母親の就労状況別　子どもの貧困率（2012）
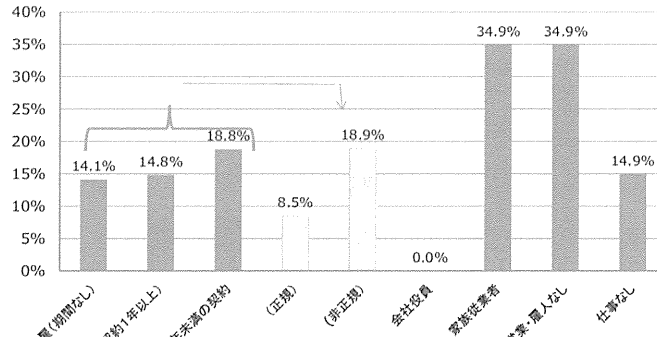

注：（正規・非正規）の区分は、一般常雇（期間定めなし、契約1年以上、1月以上1年未満の契約、日々または1月未満の契約）の雇用者を、勤め先での呼称別に区分し集計したもの。正規は「正規の職員・従業員」、非正規は「パート、アルバイト、派遣職員、契約職員、嘱託、その他」。
「日々または1月未満の契約」については、サンプル数が少ないため貧困率は集計していません。

雇用者の中では契約期間による違いはそれほどない。一般常勤雇用であっても、子ども全体の平均を若干下回る程度。
母親が正規雇用であると、子どもの貧困率は低くなるが、その影響は父親の正規雇用に比べ小さい。
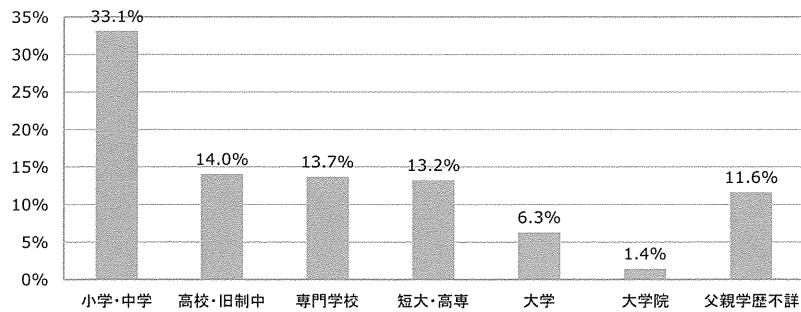母親が非正規雇用であっても、父親の非正規雇用の場合に比べ、貧困率は低い。
母親が「仕事なし」の時の貧困率リスクは、一般常雇の場合と殆ど変らない。
家族従業員、自営業（雇用人なし）の貧困率は男性と同様に突出して高い。

出所：「阿部彩（2014）「相対的貧困率の動向：2006, 2009, 2012年」貧困統計ホームページ　（www.hinkonstat.net）

父親の学歴別　子どもの貧困率（2012）

父親の学歴別　相対的貧困率

父親の学歴別では、小・中学校卒の父親を持つ子どもの貧困率が突出して高い。
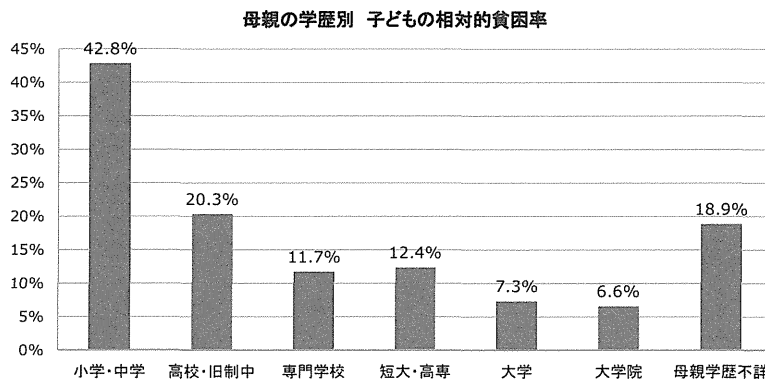高校・旧制中、専門学校、短大・高専では、殆ど変わらない。
大学卒では6．3％、大学院卒では1.4％と貧困率は低くなる。

出所：「阿部彩（2014）「相対的貧困率の動向：2006, 2009, 2012年」貧困統計ホームページ

母親の学歴別　子どもの貧困率（2012）

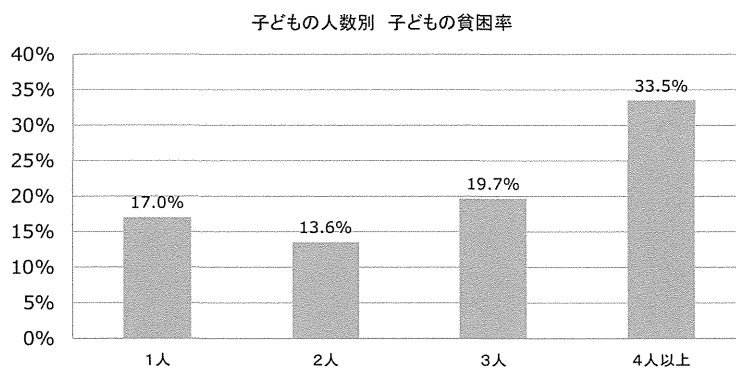**母親の学歴別　子どもの相対的貧困率**

母親の学歴別では、小・中学校卒の母親を持つ子どもの貧困率が特に高く（42.8％）、これは父親が小・中卒の場合よりもさらに高くなっている。
高卒（旧制中卒）の場合は、20.3％と中卒に比べ半減するものの、依然として高い数値。
専門学校、短大・高専では、高卒よりも低い貧困率となっており、母親の学歴の方が、父親の学歴よりも、それが与える子どもの貧困率の差より大きい。
大卒、大学院卒は、共に、低い貧困率（約7％）となっている。

出所：「阿部彩（2014）「相対的貧困率の動向：2006, 2009, 2012年」貧困統計ホームページ

子どもの人数別　子どもの貧困率

子どもの人数別　子どもの貧困率

注：　世帯内の20歳未満の人数別

子どもの貧困率は子どもが4人以上の世帯にて特に高い
子どもの数が2人の世帯の貧困率が最も低い

Child poverty in Japan:
comparing the accuracy of alternative measures

Oleksandr Movshuk*

Department of Economics, University of Toyama,

3190 Gofuku, Toyama, 930-8555, Japan

E-mail: movshuk@eco.u-toyama.ac.jp

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Abstract

In this paper I compare alternative indexes of child poverty in Japan, which are based on either household income or consumption. 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. The paper considered three explanations for the difference: 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 rates of consumption-based poverty are primarily due to the income under-reporting, with less evidence for consumption over-reporting and for consumption smoothing. Finally, the paper compared income- and consumption-based poverty measures in their ability to identify households with lower material well-being (measured by the inability to own a house or the lack of major household appliances). Out of 27 indicators of material well-being, consumption was always superior to income in identifying disadvantaged households with children, with nearly all cases statistically significant.

1 Introduction

For a long time, the problem of child poverty was downplayed by the government in Japan. In consequence, the first official estimate of child poverty rate was made only in 2009, even though household data to calculate the estimate had been available over decades. The poverty problem turned out particularly serious for Japanese children, for whom poverty rate turned out among the highest among developed countries.

The situation has hardly improved in subsequent years. According to the latest official estimate, the child poverty rate was 16.3 percent, which puts Japan well above the median poverty rate for children among OECD countries (12.3 percent, according to OECD (2014)). Moreover, the child poverty rate is not only high in international comparisons, but also keeps on growing over time. In 1985, child poverty rate 10.9 percent, which put Japan only slightly above the median level for OECD countries in mid-1980s (9.8%).

In contrast to the delayed official recognition of child poverty, a number of academic studies examined the severity, causes and negative consequences of child poverty in Japan (Abe, 2008, 2014). It was common to define child poverty by low incomes, and less attention was paid to alternative measures of household resources (such as consumption or wealth). Exceptions to this general trend are Ohtake and Kohara (2011), 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. Compared with previous studies, the paper makes three novel contributions. First, it confirms previous results of Ohtake and Kohara (2011) that consumption-based measures of child poverty are consistently lower compared with income-based measures, and the result holds with various alternative definitions of income and consumption.

Second, the paper evaluates empirical evidence for three possible reasons why the income-based and consumption-based poverty indexes could diverge, and concludes that the divergence is mostly due to the under-reporting of income compared with over-reported consumption expenditures or consumption smoothing. The paper's result contradicts

Ohtake et al. (2013), who claimed 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". The paper demonstrates that the consumption-smoothing behavior is unlikely among poor households with children, and provides evidence that income under-reporting is more likely to inflate income-based indexes of child poverty. The finding for Japan agrees with previous studies by Meyer and Sullivan (2003, 2011) for the United States, Brewer et al. (2006); 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 among the poor households.

Third, the paper examines distinctive features of households with children that were either income-poor or consumption-poor, and compares the incidence of other indicators of material well-being (such as the availability of various household appliances, land and house ownership, and the possibility to have a child studying in university). In this comparison of material well-being of income- and consumption-poor, I used two tests that were proposed by Meyer and Sullivan (2003, 2012a). Though these tests are not strictly comparable, both of them consistently indicated that consumption was better in identifying households with worse material conditions. Out of 27 indicators of material well-being, consumption was always superior to income in identifying disadvantaged households with children, with nearly all cases statistically significant.

2 Income and consumption as alternative measures of living standards

While income continues to be most widely used for measuring poverty, a number of conceptual and practical reasons exist why consumption could be a better measure of well-being. Income and consumption could be different in two cases: when households save a

part of their incomes, or when they smooth consumption in response to a temporal drop in income by running down their assets (or piling up new debts). The second case is at the center of permanent-income hypothesis, which asserts that consumption is more closely related to life-long resources, while income is more volatile in response to short-term shocks that people try to smooth out. 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".

More recent studies compared measurement errors in income and consumption among poor households, and found that the measurement error could be particularly severe for income, with reported incomes often much lower than expenditures among income-poor households. For example, Sabelhaus et al. (2014), Attanasio et al. (2006) and Fisher et al. (2012) found that living expenditures were twice as high as reported incomes for the bottom percentiles of income-poor, with no evidence that such households had sufficient assets or debt that could 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.

3   Data and definitions

Household data for this paper were taken 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 the paper uses household data from four waves of the survey (1989, 1994, 1999, and 2004). The dataset included information for all households, and I could replicate publicly-released descriptive statistics for household incomes, expenditures and balance sheets of surveyed households.

The NSFIE is conducted from September to November for multiple-person households, while single households are surveyed in October and November. A particular feature of the survey is the lack of recall period, so income and expenditure typically refer only to the

survey period. In consequence, consumption data need to be seasonally-adjusted to refer for the whole year. Moreover, monthly income data are of little use, because they do not include bonus payments that are paid outside of the survey period (namely, in July and December).

The survey gathers data from about 60 thousand households, and collects exceptionally detailed information on their living conditions, including income, consumption expenditures of a large number of goods and services, the stock of financial assets and liabilities, changes in the balance sheet of households over the preceding year, and the ownership of various household durables.

In subsequent subsections, I explain definitions of major variables, discuss major data adjustments, and explain in more details the data-cleaning process.

3.1 Poverty indexes

To get comparable estimates to previous studies of child poverty in Japan, the headcount poverty rate was defined as one-half of median income (or consumption). Poverty gap was defined as the amount of money, which is needed to raise all poor children up to the poverty line, and was measured in percent of disposable income or consumption. 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.

Both headcount poverty rate and poverty gap are expressed in percent, and could be calculated with nominal data. When nominal data had to be converted to real terms, I used the consumer price index with the base in 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. The same age is used in calculations of the official child poverty in Japan, allowing the comparison between the paper's estimates of child poverty rates with the official figures.

3.3 Variables

Variable definitions broadly followed the ones used by Hayashi (1997) and Lise et al. (forthcoming). Disposable income was 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 and Zaidi (1999), consumption expenditures and non-durable consumption did not include remittances to other households. Exact formulas are provided in *Data Appendix* (sub-section A.1).

3.4 Data adjustments

As already mentioned, most data in the NSFIE do not refer to the full calendar year, but to the survey period (two months for single households, and three month for multiple-person households). While the survey collects data for gross annual income, consumption expenditures refer only to the survey period. To remove the impact of seasonal factors, I calculated seasonal adjustment coefficients for 10 major categories of consumption expenditures, using comparable consumption categories from the Family Income and Expenditure Survey (FIES). Unlike the NSFIE, the FIES is conducted monthly, and the survey's reports contain aggregate data for the whole calendar year. While household coverage of these surveys is not strictly comparable, they are broadly similar in the coverage of workers' households. Following Hayashi (1997) and Lise et al. (forthcoming), I calculated

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[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.

seasonal coefficients of 10 major consumption categories in FIES and NSFIE for 1989, 1994, 1999 and 2004, and used them to extrapolate the NSFIE data to the whole calendar year.

3.5 Missing data

The NSFIE data does not contain information for taxes and social security (SS) contributions for the category of 'other households' (which mostly include self-employed individuals and executives). For earlier two waves of the survey (1989 and 1994), the tax and social security information was fortunately available, so that the problem needed to be solved for the remaining two waves of the survey (1999 and 2004).

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

Second, I imputed the rate of taxes and SS contributions, using income, tax and SS data for 'other households' in 1989 and 1994. Specifically, the rate of tax payments and SS contributions was regressed on the following explanatory variables: annual income, gender, age of household head, region of residence, and a year dummy for 1989. To avoid unrealistic tax rates, I restricted them to remain in the interval between 0 and 1, using the predictive mean matching imputation method (provided by pmm option in STATA's impute command).

To check the accuracy of the imputation procedure, I also applied the procedure to NSFIE waves in 1989 and 1994, and then compared imputed and actual data for disposable incomes. The match turned out very close, with the Spearman rank correlation 0.9927 for 1989, and 0.9947 for 1994.

3.6 Data cleaning

The initial dataset contained information on 241,797 households, and contained a number of unreliable observations. Table 1 describes major steps in cleaning up the initial dataset. First, I omitted households that were flagged to have unreliable incomes. Second, I omitted households with either negative or zero values of either total consumption expenditures,

and non-durable consumption[2]. Third, I dropped households with married household head who was younger than 18 years old. The final sample size contained 234,038 households, with the largest reduction in the sample size due to households with unreliable income information.

4   Results

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

Figure 1 (Panel A) displays changes in the income-based poverty rate for children, and compares it with the official poverty rate, calculated from the Comprehensive Survey of Living Conditions (CSLC). Previously, Ohtake and Kohara (2010) estimated the poverty rate for the total population, and found that the rate was lower with the NSFIE data compared with the CSLC data. Similarly, the difference between poverty rates in Figure 1 was 5.2 percentage points in the late 1980s, and then decreased to 3.3 percentage points in mid-2000s.

According to Ohtake and Kohara (2011), this difference could be attributed to using very detailed family account books in the NSFIE, which record expenditures for a large number of goods and services. In contrast, CSLC asks households to give a rough estimate of their total living expenditures, with no family account books used in the survey. In consequence, both rich and poor households tend to be under-represented in the NSFIE, due to the high opportunity cost of rich households, and the inability of poor household to afford keeping the family account books.

To check this explanation, I compared poverty lines from the two surveys, and show them 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 be similar. Panel B shows that the two poverty lines are very close, and virtually coincide in 1989, 1994, and 1999.

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[2] While disposable income was also negative for a small number of households, I kept them in the sample, because in contrast to negative consumption, negative disposable incomes were easier to explain. Typically, these cases due to unusually large tax payments that were not related to incomes, but presumably reflected tax liabilities after receiving unusually large bequests. Overall, there were only 77 cases of negative disposable incomes, representing a minuscule part of the total sample.

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, while Panel (B) reports poverty rates for different family types. 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 child poverty rates, with rise from 4.5 percent in 1989 to just 5.2 percent in 2004. Poverty rates from non-durable consumption were in the intermediate range, and once again indicated increasing 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, with identical poverty rates in 1989, 1994, and 1999, and a difference of just 0.1 percentage point in 2004. Due to the small discrepancy between alternative imputations of disposable income, subsequent results will refer to the first imputation of disposable income.

Panel B of Table 2 shows child poverty rates for major family types. When measured by disposable income, the poverty rate was highest for single mothers, at around 45 percent, with a one-time drop to 33.9 percent in 1994. Conversely, the lowest poverty rate was in three-generation households, with only 5.0 percent of poor children in 2004. Families with both parents had intermediate levels of child poverty, at around 9 percent. For other measures of resources, the ranking of poverty rates remained the same across family types, with single mothers consistently having the highest poverty rates, followed by single fathers and by families with both parents, while the lowest child poverty was in three-generation households.

Table 3 reports child poverty with a different index of poverty (poverty gap), and similarly to Table 2, compares poverty estimates with different definitions of household resources. 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. While the poverty gap for these two measures increased over time, its magnitude

was less pronounced than for disposable income, by only 0.2 and 0.6 percentage points, respectively.

The choice of different resource measures resulted not only in different rates of child poverty, but also in significant differences which children were identified as poor. Figure 2 illustrates the difference between income- and consumption-poor in 2004. As shown in Panel (A) of Table 2, the income-based poverty rate was 10.4% percent, while it was 7.6% with non-durable consumption. Figure 2 shows that the overlap between these two resource measures was only partial, with only 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 the choice which children are classified as poor.

Given the large mismatch between the composition of income- and consumption-poor, two questions needs to be answered: 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 considered superior for identifying children in material need? Possible answers to the first question will be examined in Section 5, while Section 6 will consider the ability of income- and consumption-based poverty measures to identify children with worse material conditions.

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

The difference between income- and consumption-based measures of poverty is a common finding, with consumption-based poverty typically smaller compared with income-based poverty. Three possible explanation has been suggested for the difference: measurement errors in either income and consumption, or consumption smoothing in response to negative income shocks (Meyer and Sullivan, 2012b; Brewer et al., 2013). To have consumption poverty less than income poverty, the measurement error should have specific patterns: either incomes are under-reported (which would inflate the number of income-poor, or

consumption expenditures are over-reported (which reduces the number of consumption poor). Consumption smoothing also should be in particular form, with households either reducing their assets, or running up new debts. The the rest of this section, I will consider evidence for each of these alternative 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 scarce evidence that household consumption could be over-reported. In fact, the opposite is a common finding in studies that compared consumption expenditures in household surveys with the corresponding aggregates from the national accounts. Barrett et al. (2014) made such a comparison for Australia, Canada, the United Kingdom and the United States, and found that households typically substantially under-reported their consumption expenditures compared with the national account aggregates, with only Canada having a close match between the two expenditure measures. In other three countries, the expenditure shortfall in household surveys became even larger over time, and has approached 30 percent in recent years.

Similar comparisons for Japanese household expenditures were reported by Sakai (2010) and Maeda and Umeda (2013), who examined NSFIE data in 2004 and 2009, respectively. Both studies found that consumption expenditures were under-reported in Japan as well. For example, the shortfall for total consumption expenditures was 12.1 percent in 2004, and 6.8 percent in 2009.

Moreover, the mismatch with national account is likely to be even smaller for the poor households, because their major expenditure categories (on food, housing and recreation) had smaller mismatch with national accounts. Using expenditure weights for households in the first income decile, I re-calculated the difference between total expenditures between NSFIE and national accounts. In 2004, the expenditure shortfall diminished from 12.1 to 5.8 percent, while in 2009, the initial shortfall of 6.8 percent turned into surplus of 3.4 percent. In both cases, use of expenditure shares for the poorest households resulted in even better match between expenditures in NSFIE and national accounts.

5.2 Under-reporting of income

In contrast to the measurement error in consumption, there is considerable evidence that poor households are likely to under-report their incomes. Such evidence was is available for the United States (Meyer and Sullivan, 2012b), the United Kingdom (Brewer et al., 2006), and Canada (Brzozowski and Crossley, 2011). 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 lowest 20 income percentiles. For each percentile group, median expenditures are plotted by dots, starting from the lowest percentile of income 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 presented in 2010 prices. At the lowest income percentiles, there is a remarkable stability in consumer expenditures, at around 100 thousand yen per equivalent adult. For the lowest income percentiles, the level of expenditures greatly exceeds the reported income per equivalent adult, with the income deficit equal to the difference between the straight line and hollow circles. In each panel, the income deficit is the largest for the first income percentile, at around 30,000 yen per month in 1989, and then increases to around 50,000–60,000 yen per months in subsequent surveys. To finance this income shortfall, households need to run down their assets or increase their debts in a sustainable way. If households are not using their balance sheets to fill in the income shortfall, this will provide evidence for income under-reporting among households. In next subsection, I will examine evidence whether the poorest households were using their balance sheets to finance the shortfall in their incomes compared with expenditures.

5.3 Consumption smoothing by reducing assets or running-up debt

There are three pieces of evidence that consumption smoothing was unlikely among the poorest households by income. The first one refers to the flow measure of household

balance sheets, the real 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. In strict 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 lowest income percentiles were not matched by reduced net worth of households. The negative change in net worth could be observed for the lowest two income percentiles in 1999 and the lowest three percentiles in 2004, but in both years the reduction in net worth was much smaller than the income shortfall. For example, the income shortfall for the first income percentile in 2004 was 44 thousand yen per month, which was almost double of the negative net worth for this poorest income group (27 thousand yen). In all other groups with the income shortfalls, changes in net worth were never sufficient to financing these income shortfalls.

The second piece of evidence that consumption-smoothing was unlikely among income-poor households comes from their stock of financial assets and debts. Figure 5 shows the median levels of household assets and debts for the bottom 10 percentiles of income-poor households. The picture is clearest for households debt: with no exception, the income-poor households had zero stock of debts. As for the stock of household assets, it was also insufficient to support sustainable income deficits compared with expenditures, especially for the lowest income percentiles. For example, the median assets of the lowest income percentile in 2004 was 562 thousand yen, compared to the income shortfall for this household group of 44 thousand yen (Table 5). For household groups with income shortfalls, I calculated their asset coverage, defined as the number of months that households could finance their income shortfalls from their asset stocks. For example, the median asset coverage for the first income percentile was 13 months in 2004, and was even lower in previous years. 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 parts: (1) change in financial assets, (2) change in financial liabilities (with the minus sign), and

(3) change in real assets[3]. Table 4 reports changes in the constituent parts of the net worth. The balance sheets of the poorest households changed mostly through net financial assets. Conversely, in agreement with zero stocks of financial debts, the poorest households did not engage in running up new debts, or in net purchases of real assets. For the latter two components, the median net change was zero in all four NSFIE cross-sections. As for the net financial assets, they did not change much in 1989 and 1994, and turned into negative values in 1999 and 2004, but were much lower than the difference between the reported expenditures and incomes. Overall, both the stock and flow measures of balance sheets of the poorest households are in wide disagreement with the amount of income deficit for income-poor households, indicating little scope for any sufficient consumption smoothing activity.

To compare the reliability of expenditure data for the poorest households, I repeated the same comparison of disposable income and expenditures, but this time — for the bottom 25 percentiles of consumption-poor households. For these groups of households, I calculated the median disposable income, and results are shown in Figure 4. Similarly to Figure 3, the straight line indicates the condition when disposable incomes are equal to consumption expenditures, with no saving or dissaving activity.

In contrast to income-poor households, no percentile of consumption-poor households has an income shortfall, with median incomes always above 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 agreement with the difference between their incomes and expenditures, with positive savings matching positive increases in net worth.

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

This section provides additional evidence that income is an inferior measure of child poverty in comparison with consumption. While the previous section discussed the possi-

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

bility of income under-reporting among households with children, this section will point at another problem with income-based poverty measures: their relative failure to identify households with low material standards of living, associated with owning a house, a plot of land or a car ownership, the availability of various consumer appliances and amenities (such as air conditioners, refrigerators, computers, television, digital and video cameras), and the chance to have a child study in university.

I use two tests to identify whether income or consumption is better in identifying households with worse material conditions by alternative measures of material well-being. 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 with relatively high incomes includes the rest of households. Let these two groups be denoted by Inc_{low} and Inc_{high}.

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

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

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

To study whether it is income or consumption that identifies better the material hardship in living conditions, the test uses a difference-in-difference statistic

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

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

Table 7 reports results of applying the test to NSFIE data in 2004. The first column shows characteristics of income-poor households, while income-rich households are described in second column. The third column shows the difference between income-poor and income-rich households. In total, the table reports comparisons for 27 characteristics of living conditions. They mostly included various consumer durables (system kitchen, solar water heaters, water heaters, etc.), house and land ownership, and the possibility that a child is currently a university student. For all of these characteristics, the difference between Inc_{low} and Inc_{high} households is always negative (as shown in column 3), though the difference is just -1.3 percentage points for some widely-used durables (such as vacuum cleaners and TV).

The similar comparison is done for consumption-poor and consumption-rich households in columns (4) and (5). Once again, the difference in column (6) is always negative. Most notably, the test statistic λ is negative in cases, indicating that non-durable consumption is a better predictor of relatively worse living conditions compared with income. To evaluate the statistical significance of λ, I re-sampled the household data by bootstrap sampling, and calculated the empirical distribution of λ for specific household characteristics. Then using this empirical distribution, I calculated empirical p-values for specific for of λ, and report them in column (8) of Table 7.

Consider results for the ownership of system kitchen, which are shown in the first row of Table 7. The λ statistic was -7.1 percentage points, and its bootstrap p-value was less than 0.001, indicating a highly significant result for this household characteristics. Overall, in only 4 comparisons the test produced insignificant results, with p-values above the significance level of 0.05. In other cases, the consumption-poor children were living in households with lower availability of various consumer durables, and such households were less likely to own a plot of land or a house, while their living space was more limited, by 6.6 square meters per equivalent adult. Finally, consumption-poor households had

lower probability of having a child, studying in university, and the difference with income-poor households was highly statistically significant.

The second test was proposed by Meyer and Sullivan (2012a). The test compares characteristics of households that are added to poverty by either income-based or consumption-based poverty measures. The test begins by fixing a baseline poverty cutoff, such as 9.9% of poor children in 2004 when measured by disposable income (as reported in Table 2). Then the same poverty cutoff is applied to a consumption-based household data. The same cut off is used to ensure that differences in household characteristics do not emerge from looking at different cut-offs in the distribution of income or consumption. With the same number of people classified as either income- or consumption-poor, some 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 poverty households with *less* ownership of consumer durables, and other similar indicators of enhanced material well-being. In particular, consumption would have advantage over income if the third group of "only consumption-poor" have lower materials 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 the second and third 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 test to the same 27 measures that includes the availability of various consumer durables, the ownership of land and housing, and the probability of having a child studying in a university. Test results are shown in Table 6. Consider the availability of system kitchen, shown in the first row. For households that were both income- and consumption poor, only 12.2 percent owned system kitchens (as shown in column (1)). In contrast, households who were neither income- nor consumption-poor, 62.7 percent had the household amenity (column (4)). The group of "only income poor" has households that

are added to the poor by income (but not by consumption). In this group, the availability of system kitchens was 30.9 percent (column (2)). In contrast, the availability of system kitchens was lower for consumption-poor households, at 23.0 percent (column (3)). The difference of -9.9 percentage points between income-poor and consumption poor households implies that consumption was a better indicator of worse material conditions, with p-value less than 0.001.

Overall, the difference between income- and consumption-poor households was negative in all 27 indicators of well-being. Moreover, the difference turned statistically significant in 25 cases, with p-values exceeding the significance level of 0.05 for only solar water heaters and video cameras.

In summary, even though the first and second tests are not comparable in their specifications, their results in comparing income- and consumption-based poverty measures were broadly comparable. Consumption was always a better indicator of worse material conditions among households with children, and in nearly all the cases the result was statistically significant. These results are remarkably similar to findings by Meyer and Sullivan (2003, 2011, 2012a) and Brewer et al. (2013), who examined poverty rates for all households in the United States and the United Kingdom, respectively. The results presented in this paper for Japan gives further empirical evidence about the overwhelming superiority of consumption for identifying the truly disadvantaged households, including, in particular, 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 for other developed economies, consumption-based measures indicated less child poverty compared to income-based measures. To explain the difference across alternative definitions of household resources, the paper examined three alternative hypothesis (over-reporting of consumption, under-reporting of income, and consumption-smoothing behavior), and concluded that the lower rates of consumption-based poverty occurred because of the income under-reporting among the poorest households. While similar results were reported for poor households