Child poverty in Japan: comparing the accuracy of alternative measures

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Abstract

In this paper I compare income and consumption as alternative indexes of child poverty in Japan. Using micro data from the National Survey of Family Income and Expenditures, I found that consumption-based measures showed less child poverty compared with income-based measures. To explain the difference, the paper considered three explanations: under-reporting of incomes (which would inflate the number of income-poor), over-reporting of consumption (which would reduce the number of consumption-poor), and consumption smoothing in response to negative income shocks. I present evidence that the lower rate of consumption-based poverty primarily reflects the income under-reporting, with little evidence for the over-reporting of consumption and for the consumption smoothing among the poor. I also compared income and consumption in their ability to identify households with lower material well-being (such as the lack of major household appliances, or inability to own a house). In cases of significant differences in such comparisons, consumption was almost always better than income in identifying materially disadvantaged households with children.

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1 Introduction

Until recently, the problem of child poverty was officially downplayed in Japan. Even though various household surveys could have been used to calculate child poverty rates, the first official release of child poverty rate was made only in 2009. With this announcement came the shocking realization that Japan was in fact lagging many other developing countries in the seriousness of child poverty. And in subsequent years, the situation has hardly improved. For example, the latest official estimate puts child poverty at 16.3 percent in 2012, which places Japan on the 11th place among 35 OECD countries (OECD, 2015).

In contrast to the delayed official recognition, a number of academic studies have examined the severity, causes and negative consequences of child poverty in Japan (Abe, 2008, 2014). Traditionally, they defined child poverty by low incomes, with less attention to alternative measures of household resources (such as consumption or wealth). Exceptions to this general trend are few, and include Ohtake and Kohara (2011) and Ohtake et al. (2013), who calculated child poverty rates by income and consumption, and Saunders and Abe (2010), who compared income poverty with the overall incidence of deprivation (defined as the lack of items which are considered necessary for child's development).

In this paper I examine three alternative measures of household resources: disposable income, consumption expenditures and non-durable consumption, and make three novel contributions. First, I confirm the previous result of Ohtake and Kohara (2011) and Ohtake et al. (2013) that consumption-based measures of child poverty are consistently lower than income-based measures, and provide new evidence that the result is robust to various definitions of income and consumption.

Second, I evaluate empirical evidence for three possible reasons why the use of income and consumption produces different poverty rates, and conclude that the divergence mostly reflects the under-reporting of income, with less evidence for two other explanations, by the over-reported consumption or by consumption smoothing. This result contradicts Ohtake et al. (2013), who stated that consumption-based poverty is lower because "some people facing an income drop can cope by reducing their savings, by borrowing, and/or by receiving other transfer incomes to sustain the same level of consumption, while other people facing an income increase may restrain expenditure to protect against future shocks

by raising savings, investment, and/or transferring to others". In contrast, I found that the consumption-smoothing behavior is unlikely among poor households with children. Instead, income under-reporting is more likely to inflate income-based indexes of child poverty. The finding agrees with previous studies by Meyer and Sullivan (2003, 2011) for the United States, Brewer et al. (2006) and Brewer and O'Dea (2012) for the United Kingdom, and Brzozowski and Crossley (2011) for Canada, who compared various attributes of income-poor and consumption-poor households, and concluded that the primary reason for lower rates of consumption-based poverty is income under-reporting.

Third, I examined what distinguished households with children that were either income-poor or consumption-poor, by looking at alternative indicators of material well-being. These indicators included the availability of various household appliances, land and house ownership, and the possibility to have a child who is a university student. In these comparisons between income- and consumption-poor, I used two tests, originally suggested by Meyer and Sullivan (2003, 2012a). Though these tests are not strictly comparable, I found that they consistently indicated that consumption was better in identifying households with worse material conditions. The advantage of consumption was especially pronounced in comparisons that were statistically significant, with consumption almost always superior to income. In contrast, income was preferable to consumption just once, and the poor performance of income occurred in both tests.

The paper is organized as follows: Section 2 discusses theoretical and empirical merits of using consumption as a measure of household welfare. Then Section 3 explains data sources and steps in cleaning up the initial dataset. The Section also explains definitions of resource variables and poverty indices that were analyzed in the paper. Section 4 reports various indices for child poverty in Japan, with a particular focus on the difference in measured poverty when either income or consumption was used. Section 5 examines possible explanations why the extent of child poverty in Japan turned out different with income and consumption. Section 6 continues the comparison between income and consumption, and examines their ability to identify materially-disadvantaged households. Finally, Section 7 reports major conclusions, and offers policy implications of reported findings.

2 Income and consumption as alternative measures of living standards

While income is still most widely used for measuring poverty, there are conceptual and practical reasons why consumption, rather than income, could be a better poverty measure. For a given household, income and consumption may differ in two cases: when the household saves a part of its income, or when the household smooths its consumption in response to a temporal drop in income, either by running down assets, or by piling up new debts. The second case is emphasized by the permanent-income hypothesis, which closely associates consumption with life-long resources of households. In contrast, income is considered to be more volatile, is sensitive to short-term shocks, which households try to smooth out by using their balance sheets. Based on this theoretical background, the conceptual advantage of consumption for measuring poverty was advocated by Cutler and Katz (1992), Slesnick (1993, 2001), and Blundell and Preston (1996), with a typical conclusion by Deaton and Grosh (1998) that "given the choice [between income or consumption], (perfectly measured) consumption is a more useful and accurate measure of living standards that is (perfectly measured) income".

But in practice, it is not realistic to expect that income and consumption are measured perfectly, and it is the difference in measurement errors that explains the practical advantage of consumption over income. A number of studies examined the reliability of income and expenditure data in household surveys, and concluded that consumption has relatively small measurement errors. For example, Attanasio et al. (2006), Fisher et al. (2012) and Sabelhaus et al. (2014) found that reported incomes are often unreliable for the poorest households in the United States. Such households often have incomes that are only one-half of their expenditures, with no sufficient assets or liabilities to account for the income deficit. Similar finding was reported by Brewer et al. (2006) for the United Kingdom, and Brzozowski and Crossley (2011) for Canada. In contrast to the growing evidence that incomes of the poor households are often under-reported, comparable measurement errors in consumption expenditures are generally considered to be smaller (Meyer and Sullivan, 2003).

3 Data and definitions

In this paper I use data for Japanese households from the National Survey of Family Income and Expenditure (NSFIE). The survey is conducted by the Ministry of Internal Affairs and Communications every five years, and I used four waves of the survey (1989, 1994, 1999, and 2004). The dataset includes all surveyed households, and I could replicate various descriptive statistics for income, expenditures and household balance sheets from the official reports of the survey.

The NSFIE is conducted from September to November for multiple-person households, while single households are surveyed in October and November. Compared with household surveys in other countries, the NSFIE has an exceptionally large sample size (nearly 60 thousand households), and collects detailed data on various household characteristics, including income, consumption expenditures on a wide range of goods and services, the stock and flow of financial assets and liabilities, and the ownership of various household durables.

A particular feature of the survey is the lack of recall period, with income and expenditure typically referring only to the survey period. As a result, consumption data have to be seasonally-adjusted to make them applicable to the whole year. In addition, even though the survey contains detailed income data at monthly frequencies, these data are of little use, because they omit bonus payments that are paid in July and December, which are outside of the survey period. In subsequent subsections, I explain definitions of major variables, discuss major data adjustments, and explain how the original dataset was cleaned of unreliable observations.

3.1 Poverty indexes

I calculated two conventional poverty indices for households with children: the headcount poverty rate and poverty gap. When income was used as a resource measure, the poverty rate counted households that had incomes below the poverty line; the poverty line, in turn, was defined as one-half of median income across all households. To account for differences in household size, I normalized income and consumption by an equivalence scale, equal to

the square root of the total number of household members. The calculation of poverty rates was similar with consumption expenditures, and non-durable consumption.

Poverty gap was defined as the amount of money, needed to raise all poor children up to the poverty line. The index was measured in percent of median disposable income (or consumption), and these resource measure were normalized by the equivalence scale. Since headcount poverty rate and poverty gap are expressed in percent, they could be calculated from nominal data. When data in real terms were required, I used the consumer price index for all commodities, with the base year 2010.

3.2 Children

Poverty indexes for children were calculated on individual basis, with child poverty rate defined by the number of children living in poor households, compared to the total number of children. Children were defined as unmarried household members, who were younger than 18 years old. Since the same age limit is used in calculations of the official child poverty in Japan, estimates in this paper are comparable to the official child poverty rate in Japan.

3.3 Variables

Variable definitions broadly followed Hayashi (1997) and Lise et al. (forthcoming). Income measure was disposable income, defined as the difference between gross income and non-living expenditures (essentially, taxes and social security contributions). Gross income mainly contained wages, income from assets (such as dividend and interest income), income in kind, and social security benefits. For households with house ownership, gross income also included the imputed rent from owner-occupied housing. Non-living expenditures included taxes (mainly income and residential taxes) and social security contributions (such as public pension fees, health insurance fees, and similar payments).

Total consumption expenditures were the sum of all living expenditures, including the imputed rent from owner-occupied housing from house owners. Similarly to Lise et al. (forthcoming), I defined non-durable consumption by omitting from the total consumption expenditures a number of consumer durables[1]. Following Hayashi (1997) and Deaton

[1] These categories included (1) housing rent, (2) durable goods for housework, (3) interior furnishings and decorations, (4) bedding, (5) purchase of vehicles and bicycles, and (6) recreational durable goods.

and Zaidi (1999), consumption expenditures and non-durable consumption did not include remittances to other households. Exact formulas are provided in *Data Appendix* (subsection A.1).

3.4 Data adjustments

As already mentioned, most data in the NSFIE do not refer to the full calendar year, but just to the survey period of either two or three months. The only variable with annual frequency was gross household income. In contrast, all consumption expenditures had to be seasonally-adjusted. To extrapolate expenditures to the whole year, I calculated seasonal adjustment coefficients for 10 major expenditure categories, using expenditure data from a different survey of Japanese households that reports expenditures at annual frequencies (the *Family Income and Expenditure Survey*).

While the household surveys are not strictly comparable (for example, the *Family Income and Expenditure Survey* omits some household categories that are covered by the NSFIE), both surveys are broadly similar in the coverage of the largest household category, the workers' households. Following Hayashi (1997) and Lise et al. (forthcoming), I calculated seasonal coefficients of 10 major consumption categories for these households in 1989, 1994, 1999 and 2004, and used the coefficients to adjust the NSFIE expenditure data to the whole calendar year.

3.5 Missing data

The NSFIE data does not contain information for taxes and social security contributions for the category of 'other households' (which mostly include self-employed individuals and executives). But the raw NSFIE data for 1989 and 1994 contained the tax and social security information for 'other households', so that the problem of missing data had to be solved only for 1999 and 2004.

I used two approaches to impute the missing data. First, I followed Hayashi (1997, p. 412–413), who suggested to use effective tax rates for major income brackets, which are reported in *Annual Reports* from Japan's National Tax Bureau. In practice, I used effective tax rates for 14 income brackets from *Annual Reports* for 1999 and 2004.

Second, I imputed the rate of taxes and social security contributions in 1999 and 2004, using income, tax and social security data for 'other households' in 1989 and 1994. Using these earlier surveys, I regressed the rate of tax and social security contributions on the following explanatory variables: annual gross income, gender, age of household head, region of residence, and a year dummy for 1989. Using regression estimates from this model, I predicted the missing taxes and social security contributions in 1999 and 2004. To avoid unrealistic predictions of tax rates, I restricted them to stay between 0 and 1 (using the imputation method of predictive mean matching[2]).

To check the accuracy of the second imputation procedure, I applied it to NSFIE waves in 1989 and 1994, and then compared imputed and actual values of disposable incomes for 'other households'. The match turned out remarkably close, with highly significant Spearman rank correlations (0.9927 for 1989, and 0.9947 for 1994). In additional robustness check, I calculated child poverty rates and poverty gaps from two imputations of disposable income in 1999 and 2004. As will be reported in Section 4, the difference in poverty estimates was minor, less than 0.1 percentage points for poverty rates, and even less for poverty gaps, indicating that the choice of specific imputation method had limited effect for major results in this paper.

3.6 Data cleaning

The initial dataset contained information on 241,797 households, and some of these households contained unreliable data. Table 1 describes major steps in data cleaning. First, I omitted households that the NSFIE dataset identified as having unreliable incomes. Second, I omitted households with negative or zero values of total consumption expenditures, and similarly, negative or zero values for non-durable consumption[3]. Third, I dropped households with married household heads, but who were younger than 18 years old. The final

[2] The method is provided by `pmm` option in STATA's `impute` command.

[3] While a number of households reported negative disposable incomes, I kept these households in the sample, because the occurrence of negative disposable incomes was easier to explain (in contrast to negative consumption expenditures). Most negative values of disposable incomes were due to the combination of unexceptional gross incomes and unusually large tax payments, apparently associated with unusually large bequests. As shown at the bottom of Table 1, there were only 77 households with negative disposable incomes, making their impact on reported poverty rates very small.

sample size contained 234,038 households, with the largest reduction due to households with unreliable income data.

4 Results

4.1 Poverty rate and poverty gap with different measures of household resources

Panel A of Figure 1 shows income-based poverty rate for children that were calculated from the NSFIE data, and compares them with the official poverty rate, calculated from the Comprehensive Survey of Living Conditions (CSLC). Previously, Ohtake and Kohara (2010) made a similar comparison for the poverty rate for the total population, and found that the NSFIE data produced a lower poverty rate. A similar result is evident Figure 1, though the gap between the alternative estimates was shrinking over time, from 5.2 percentage points in the late 1980s to 3.3 percentage points in mid-2000s.

Ohtake and Kohara (2011) explained the difference in poverty rates by the NSFIE's requirement that households use detailed account books to record their daily expenditures. In contrast, the CSLC asks households to give just a rough estimate of their total living expenditures, and requires no family account books. In consequence, both rich and poor households tend to be under-represented in the NSFIE, first because of the high opportunity cost of rich households, and second, because it may be difficult for poor households to afford keeping the detailed family account books.

To check this explanation, I compared not only poverty rates, but also poverty lines from the two surveys. The poverty lines are shown in Panel B of Figure 1. If rich and poor households are equally under-represented in the NSFIE, then the poverty lines from NSFIE and CSLC should stay close. Panel B shows that the two poverty lines turned out very similar, virtually coinciding in 1989, 1994, and 1999. Even when the two poverty lines diverged in 2004, the difference was only around 8,000 yen. Evidently, the higher child poverty rate with the CSLC data may reflect a larger degree of cooperation of poor households with this relatively less demanding survey.

Child poverty rates with different resource measures are reported in Table 2, with poverty rates for all households in Panel A, and poverty rates for different family types in Panel B. Among different resource measures, child poverty rate was the highest with disposable income, rising from 7.7 percent in 1989 to 10.4 percent in 2004. Conversely, the use of total consumption spending produced the lowest poverty rate among three resource measures, with increase from 4.5 percent in 1989 to 5.2 percent in 2004. Poverty rates from non-durable consumption fell between these two extremes. Similarly, they also showed an increasing rate of child poverty, from 5.2 percent in 1989 to 7.6 percent in 2004. Finally, the poverty rate with the second imputation for disposable income produced very similar results in 1999 and 2004[4], with virtually the same poverty rate of 10.2 percent in 1999, and a difference of just 0.1 percentage point in 2004. The small discrepancy indicates that the choice of imputation method did not matter much for estimates of child poverty rates; a similar result will appear again with estimates of poverty gaps in Table 3.

Panel B of Table 2 reports differences in child poverty rates across five family types. When measured by disposable income, the poverty rate was highest for single mothers, at around 45 percent (with a conspicuous drop to 34 percent in 1994). Conversely, the lowest poverty rate was for three-generation households, at only 5.3 percent in 2004. Families with both parents had intermediate levels of child poverty that fluctuated around 9 percent.

For consumption expenditures and non-durable consumption, poverty rates were consistently lower for all family types, as compared to disposable income. But the relative ranking across family types did not change much. Single mothers continued to have the highest child poverty rate, followed by single fathers and by families with both parents, while three-generation households had the lowest levels of child poverty. The poverty rate for single fathers turned out relatively volatile compared with other family types, evidently due to very small size of this household type.

Table 3 reports estimates for child poverty gap with different definitions of household resource, first for all households in Panel A, and then for five family types in Panel B. Once again, disposable income produced the largest estimates of poverty gap, which increased from 1.6 percent in 1989 to 2.6 percent in 2004. Conversely, the poverty gap was much smaller with total consumption expenditures and non-durable consumption. The poverty

[4] For 1989 and 1994, they were identical by construction.

gap also increased with these two measures, but their increases were smaller in magnitude compared with disposable income (by 0.2 percentage points for consumption spending, and by 0.6 percentage points for non-durable consumption), .

The choice of different resource measures resulted not only in different rates of child poverty, but also in significant differences which children were classified as poor. Figure 2 illustrates the difference between income- and consumption-poor in 2004[5]. As previously reported in Panel A of Table 2, the income-based poverty rate was 10.4% percent in 2004, while it was 7.6% with non-durable consumption. Figure 2 shows that the overlap between these two resource measures was only partial, with just 4.1% of children identified as poor by both measures. On the other hand, as much as 6.3% of children were income-poor (but not consumption-poor), while 3.5% of children were consumption-poor (but not income-poor). Evidently, the choice of resource measure matters a lot for classifying poor children.

Given the large mismatch between income- and consumption-poor, the rest of the paper will search for answers to the following questions: first, why the poverty rates were different for income and consumption, and second, with only partial overlap between income- and consumption-poor, which resource measure may be preferable for identifying children in true material need? Possible answers to the first question will be examined in Section 5, while Section 6 will try to answer the second question.

5 What explains differences in income and consumption poverty among children?

The difference between income- and consumption-based poverty rates is a common finding in the literature (Attanasio et al. (2011), Brewer and O'Dea (2012), Meyer and Sullivan (2012b), Ohtake et al. (2013), and Pendakur (2001)), with consumption-based poverty typically smaller than income-based poverty. Three possible explanations have been suggested in the literature: (1) measurement error in income, (2) measurement error in consumption, or (3) consumption smoothing in response to negative income shocks (Brewer et al., 2013; Meyer and Sullivan, 2012b). For consumption poverty to be less than income poverty,

[5] The composition of income-poor and consumption-poor was similar for other waves of NSFIE, and these results are omitted for brevity.

the first two measurement errors should have specific patterns: either incomes are under-reported (which would inflate the number of income-poor), or consumption expenditures are over-reported (which would reduce the number of consumption poor). The third explanation, by consumption smoothing, also should have a particular pattern, with households either reducing their assets, or running up new debts, with corresponding changes in flow measures of household balance sheets. In this section, I will consider evidence for each of these explanations, and will argue that the best evidence is available for the income under-reporting among the poor households.

5.1 Over-reporting of consumption

There is hardly any evidence that household consumption could be over-reported in household surveys. In fact, it is much more common to find that households are under-reporting their expenditures. For example, Barrett et al. (2014) compared total expenditures in household surveys and national accounts in Australia, Canada, the United Kingdom and the United States, and found that households typically *under-reported* their consumption expenditures in Australia, the United Kingdom and the United States (by as much as 30 percent in recent years), and only Canada had a close match between the two expenditure measures. Crucially, in no country were households over-reporting their expenditures.

Similar comparisons for Japanese household expenditures were reported by Sakai (2010) and Maeda and Umeda (2013), who compared NSFIE data with national accounts in 2004 and 2009, respectively. Similarly to Barrett et al. (2014), these studies found that consumption expenditures in the NSFIE were under-reported compared with national accounts. Table 4 summarizes these expenditure comparisons, using 12 major consumption categories.

To aggregate these 12 categories into the total household expenditures, I used two sets of weights. The first set of weights was from national accounts. With these weights, household expenditures in the NSFIE were under-reported, by 12.4 percent in 2004, and by 6.7 percent in 2009.

But for the poorest households, the mismatch with national accounts is likely to be even smaller, because their major expenditure categories (on food, housing and recreation) tend to have smaller discrepancies with national accounts. NSFIE reports expenditure weights

for various income categories, including households at the lowest income decile. When I applied this second set of weights, the difference between total expenditures in the NSFIE and national accounts became even smaller. As shown in Table 4, the expenditure shortfall diminished in 2004 from 12.4 to 5.8 percent, while in 2009, the initial shortfall of 6.7 percent turned into surplus of smaller magnitude (just 3.4 percent).

In summary, the comparison between NSFIE and national accounts shows no evidence of substantial over-reporting of household expenditures in Japan. Instead, Japanese household surveys look similar to Canadian households, with broad, though not perfect, conformity with national accounts.

5.2 Under-reporting of income

A number of studies have concluded that poor households may under-report their incomes (Meyer and Sullivan (2012b) for the United States, Brewer et al. (2006) for the United Kingdom, and Brzozowski and Crossley (2011) for Canada). To examine income under-reporting in Japan, I followed Brewer et al. (2006), and divided households with children into 100 sub-groups (percentiles) by their equivalised disposable income (that is, their real disposable income per the number of equivalised adults). Then I calculated the median expenditures for each of these sub-groups. Figure 3 shows median expenditures for poorest 25 income percentiles[6]. For each percentile group, median expenditures are plotted as hollow circles, starting from the lowest income percentiles on the left. Without saving or dissaving behavior, expenditures and disposable incomes in each sub-group should be equal. This condition is indicated in Figure 3 by the straight line.

In each panel of Figure 3, total consumption expenditures are converted to real terms, and expressed in 2010 prices. At the lowest income percentiles, consumer expenditures remain remarkable stable, with only a gradual increase around 100 thousand yen per equivalent adult. For the lowest 4 income percentiles, total expenditures always exceed the reported income, with the income deficit shown by the gap between the straight line and hollow circles. In every year, the income deficit is the largest for the first income percentile.

[6] In addition, Table 5 reports specific figures on median income and expenditures for the poorest 10 income percentiles

As reported in Table 5, the income deficit (which the table reports as negative saving) was 38 thousand yen per month in 1989, and increased further to 48 thousand yen in 2004.

To finance these income shortfalls, households need to either run down their assets or increase their debts. If households are not using these two strategies to finance in their income shortfall, this will provide an indirect evidence for income under-reporting. In next subsection, I will examine evidence whether the poorest households used their balance sheets to finance the income shortfalls.

5.3 Consumption smoothing by reducing assets or running-up debt

There are three pieces of evidence that consumption smoothing was unlikely among income-poor households. The first one refers to the flow measure of household balance sheets, the change in household net worth per equivalent adult. The flow measure is shown by vertical bars in Figure 3 for the bottom 25 income percentiles. By an accounting identity, the shortfall of income compared with expenditures should be matched by negative change in net worth. Figure 3 demonstrates that the income shortfalls for the poorest households were rarely matched by reduced net worth. And even if reductions in net worth took place, they were always much smaller than the corresponding income shortfalls. Table 5 provides additional comparisons between income shortfalls (reported as *Saving* with minus sign) and changes in net worth (denoted as $d(NetWorth)$). For example, the 1st income percentile had income shortfall of 48 thousand yen in 2004, which was not matched by the reduced net worth for this income group, by only 20 thousand yen.

The second piece of evidence that consumption-smoothing was unlikely among income-poor households comes from their stock of financial assets and liabilities. Figure 5 shows the median stock of household asset and liabilities at the lowest 10 percentiles of equalized disposable incomes. The picture is clearest for the median stock of household debt: it was always zero in every income percentile. As for the stock of financial assets, in many cases it was too low to support income shortfalls in a sustainable way, especially for the poorest households with relatively large income deficits. For example, the median assets of the lowest income percentile was 562 thousand yen in 2004, while these households had income shortfall of 48 thousand yen (Table 5).

To measure the feasibility of using the stock of available assets to support income shortfalls, I calculated an asset coverage ratio, equal to the number of months that households could finance their income shortfalls from financial assets. For example, the median asset coverage for the first income percentile was just 12 months in 2004, and turned out even lower in 1994. Overall, the available assets by income-poor households make consumption-smoothing very unlikely.

Third piece of evidence that income-poor households are unlikely to smooth their consumption comes from examining components of changing net worth of households. By accounting identity, change of household net worth can be decomposed into three components: (1) change in financial assets, (2) change in financial debt (with the minus sign), and (3) change in real assets[7].

Table 5 reports these three components. Evidently, changes in net worth of the poorest households occurred predominantly through changes in net financial assets. As for the remaining components of changing net worth, the poor households did not use them at all, with zero values for $d(Debt)$ and $d(Real\ Asset)$ in every income percentile. And even in few cases when net financial assets were negative, their magnitude was never sufficient to explain the negative difference between the reported expenditures and incomes. Evidently, the balance sheets of poorest households do not explain the full amount of their income deficits, indicating that such households had little scope for consumption smoothing.

To compare the reliability of expenditure data for the poorest households, I repeated the same comparison of disposable incomes and expenditures, but this time — for the bottom 25 percentiles of *consumption*-poor households. For percentile of consumption, I calculated the median disposable income, and show them in Figure 4. Similarly to Figure 3, the straight line indicates the condition when disposable incomes are equal to consumption expenditures.

In contrast to the widespread income deficits among income-poor households, no percentile of consumption-poor households had an income shortfall, with median incomes always above total expenditures (as shown by hollow dots above the straight line, for which incomes and expenditures are equal). Moreover, changes in net worth for consumption-poor households are in better (though still not perfect) agreement with the difference between

[7] Data Appendix (Subsection A.2) describes this decomposition in more details

their incomes and expenditures, with positive savings consistently matched by positive increases in net worth.

6 Alternative indicators of material well-being of children, classified as income- and consumption-poor

While the previous section focused on the possibility of income under-reporting among poor households with children, this section will examine another problem with income-based poverty measures: their relative failure to identify households that have low living standards. These alternative measures of worse living conditions will include the lower probability to own land or housing, or the lack of various consumer appliances and amenities (such as air conditioners, refrigerators, computers, television, digital and video cameras).

I use two tests to identify which measure, income or consumption, is better in identifying households with worse material conditions. The first test was proposed by Meyer and Sullivan (2003), and its recent applications include Meyer and Sullivan (2011) and Brewer et al. (2013) for poor households in the U.S. and U.K., respectively.

The test classifies households into 4 groups. The first two groups include households with low and high incomes. The income-poor group includes households at the bottom 5 percent of income distribution, while the second group includes the remaining households[8]. I will denote these groups as Inc_{low} and Inc_{high}.

The other two groups are classified by non-durable consumption, with $Cons_{low}$ including households with lowest 5 percent in the distribution of non-durable consumption, and group $Cons_{high}$ including the remaining households.

Consider a case when living conditions are measured by the ownership of a consumer appliance (say, a computer). Let $S(i)$ be the mean ownership share for category i. If the consumer appliance is a valid indicator of better living conditions, the ownership share is likely to be lower for poor households, with

$$S(Inc_{low}) - S(Inc_{high}) < 0 \text{ and } S(Cons_{low}) - S(Cons_{high}) < 0$$

[8] The choice of 5 percent cutoff to define poor households is arbitrary, and other cutoffs (such as 10 percent) are equally valid. In addition to reported results, I conducted a robustness check with 10 and 20 percent cutoffs, but these alternative choices produces broadly similar results.

To study whether it is income or consumption that is a better measure to identify worse material conditions, the test uses a difference-in-difference statistic λ, calculated by

$$\lambda = \left[S(Cons_{low}) - Cons_{high})\right] - \left[S(Inc_{low}) - S(Inc_{high})\right]$$

When the test statistic is negative, consumption provides a relatively better measure of material hardship than income, while positive values of λ indicate that income is superior to consumption in differentiating disadvantaged households.

Table 6 reports results of applying the test to the NSFIE data in 2004[9]. I examined 31 indicators of material well-being, and most of them show the ownership shares of various consumer durables. Other well-being indicators included ownership shares for land and housing, the share of households with at least one university student, and the total living space per equivalent adult. The ownership-type indicators are sorted by their decreasing availability for all households with children. As shown in column (1), the availability was highest for vacuum cleaners (99.5 percent), while plasma TV had the lowest ownership share (just 2.4 percent).

Column (2) reports the availability share for income-poor households (Inc_{low}), while the share for income-rich households (Inc_{high}) is reported in column (3). Column (4) shows that the difference between income-poor and income-rich households was always negative, but for some widely-used durables, the difference was less than 1 percentage point (for example, for color TV, vacuum cleaners and washing machines).

The similar comparison was made for consumption-poor and consumption-rich households in columns (5) and (6). The difference in column (7) was always negative, but for some widely-used consumer durables, the difference was again less than 1 percentage point. Finally, the test statistic λ in column (8) turned out negative in 21 comparisons, indicating that in most cases, non-durable consumption was a better predictor of worse living conditions.

To evaluate the statistical significance of λ, I re-sampled the household data by bootstrap sampling with 999 replications. Then I calculated the empirical distribution of λ, using the actual λ and its 999 re-sampled values. From this empirical distribution of λ, I calculated

[9] Results for other rounds of NSFIE were broadly similar, and are omitted for brevity.

empirical p-values for the test statistic and report them in column (9). Significant cases were identified by p-values less than 0.05.

The first significant comparison was for the ownership of study desks. The λ statistic for this durable was -9.9 percentage points, and its bootstrap p-value was less than 0.001 (in other words, no re-sampled λ was larger in magnitude than the actual test statistic -9.9), indicating a highly significant difference. Because the test statistic was also negative, column (10) concludes that consumption was superior to income in identifying worse living conditions (fewer study desks in this case).

In total, I found 13 categories that had significant λ statistics. In these cases, the test statistic favored income (that is, it was positive) only once, for the ownership of golfing equipment. In the remaining 12 categories, λ was negative, indicating that consumption-poor households had fewer consumer durables (namely, sewing machines, system kitchens, water heaters, pianos, dish washers, and solar water heaters). In addition, consumption was a preferred measure for the ownership of both land and housing, and for comparison of total living area. Finally, consumption-based poverty was associated with households with lower probability to have a university student.

The second test to compare income and consumption was proposed by Meyer and Sullivan (2012a). Essentially, the test examines what kinds of households are added to poverty by either income-based or consumption-based poverty measures. The test begins by fixing a baseline poverty cutoff, such as the poverty rate of 10.4% when measured by disposable income in 2004 (as previously reported in Table 2). Then the same poverty cutoff is applied to a consumption-based household data[10]. With the same number of households classified as either income- or consumption-poor, some of these households would be classified as (1) both income- and consumption poor, while the rest could fall into three categories: (2) only income-poor, (3) only consumption-poor, (4) neither income- nor consumption-poor.

The test focuses on households that change their poverty status according to either income-based or consumption-based measure (namely, the second and third groups). A valid poverty measure would add to poor households those with *less* ownership of consumer durables (or other similar indicators of better well-being, such as child education

[10] The same cutoff is used to ensure that differences in household characteristics do not emerge from looking at different cutoffs in the distribution of income or consumption.

in university). In particular, consumption would have advantage over income if the third group of 'only consumption-poor' have lower material standards compared with the second group of 'only income-poor' households. A t-test can be applied to examine whether differences in ownership rates are significantly different between these groups. The null hypothesis of the test is that households in second and third groups of households have identical characteristics of material well-being.

I applied the second test to the same 31 well-being indicators as in the first test, and report results in Table 7. Once again, the availability of study desks was the first well-being category with significant difference. Specifically, for households that were both income- and consumption poor, the ownership share was 53.0 percent (as shown in column (1)). In contrast, households who were neither income- nor consumption-poor, 82.5 percent owned study desks (as shown in column (4)). The group of 'only income poor' contained households that are added to the poor by income (but not by consumption). In this group, the availability rate was 68.6 percent. In contrast, the availability was lower for households that were added to the poor by consumption, at 58.0 percent (as shown in column (3)). The difference of between these two groups was -10.6 percentage points and p-value less than 0.001. Finally, the negative difference implied that consumption was a preferred indicator of worse material conditions.

Overall, the difference between income- and consumption-poor households tended to be negative, and the superiority of consumption was especially pronounced in 13 significant comparisons. Just once income was favored over consumption (once again, in the ownership of golfing equipment).

In summary, even though the first and second tests differ in their specifications, their conclusions turned out broadly comparable, with almost perfect overlap between categories with significant differences, and I found consumption to be overwhelmingly superior to income. The result is remarkably similar to Meyer and Sullivan (2003, 2011, 2012a) and Brewer et al. (2013), who examined US and UK households, respectively. This paper's results for Japan give further empirical evidence about the superiority of consumption for identifying the truly disadvantaged households, and also demonstrate that the consumption superiority over income extends to households with children.

7 Conclusion

This paper examined the sensitivity of Japan's child poverty rates to various definitions of household resources. In broad agreement with previous studies, consumption-based measures showed less child poverty compared to income-based measures. To explain the difference, the paper examined three alternative hypothesis (over-reporting of consumption, under-reporting of income, and consumption smoothing), and concluded that it was mainly the under-reporting of incomes that could account the lower rates of consumption-based poverty. While similar results have been reported for poor households in the U.S. and U.K., the paper's results for Japanese households with children appears to be a novel one.

The relative advantage of consumption over income was further demonstrated when income and consumption were compared in their ability to identify households with lower material well-being (such as less likely ownership of major consumer durables). For 31 comparisons with the alternative well-being indicators, consumption was generally superior to income in identifying disadvantaged households.

If consumption is in fact a better measure of worse material conditions, but incomes are used instead to identify child poverty, this creates two problems. The first problem is *false positives*, when some children are classified as 'poor', even though they are not really the most disadvantaged ones. The second problem is *false negatives*, when by using income, we fail to identify children who really the most disadvantaged.

How large is the number of false positives and false negatives among Japanese children? This can be estimated from Figure 2, which shows how poor children were classified with NSFIE data for 2004. False positives refer to children who were income-poor, but not consumption-poor, and they represented 6.3% of children. Conversely, false negatives were consumption-poor, but not income-poor, and accounted for 3.5% children.

These results have an important policy implication, namely, the possible misallocations of public funds when only incomes are used in identifying child poverty. With false positive errors, public funds may be allocated to children are not really the most disadvantaged, while with false negative errors, the society may fail to support children who are truly in need. If incomes continue to be used as the only indicator of household well-being, the goal of reducing child poverty may not be reached as promptly as we originally expected.

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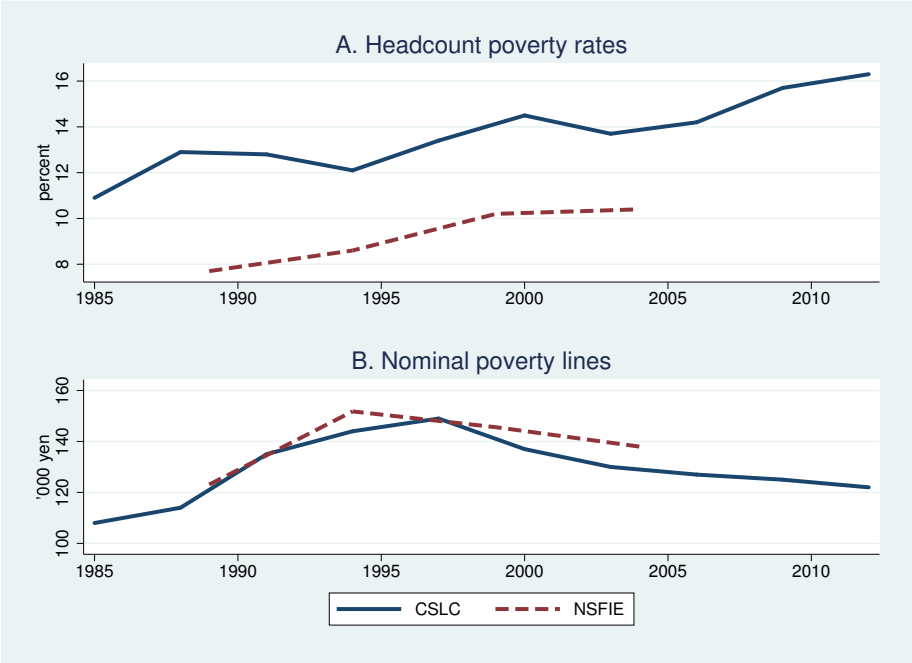
Table 1. Sample size

(A) Changes in the sample size with data cleaning:	
1. Original sample size	241,797
2. Less: households, marked for unreliable income information	234,095
3. Less: households with negative consumption	234,088
4. Less: households with zero consumption	234,067
5. Less: households with married household head, younger than 18 years old = Final sample size	234,038
(B) Final sample size by survey year:	
1989	58,413
1994	59,550
1999	58,881
2004	57,194
Out of which: Households with negative disposable income	77

Figure 1. Comparison of child poverty rates in Japan.



Note: the figure compares the headcount poverty rates for children and the nominal poverty lines from two household surveys: the Comprehensive Survey of Living Conditions (CSLC) and the National Survey of Family Income and Expenditures (NSFIE). The poverty line is one-half of median household income per equivalent adult. The number of equivalent adults equals to the square root of the total number of household members. Units of measurement are the share of the total number of children in percent (Panel A) and thousand yen (Panel B).

Table 2. Child poverty rate with different measures of household resources

	1989	1994	1999	2004
(A) Child poverty rate for all families				
Disposable income	7.7	8.6	10.2	10.4
Consumption spending	4.5	5.1	5.7	5.2
Non-durable consumption	5.2	6.6	7.9	7.6
Disposable income with alternative imputation	7.7	8.6	10.2	10.5
(B) Child poverty rate for major family types				
	Disposable income			
Both parents	7.6	8.4	9.7	9.2
Single mother	46.9	34.0	44.7	45.0
Single father	26.9	11.8	17.3	21.8
3-generation household	5.9	5.9	5.9	5.3
Other household	6.9	8.8	9.1	14.4
	Consumption spending			
Both parents	3.8	4.8	5.0	4.2
Single mother	19.7	16.6	23.9	21.3
Single father	20.7	10.6	4.3	9.4
3-generation household	4.3	4.0	4.4	3.8
Other household	7.8	7.5	8.6	8.8
	Non-durable consumption			
Both parents	5.1	7.1	8.1	7.4
Single mother	29.7	23.4	29.9	27.9
Single father	20.7	10.0	9.5	15.1
3-generation household	3.4	3.1	3.1	2.8
Other household	5.8	5.7	7.7	8.5
	Disposable income with alternative imputation			
Both parents	7.6	8.4	10.0	9.4
Single mother	46.9	34.0	46.4	46.5
Single father	26.9	11.8	17.3	18.2
3-generation household	5.9	5.9	4.9	4.7
Other household	6.9	8.8	7.6	13.1

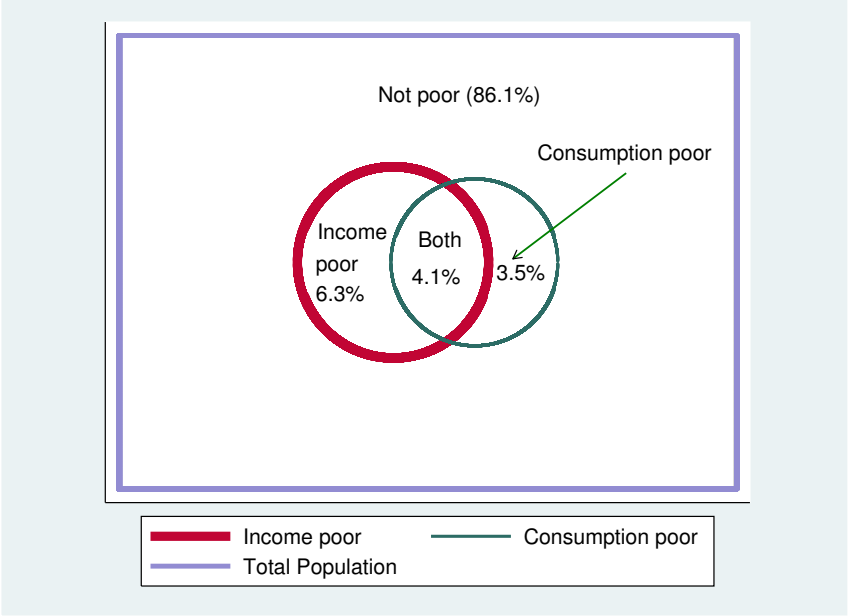
Note: disposable income is defined as total income from all sources (salaries, public and private pension benefits, interest and dividends, etc.) and the imputed rent for owner-occupied housing, less taxes and social security contributions. Consumption spending includes total living expenditures and the imputed rent for owner-occupied housing. Non-durable consumption is based Lise et al. (forthcoming), and equals total consumption spending, less transfers to other households and spending on housing rent and expenditures on durables. Income, expenditures and non-durable consumption are normalized by the square root of total number of household members. Children are defined as unmarried members of household who are younger than 18 years old. The unit of measurement is the percentage of the total number of children (Panel A), and the percentage of the total number of children in a specific family type.

Table 3. Poverty gap for children.

	1989	1994	1999	2004
All families				
Disposable income	1.6	1.9	2.4	2.6
Consumption spending	0.7	0.8	0.9	0.9
Non-durable consumption	0.9	1.2	1.5	1.5
Disposable income (alternative imputation)	1.6	1.9	2.4	2.6
By family type				
	Disposable income			
Both parents	1.5	1.7	2.1	2.0
Single mother	15.3	11.4	17.2	17.4
Single father	7.1	2.1	5.0	5.5
3-generation household	1.1	1.2	1.2	1.0
Other household	1.7	2.2	2.3	3.9
	Consumption spending			
Both parents	0.6	0.7	0.7	0.6
Single mother	3.8	3.6	4.7	5.1
Single father	3.9	1.1	0.5	2.6
3-generation household	0.6	0.6	0.6	0.6
Other household	1.4	1.2	1.6	1.5
	Non-durable consumption			
Both parents	0.9	1.3	1.5	1.4
Single mother	6.0	5.8	7.4	8.2
Single father	5.7	1.4	1.4	3.3
3-generation household	0.5	0.4	0.4	0.4
Other household	1.2	0.9	1.3	1.6
	Disposable income (alternative imputation)			
Both parents	1.5	1.7	2.0	2.0
Single mother	15.3	11.4	17.9	18.0
Single father	7.1	2.1	5.2	5.6
3-generation household	1.1	1.2	1.0	0.8
Other household	1.7	2.2	1.9	3.7

Note: Poverty gap is the average shortfall from the poverty line, expressed as a percentage of the poverty line. Variable definitions are the same as in Table 2.

Figure 2. Composition of children, defined as income-poor and consumption-poor in 2004.



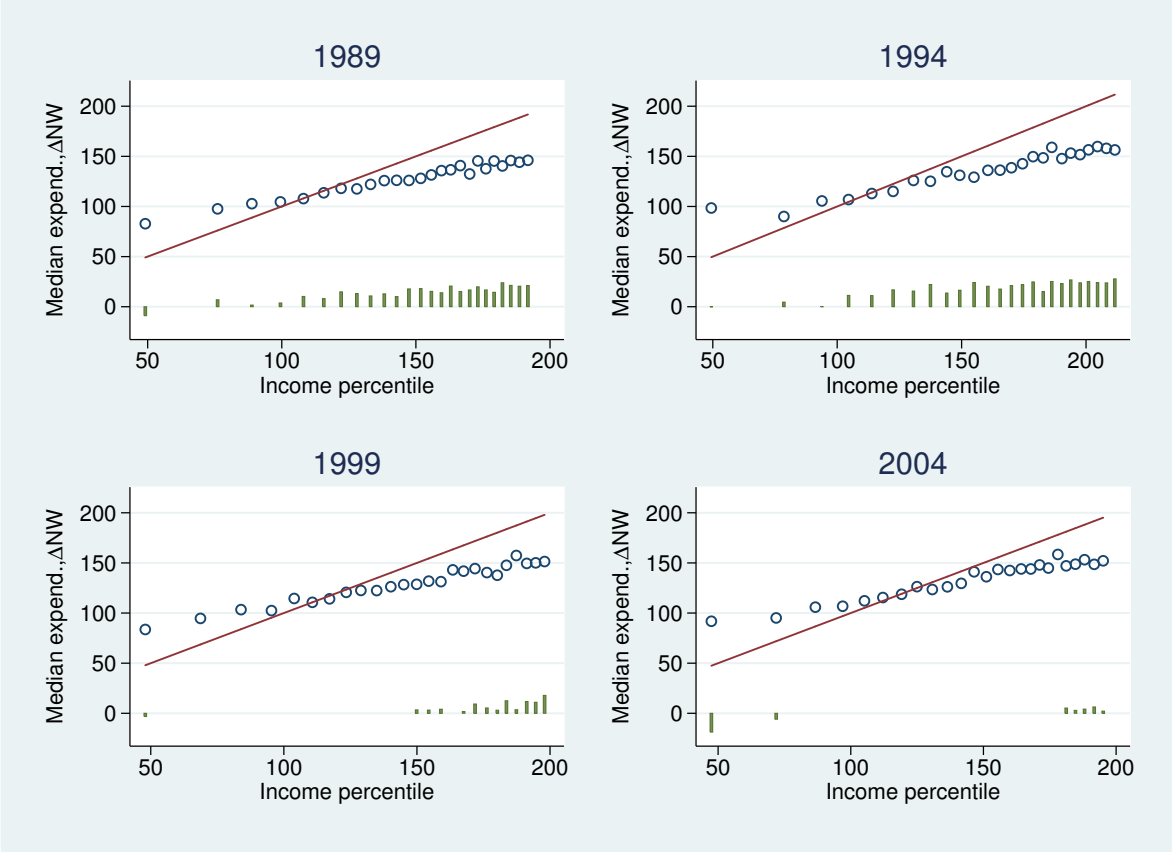
Note: The figure shows the degree of overlap between children, identified as income-poor and consumption-poor in 2004. 'Income' and 'consumption' denote disposable income and non-durable consumption, respectively.

Table 4. Comparison of total consumption expenditures in Japan's System of National Accounts (SNA) and National Survey of Family Income and Expenditures (NSFIE).

Panel A: Comparison with national accounts in 2004			
		Expenditure weights for:	
	NSFIE/SNA ratio	SNA	Poorest 10 percentile
Food and non-alcoholic beverages	1.161	0.139	0.234
Alcoholic beverages and tobacco	0.539	0.027	0.017
Clothing and footwear	1.124	0.034	0.036
Housing, electricity, gas and water	0.954	0.254	0.316
Furniture and household utensils	0.772	0.039	0.036
Medical care	0.842	0.043	0.052
Transportation	0.777	0.106	0.069
Communication	1.038	0.029	0.028
Entertainment and cultural services	0.932	0.102	0.111
Education	1.203	0.023	0.004
Restaurants and accommodation	0.673	0.066	0.039
Other	0.528	0.137	0.059
Total consumer expenditures:			
SNA weights	0.876		
Poorest 10% households	0.942		
Panel B: Comparison with national accounts in 2009			
		Expenditure weights for:	
	NSFIE/SNA ratio	SNA	Poorest 10 percentile
Food and non-alcoholic beverages	1.271	0.139	0.234
Alcoholic beverages and tobacco	0.646	0.027	0.019
Clothing and footwear	1.064	0.034	0.030
Housing, electricity, gas and water	1.131	0.254	0.338
Furniture and household utensils	0.765	0.039	0.038
Medical care	0.860	0.043	0.052
Transportation	0.735	0.106	0.054
Communication	1.089	0.029	0.031
Entertainment and cultural services	1.014	0.102	0.102
Education	1.064	0.023	0.007
Restaurants and accommodation	0.744	0.066	0.034
Other	0.440	0.137	0.061
Total consumer expenditures:			
SNA weights	0.933		
Poorest 10% households	1.034		

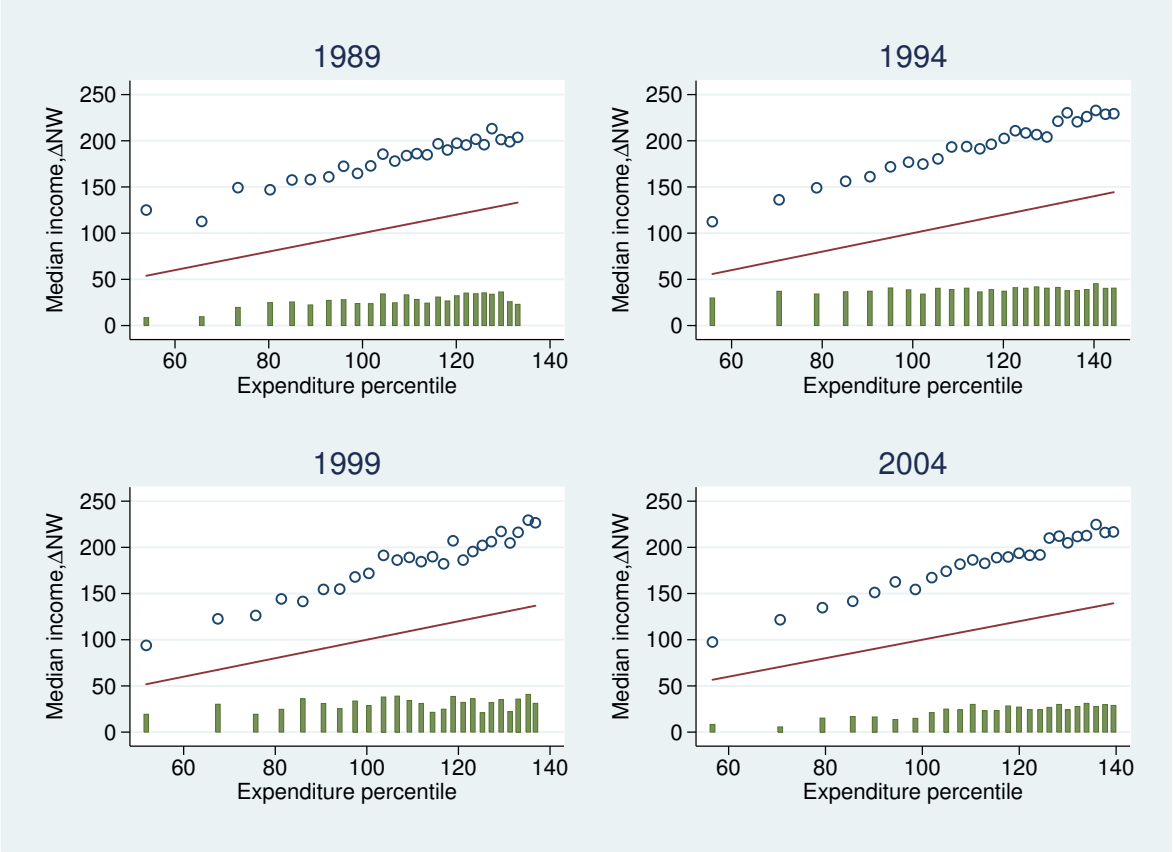
Source: author's calculations, based on Maeda and Umeda (2013) and Sakai (2010).

Figure 3. Median total expenditures and changes in net worth of households by income percentile.



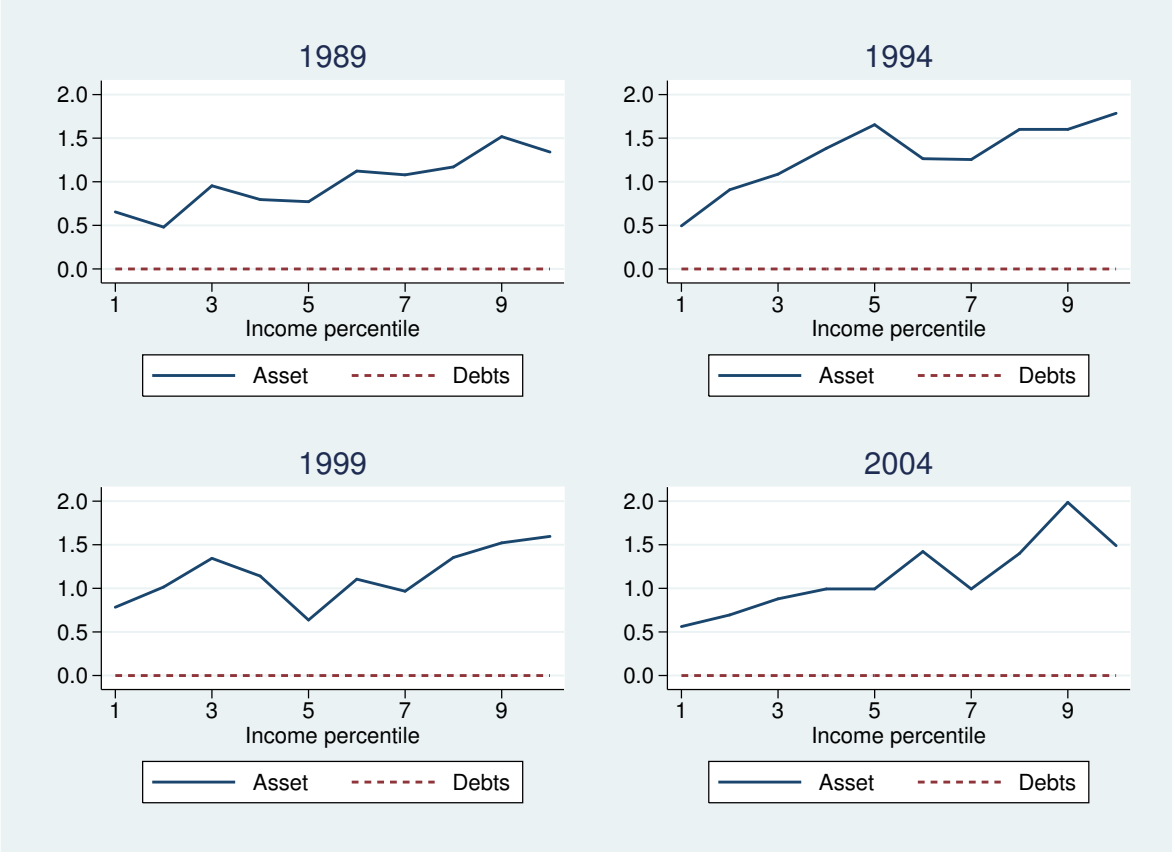
Note: the figure shows median total expenditures and changes in net worth for the bottom 25 percentiles of disposable income. Hollow circles show median expenditures for specific percentile of disposable income. The straight line shows the condition when total expenditures (on axis Y) are equal to disposable income (on axis X). Bar graph shows median change in net worth for a specific income percentile. By accounting identity, change in net worth should be equal to the difference between disposable income and total consumption expenditures (i.e., the difference between the straight line and hollow circle for a specific income percentile). All variables are divided by the number of equivalent adults, and are measured in 2010 prices. The unit of measurement is 1000 yen.

Figure 4. Median disposable incomes and changes in net worth of households by expenditure percentile.



Note: the figure shows median total income and changes in net worth for the bottom 25 percentiles of total consumer expenditures. Hollow circles show median incomes for specific percentiles of expenditures. The straight line shows the condition when disposable income (on axis Y) equals to total expenditures (on axis X). Bar graph shows median change in net worth for a specific income percentile. By accounting identity, change in net worth should be equal to the difference between disposable income and total consumption expenditures (*i.e.*, the difference between hollow circle and the straight line for a specific income percentile). All variables are divided by the number of equivalent adults, and measured in 2010 prices. The unit of measurement is 1000 yen.

Figure 5. Median assets and debt for households at the bottom 10 percentiles of disposable income.



Note: the figure shows household assets and debts, normalized by the number of equivalent adults. The unit of measurement is million yen (in 2010 prices).

Table 5. Income, expenditure, savings and balance sheet flows for households at the bottom 10 percentiles of disposable income.

	Income percentiles									
	1	2	3	4	5	6	7	8	9	10
	1989									
Disposable income	49	76	89	100	108	116	122	128	133	138
Expenditures	83	98	103	105	108	114	118	118	122	126
Saving	-38	-22	-14	-5	0	3	2	11	11	13
d(Asset)	-8	3	0	3	5	6	11	9	6	8
d(Debt)	0	0	0	0	0	0	0	0	0	0
d(RealAsset)	0	0	0	0	0	0	0	0	0	0
d(NetWorth)	-8	7	2	4	10	8	15	13	11	12
Asset (stock)	654	480	954	796	771	1,123	1,080	1,170	1,518	1,341
Debt (stock)	0	0	0	0	0	0	0	0	0	0
Asset coverage	21	26	31	35						
	1994									
Disposable income	49	79	94	105	114	122	131	137	144	149
Expenditures	98	90	106	107	113	115	126	125	135	131
Saving	-44	-11	-13	-2	1	7	5	11	9	18
d(Asset)	-1	1	2	6	10	10	12	16	7	10
d(Debt)	0	0	0	0	0	0	0	0	0	0
d(RealAsset)	0	0	0	0	0	0	0	0	0	0
d(NetWorth)	-2	5	0	11	11	17	16	22	14	16
Asset (stock)	494	908	1,087	1,383	1,654	1,265	1,255	1,601	1,601	1,785
Debt (stock)	0	0	0	0	0	0	0	0	0	0
Asset coverage	9	42	53	57						
	1999									
Disposable income	48	69	84	95	104	111	117	123	129	135
Expenditures	84	95	103	102	115	111	114	121	123	122
Saving	-39	-31	-17	-9	-11	0	4	3	8	12
d(Asset)	-3	0	0	0	0	0	0	0	0	0
d(Debt)	0	0	0	0	0	0	0	0	0	0
d(RealAsset)	0	0	0	0	0	0	0	0	0	0
d(NetWorth)	-3	0	0	0	0	0	0	0	0	0
Asset (stock)	783	1,015	1,344	1,141	637	1,106	967	1,354	1,522	1,596
Debt (stock)	0	0	0	0	0	0	0	0	0	0
Asset coverage	26	35	38	46	26					
	2004									
Disposable income	47	72	87	97	105	112	119	125	131	136
Expenditures	92	95	106	107	112	115	119	126	123	126
Saving	-48	-24	-19	-10	-7	-4	1	-1	7	11
d(Asset)	-21	-8	0	0	0	0	0	0	0	0
d(Debt)	0	0	0	0	0	0	0	0	0	0
d(RealAsset)	0	0	0	0	0	0	0	0	0	0
d(NetWorth)	-20	-6	0	0	0	0	0	0	0	0
Asset (stock)	562	695	879	993	993	1,422	993	1,400	1,986	1,490
Debt (stock)	0	0	0	0	0	0	0	0	0	0
Asset coverage	12	21	37	49	39	60				

Note: the table shows median disposable income, expenditure, saving and balance sheet flows for households at the bottom 10 percentiles of disposable income. Variable *d(NetWorth)* is the net change in net worth of poor households with children, which is decomposed into three contributing factors: (1) net change in financial assets *d(Asset)*, (2) net change in financial debt *d(Debt)*, (3) net purchase of real assets *d(RealAsset)*. *Asset coverage* shows the median number of months, required to cover the income shortfall (namely, negative savings), by running down the stock of available financial assets. Exact variable definitions are provided in *Data Appendix*. All variables are normalized by the number of equivalent adults. The unit of measurement is thousand yen (in 2010 prices).

Table 6. Alternative indicators of well-being at the bottom 5% of income and consumption (households with children, 2004).

	Total	Percentiles of income			Percentiles of consumption			λ	p-value	Favored measure
	sample	0–5	5–100	Difference	0–5	5–100	Difference			
	(1)	(2)	(3)	(4) = (2) − (3)	(5)	(6)	(7) = (5) − (6)	(8) = (7) − (4)	(9)	(10)
Have a vacuum cleaner	99.5	98.8	99.5	-0.7	98.8	99.5	-0.7	0.0	0.994	
Have a washing machine	99.5	99.0	99.5	-0.5	99.0	99.5	-0.5	0.0	0.925	
Have a refrigerator	99.0	97.6	99.1	-1.5	97.7	99.1	-1.3	0.1	0.793	
Have a microwave	98.4	94.7	98.6	-3.9	95.1	98.6	-3.5	0.4	0.548	
Have a color TV	97.4	97.2	97.4	-0.2	96.6	97.5	-0.9	-0.7	0.382	
Have a mobile phone	96.1	90.4	96.4	-6.0	89.6	96.5	-6.9	-0.8	0.439	
Have a video recorder	91.2	80.6	91.7	-11.2	80.7	91.7	-11.0	0.1	0.938	
Have a car (domestic)	90.6	79.5	91.2	-11.8	80.0	91.2	-11.2	0.6	0.693	
Have a CD stereo player	89.9	73.4	90.8	-17.5	71.1	90.9	-19.8	-2.4	0.177	
Have a (digital) camera	88.9	65.2	90.2	-25.0	68.1	90.0	-21.9	3.0	0.082	
Have an air conditioner	88.3	75.9	89.0	-13.1	74.6	89.1	-14.5	-1.4	0.393	
Have a rice cooker	86.8	83.0	87.0	-4.1	83.5	87.0	-3.5	0.6	0.721	
Have a computer	80.6	50.0	82.3	-32.3	48.8	82.3	-33.5	-1.3	0.532	
Have a study desk	78.8	59.1	79.9	-20.8	49.7	80.4	-30.7	-9.9	<0.001	Cons.
Have a sewing machine	74.3	51.6	75.6	-23.9	43.5	76.0	-32.5	-8.5	<0.001	Cons.
Have a house	73.0	26.5	75.5	-49.0	11.3	76.3	-65.0	-16.0	<0.001	Cons.
Have a video camera	72.5	47.9	73.9	-26.0	50.7	73.7	-23.0	3.0	0.131	
Have a plot of land	68.6	38.0	70.2	-32.2	27.3	70.8	-43.5	-11.3	<0.001	Cons.
Have a system kitchen	59.3	21.1	61.4	-40.3	16.9	61.7	-44.8	-4.5	0.018	Cons.
Have a fax	58.9	40.8	59.9	-19.1	36.8	60.1	-23.3	-4.2	0.053	
Have a water heater	55.8	30.9	57.1	-26.2	25.2	57.4	-32.2	-6.0	0.004	Cons.
Have golfing equipment	41.4	14.9	42.8	-27.9	19.1	42.6	-23.5	4.4	0.018	Income
Have a DVD player	34.0	23.0	34.6	-11.6	22.7	34.6	-11.9	-0.3	0.873	
Have a piano	32.0	9.5	33.3	-23.7	6.7	33.4	-26.8	-3.0	0.019	Cons.
Have a dishwasher	24.2	9.7	25.0	-15.3	5.9	25.2	-19.2	-3.9	0.002	Cons.
Have a solar water heater	7.6	3.7	7.8	-4.1	2.1	7.9	-5.8	-1.7	0.035	Cons.
Have a liquid crystal TV	7.0	3.8	7.1	-3.3	3.9	7.1	-3.2	0.1	0.932	
Have a car (imported)	5.4	1.4	5.6	-4.2	1.6	5.6	-4.0	0.2	0.776	
Child in university	3.6	1.3	3.7	-2.4	0.4	3.7	-3.3	-0.9	0.018	Cons.
Have a plaza TV	2.4	1.1	2.5	-1.3	1.0	2.5	-1.5	-0.2	0.709	
Total floor space (m^2)	55.3	37.2	56.3	-19.1	33.3	56.5	-23.3	-4.2	<0.001	Cons.

Note: the table compares income- and consumption-poor households with children at the bottom 5 percent of household distribution. For income and consumption, I used disposable income and non-durable consumption, respectively, with both measures divided by the number of equivalent adults (namely, the square root of total household members). All characteristics are for households, but weighted by the number of children. Total floor space is also divided by the number of equivalent adults. P-values are calculated from 999 bootstrap replications. Preferred measures are listed in column (10) only when the test statistic λ is significant.

Table 7. Alternative indicators of well-being for income-poor and consumption-poor households with children (2004).

	Both income- and consumption-poor	Only income-poor	Only consumption-poor	Neither income- nor consumption-poor	Difference	P-value	Favored measure
	(1)	(2)	(3)	(4)	(5) = (3) − (2)	(6)	(7)
Have a vacuum cleaner	99.0	99.2	99.2	99.6	0.0	0.944	
Have a washing machine	98.9	99.4	99.3	99.5	-0.1	0.727	
Have a refrigerator	97.3	98.5	98.2	99.2	-0.3	0.550	
Have a microwave	94.2	98.1	98.0	98.7	-0.1	0.877	
Have a color TV	97.4	97.7	98.0	97.4	0.2	0.709	
Have a mobile phone	90.0	94.9	93.9	96.7	-1.0	0.290	
Have a video recorder	80.3	88.5	85.8	92.4	-2.7	0.051	
Have a car (domestic)	77.9	89.0	88.7	91.7	-0.3	0.820	
Have a CD stereo player	73.2	84.8	82.5	91.8	-2.3	0.142	
Have a (digital) camera	62.7	80.6	81.9	91.6	1.4	0.408	
Have an air conditioner	73.4	82.4	82.1	90.1	-0.4	0.824	
Have a rice cooker	84.5	83.1	85.2	87.3	2.1	0.164	
Have a computer	42.6	66.2	65.7	85.0	-0.5	0.802	
Have a study desk	53.0	68.6	58.0	82.5	-10.6	<0.001	Cons.
Have a sewing machine	45.3	65.5	56.3	77.9	-9.3	<0.001	Cons.
Have a house	14.7	48.4	24.3	81.5	-24.1	<0.001	Cons.
Have a video camera	45.8	61.7	65.3	75.4	3.6	0.077	
Have a plot of land	29.1	52.6	35.7	74.3	-16.9	<0.001	Cons.
Have a system kitchen	15.3	34.4	26.6	65.9	-7.9	<0.001	Cons.
Have a fax	34.5	55.3	47.0	61.5	-8.4	<0.001	Cons.
Have a water heater	25.6	42.0	30.6	60.2	-11.4	<0.001	Cons.
Have golfing equipment	12.8	25.4	30.2	45.0	4.8	0.011	Income
Have a DVD player	21.5	30.2	27.8	35.5	-2.4	0.210	
Have a piano	6.4	16.8	13.2	35.9	-3.6	0.016	Cons.
Have a dishwasher	6.2	13.3	9.3	27.0	-4.0	0.003	Cons.
Have a solar water heater	1.7	6.3	5.3	8.2	-1.0	0.316	
Have a liquid crystal TV	3.8	3.7	3.6	7.6	0.0	0.960	
Have a car (imported)	0.9	2.7	3.8	5.9	1.1	0.145	
Child in university	0.3	2.7	0.6	4.0	-2.1	<0.001	Cons.
Have a plaza TV	0.8	1.5	0.6	2.7	-0.9	0.043	Cons.
Total floor space (m^2)	33.1	45.0	39.2	58.5	-5.9	<0.001	Cons.
Share of households	5.4	5.5	5.5	84.6			

Note: the table compares characteristics of households that are added to poverty by income- and consumption-based poverty measures. For income and consumption, I used disposable income and non-durable consumption, respectively, with both measures divided by the number of equivalent adults (namely, the square root of total household members. All characteristics are for households, but weighted by the number of children. Total floor space is normalized by the number of equivalent adults. P-values are calculated from t-test that means of two groups (only income-poor" and "only consumption poor") are the same. Preferred measures are listed only when the difference between two group's averages is significantly different, with p-values less than 0.05.

Appendices

A Variable definitions

A.1 Income and consumption

$$
\begin{aligned}
\textbf{Disposable income} = {} & \text{Gross annual income}/12 \\
& - \text{Total taxes} \\
& - \text{Social security contributions} \\
& + \text{Imputed rent from owner-occupied housing}
\end{aligned}
$$

$$
\begin{aligned}
\textbf{Total consumption expenditures} = {} & \text{Total living expenditures} \\
& + \text{Imputed rent from owner-occupied housing}
\end{aligned}
$$

$$
\begin{aligned}
\textbf{Non-durable consumption} = {} & \text{Food} \\
& + (\text{Housing} - \text{Rents for dwelling and land}) \\
& + \text{Fuel, light and water charges} \\
& + (\text{Furniture and household utensils} \\
& - \text{Household durables} - \text{Interior furnishings} - \text{Bedding}) \\
& + \text{Clothing and footwear} \\
& + \text{Medical care} \\
& + (\text{Transportation and communication} \\
& - \text{Purchase of vehicles and bicycles}) \\
& + \text{Education} \\
& + (\text{Culture and recreation} - \text{Recreational durable goods}) \\
& + \text{Other consumption expenditure} \\
& - \text{Transfers to outside the household}
\end{aligned}
$$

A.2 Household balance sheet

Total change in net worth $[d(NetWorth)]$ = Change in net financial assets $[d(Asset)]$
$-$ Change in net financial debt $[d(Debt)]$
$+$ Change in real assets $[d(RealAsset)]$

Change in net assets $d(Asset)$ = (Savings deposit - Savings withdrawal)
$+$ (Insurance premium payments – Insurance proceeds)
$+$ (Purchase of securities - Selling of securities)

Change in net debt $d(Debt)$
$=$ (Increase in debt for houses and land – Payment of debt for houses and land)
$+$ (Purchase with installment credit – Payment of installment credit)
$+$ (Increase in other debt – Payment of other debt)

Change in real assets $d(RealAsset) =$
Real properties purchased – Real properties sold