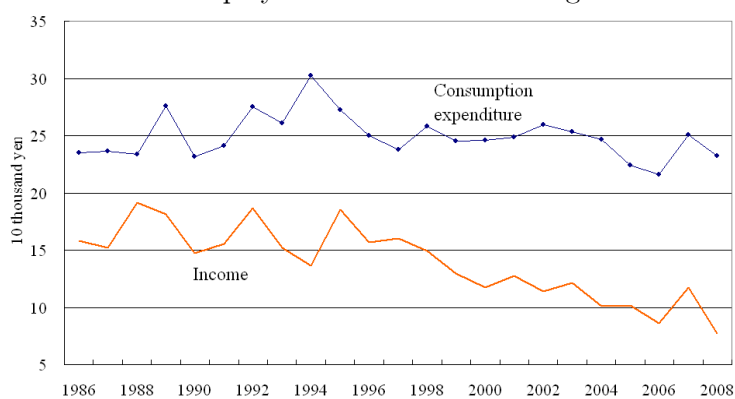
Figure 5 (continued)

Age 60 and Over: employed
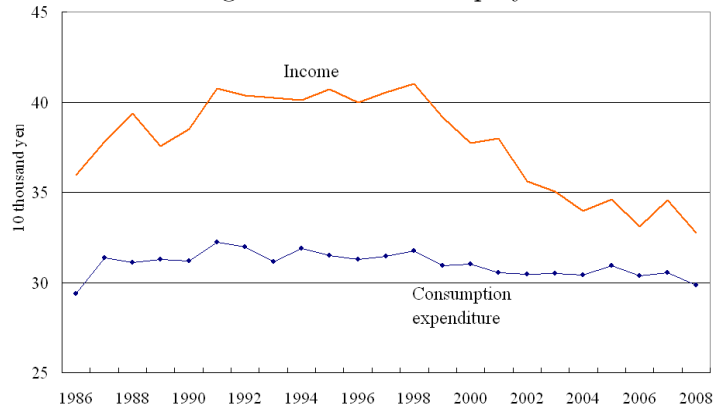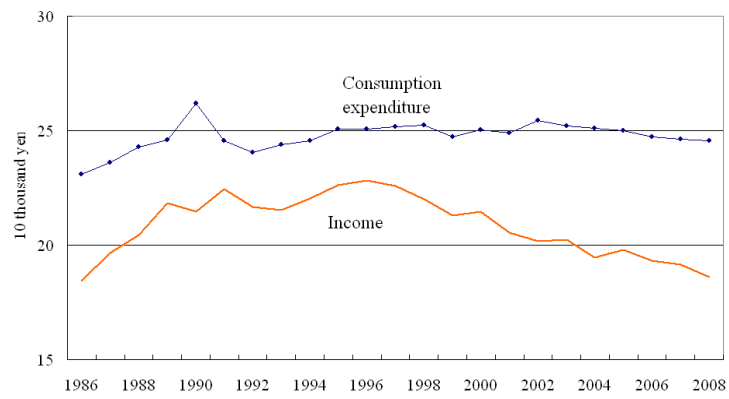

Age 60 and Over: non-employed

43

Figure 6
Government budget balance and current account

General government balance (primary balance) and current account as a share of GDP from 1980-2008. All data are taken from the SNA statistics. See notes for Table 1 for the data source.
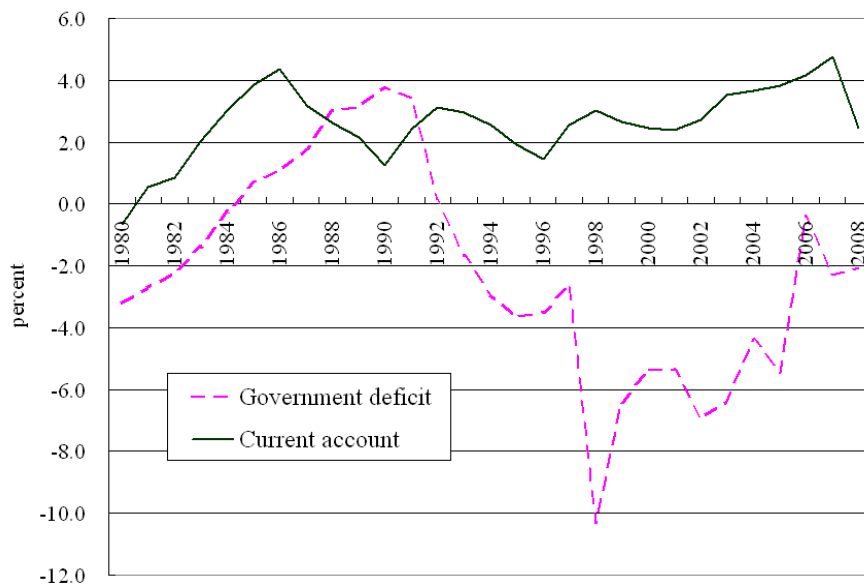
Figure 7
Substitution between corporate and household saving

Household saving, corporate saving, and total private sector saving as a share of GDP from 1980-2008. Corporate saving is the sum of saving in the financial sector and of non-financial corporations. Total private sector saving is the sum of saving by households and corporate and non-profit institutions serving households. See the notes for Table 1 for details on the data source.
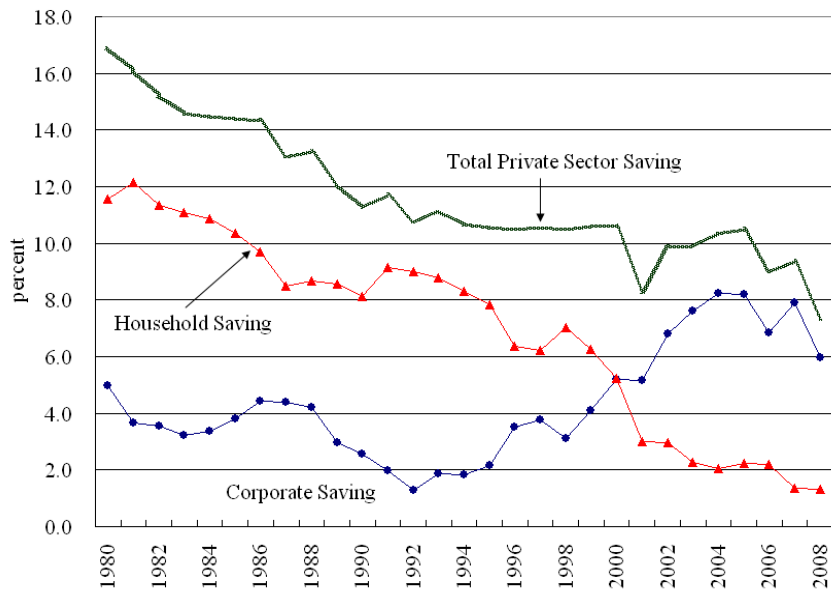
Figure 8
Wage Share in Japan: 1990–2008

Japanese wage share defined by the ratio of "compensation of employees" to "national income" is calculated from annual data in SNA statistics.