Child poverty in Japan: comparing the accuracy of alternative measures

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Outline

Alternative resource measures of poverty

- Poverty can be evaluated with different resource measures, such as:
  - Disposable income
  - Consumption (either total expenditures or only non-durable expenditures)
  - Net worth
- Income continues to be the most often used measure of poverty
- But for several reasons, consumption may be a better measure of poverty

Advantages of using consumption as a poverty measure

Theoretical advantage

According to the permanent-income hypothesis, it is consumption that reflects the life-long resources of households. With short-term income shocks, households could smooth-out their consumption by borrowing. Income in this case would underestimate the true living conditions

Practical advantage

Compared with income, consumption could have a smaller measurement error, especially among poor households (Meyer and Sullivan (2012a, 2012b), Brewer and O'Dea (2012))

Related literature I

- Cutler and Katz (1992, 1993) draw attention to the conceptual advantages of consumption for measuring poverty
- Using the U.S. household data, they discovered that the poverty rate with consumption was lower than poverty rates with income
- The finding has been repeatedly replicated for:
  - the United States (Meyer Sullivan (2012b))
  - the United Kingdom (Brewer et al. (2006))
  - Canada (Brzozowski and Crossley (2011))
  - Japan (Ohtake, Kohara (2011,2013))

Related literature II

- To explain the lower rates of consumption-based poverty, three possible explanations were proposed in the literature (Meyer, Sullivan (2012b), Brewer et al. (2013)):
  1. Under-reporting of incomes (which would inflate the number of income-poor households)
  2. Over-reporting of consumption expenditures (which would reduce the number of consumption-poor households)
  3. Use of financial assets or debt to smooth household consumption in response to negative income shocks. If this explanation is correct, households should run down their financial assets, or add new debts

Related literature III

- Meyer, Sullivan (2012b) and Brewer et al. (2013) examined these possible explanations with the U.S. and U.K. data, respectively, and found empirical support for the first explanation (*i.e.*, income under-reporting)
- For Japanese data, Ohtake and Kohara (2011,2013) mentioned the possibility of consumption smoothing among poor households, but did not examine the explanation empirically
- In this paper, I will compare child poverty rates in Japan according to income and consumption, and examine which of these measures is superior for identifying materially-disadvantaged children

Data

- I used household data from the National Survey of Family Income and Expenditure (NSFIE)
- The survey collects data from a representative sample of around 50,000 Japanese households
- Data include detailed information on household members, their income sources, numerous expenditure categories, the stock and flow of household balance sheets, etc., etc.
- Probably, the most detailed household survey in the world
- I used data from 4 waves of the NSFIE (1989, 1994, 1999, and 2004)

Sample size

Table: Change in the sample size with data cleaning

1. Original sample size	192,599
2. Less: households, marked for unreliable income information	189,107
3. Less: households with negative income or consumption	189,036
4. Less: households with zero income or consumption	189,035
5. Less: household with married household head, younger than 20 years old	188,679

Variables and definitions

- Resource measures
  1. Disposable income (total income from all sources less taxes and social security contributions)
  2. Total consumption expenditures
  3. Non-durable consumption (i.e., total consumption less durable categories)
- Child poverty rate was the share of children who lived below the poverty line
- Poverty line was 50% of median equalised income/consumption
- The equivalence scale was the square root of household size

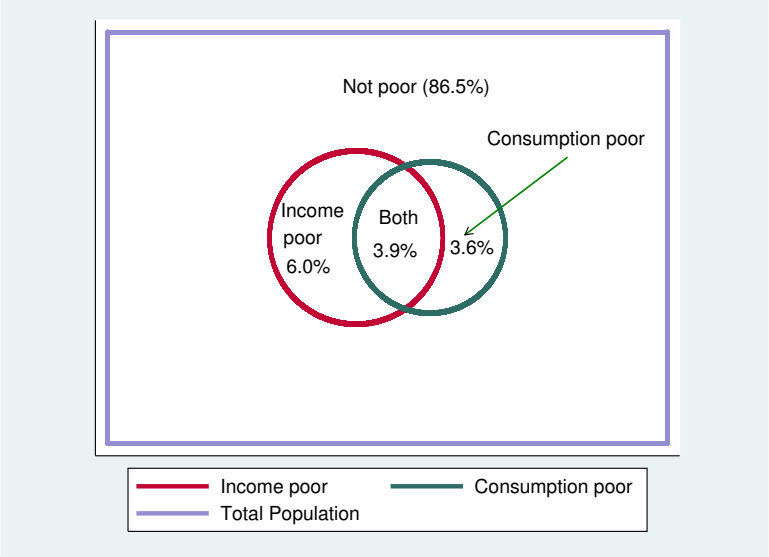
Child poverty rate with different measures of household resources

	1989	1994	1999	2004
Child poverty rate for all families				
Disposable income	7.4	8.1	9.5	9.9
Consumption spending	4.2	4.9	5.5	5.0
Non-durable consumption	4.9	6.3	7.6	7.5

Child poverty rate for major family types

	1989	1994	1999	2004
	Disposable income			
Both parents	7.2	7.9	9.1	8.7
Single mother	46.3	32.5	44.5	43.4
Single father	22.8	9.6	10.5	21.7
Multi-generation	5.2	5.0	4.7	4.0
Other families	6.6	8.8	6.8	12.7
	Consumption spending			
Both parents	3.5	4.5	4.9	4.1
Single mother	19.0	15.9	23.1	20.8
Single father	13.5	9.1	4.5	9.6
Multi-generation	3.9	3.8	3.8	2.9
Other families	7.3	7.6	7.9	9.0
	Non-durable consumption			
Both parents	4.9	6.6	7.8	7.1
Single mother	27.5	21.4	29.9	27.4
Single father	13.5	11.6	9.2	19.9
Multi-generation	2.9	3.0	2.7	2.1
Other families	5.9	6.1	6.7	9.1

Figure: Composition of children, defined as income-poor and consumption-poor (2004)



Summing up

- In agrement with previous studies, consumption-based poverty was lower than income-based poverty
- The composition of children who were income- or consumption-poor showed only small overlap
- Depending on which resource measure is used, different children are classified as poor
- Which of three possible explanations could explain the difference in estimated poverty rates?

Evidence for consumption over-reporting

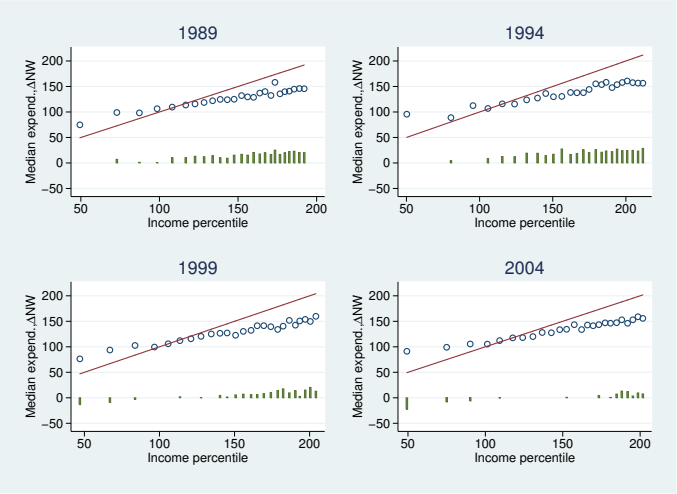
Table: Comparison of the total consumption expenditures in Japan's System of National Accounts (SNA) and the National Survey of Family Income and Expenditures (NSFIE) in 2004

		Expenditure weights for:	
	NEFIE/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**		
Weights for the poorest 10% households	**0.942**		

Evidence for income under-reporting

- To examine income under-reporting in Japan, I divided households with children into 100 sub-groups (percentiles) by equalised disposable income, and calculated the median income and expenditures for each of these groups
- With no borrowing and (dis)saving, expenditures and disposable incomes should be equal (this condition is shown by the straight line)

Figure: Median consumer expenditures and changes in net worth at the lowest 25 percentiles of disposable income

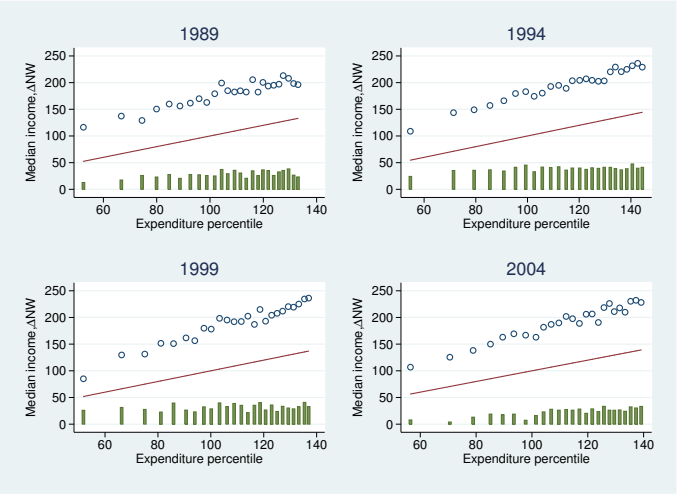


Note: the straight line indicates the equality of expenditures (on axis Y) to income (on axis X). Unit of measurement: thousand yen, in 2010 prices

Evidence for income under-reporting

- Up to the 3rd percentile of income, median expenditures exceeded disposable income
- By accounting identity, the extra expenditure over income should be matched by negative net worth. In most cases, the match is not observed
- Remarkably, Brewer at al. (2006) also reported that the lowest 2 percentile of U.K. households were spending more than their disposable incomes
- In contrast, consumption-poor households showed a much better match among incomes, expenditures, and changes in net worth

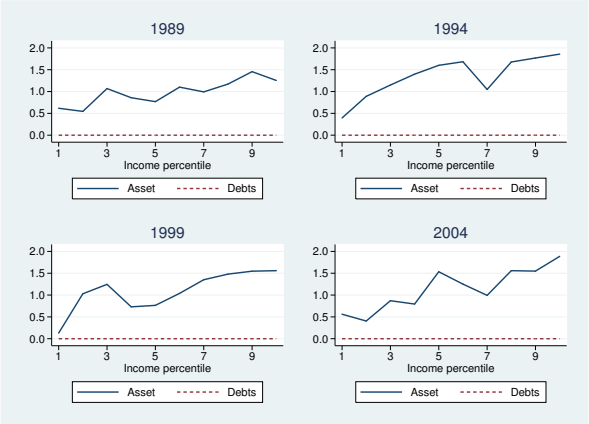
Figure: Median disposable income and changes in net worth at the lowest 25 percentiles of consumer expenditures



Note: the straight line indicates the equality of incomes (on axis Y) to expenditures (on axis X). Unit of measurement: thousand yen, in 2010 prices

Assets and liabilities are insufficient for consumption smoothing

Figure: Median assets and liabilities at the lowest 10 percentiles of disposable income



Income, expenditures and balance sheets of income-poor households with children

Table: Income, expenditure, savings and balance sheet flows for households at the bottom 10 percentiles of disposable income (thousand yen, in 2010 prices)

	Income percentiles									
	1	2	3	4	5	6	7	8	9	10
						1989				
Disposable income	49	73	87	99	108	117	123	128	134	139
Expenditures	75	99	98	106	110	114	116	119	122	125
Saving	-29	-26	-11	-7	-1	3	8	9	11	14
d(*Asset*)+	0	4	0	0	6	7	8	9	8	3
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*)	0	7	1	1	10	10	13	11	14	8
Asset (stock)	617	545	1,069	858	769	1,101	992	1,170	1,456	1,254
Debt (stock)	0	0	0	0	0	0	0	0	0	0
Asset coverage	14	27	42	44	37					

First test to compare income-poor and consumption-poor I

- The test (Meyer and Sullivan, 2003) compares income-poor and consumption-poor by other measures of material well-being (*i.e.*, the ownership of consumer durables)
- The test classifies households into 4 groups. First and second groups include households with low and high incomes (say, the bottom 5 and the upper 95 percentiles), denoted by Inc_{low} and Inc_{high}

First test to compare income-poor and consumption-poor II

- The other two groups include households at the bottom 5 and upper 95 percentiles of non-durable consumption ($Cons_{low}$ and $Cons_{high}$)
- Let $S(i)$ be the mean ownership share of a consumer durable i (say, an air conditioner)
- Poor households are likely to have lower $S(i)$, with $S(Inc_{low}) - S(Inc_{high}) < 0$ and $S(Cons_{low}) - S(Cons_{high}) < 0$
- The test uses a difference-in-difference statistic $\lambda = [S(Cons_{low}) - Cons_{high})] - [S(Inc_{low}) - S(Inc_{high})]$
- When λ is negative, consumption is a better measure of material hardship than income

Table: Results of the first test (households with children, 2004)

	Percentiles of **income**			Percentiles of **consumption**			λ	p-value	Favored measure
	0–5	5–100	Difference	0–5	5–100	Difference			
	(1)	(2)	(3)=(1)−(2)	(4)	(5)	(6)=(4)−(5)	(7)=(6)−(3)	(8)	(9)
Have a system kitchen	18.2	58.5	-40.3	14.8	58.7	-44.0	-3.6	0.054	
Have a solar water heater	3.1	7.6	-4.5	2.2	7.6	-5.4	-0.9	0.271	
Have a water heater	27.9	54.8	-27.0	21.0	55.2	-34.2	-7.2	<0.001	**Cons.**

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

	Percentiles of income			Percentiles of consumption			λ	p-value	Favored measure
	0–5	5–100	Difference	0–5	5–100	Difference			
	(1)	(2)	(3) = (1) − (2)	(4)	(5)	(6) = (4) − (5)	(7) = (6) − (3)	(8)	(9)
Have a system kitchen	18.2	58.5	-40.3	14.8	58.7	-44.0	-3.6	0.054	
Have a solar water heater	3.1	7.6	-4.5	2.2	7.6	-5.4	-0.9	0.271	
Have a water heater	27.9	54.8	-27.0	21.0	55.2	-34.2	-7.2	<0.001	Consumption
Have a microwave	89.5	93.4	-3.9	82.6	93.7	-11.1	-7.2	<0.001	Consumption
Have a rice cooker	78.3	82.5	-4.2	72.9	82.8	-9.9	-5.7	0.005	Consumption
Have a refrigerator	92.8	93.9	-1.1	85.5	94.3	-8.7	-7.7	<0.001	Consumption
Have a vacuum cleaner	94.1	94.2	-0.1	86.6	94.6	-8.0	-8.0	<0.001	Consumption
Have a washing machine	94.0	94.2	-0.2	86.8	94.6	-7.8	-7.6	<0.001	Consumption
Have a dishwasher	8.6	23.5	-14.9	4.5	23.7	-19.2	-4.3	0.001	Consumption
Have a sewing machine	48.1	72.0	-23.9	37.2	72.6	-35.5	-11.5	<0.001	Consumption
Have an air conditioner	72.1	84.4	-12.2	65.0	84.8	-19.7	-7.5	0.001	Consumption
Have a car	76.4	88.8	-12.4	69.6	89.2	-19.6	-7.2	0.001	Consumption
Have a mobile phone	87.1	91.6	-4.5	79.3	92.0	-12.7	-8.2	<0.001	Consumption
Have a fax	35.4	56.9	-21.6	30.6	57.2	-26.6	-5.0	0.031	Consumption
Have a TV	92.6	92.4	0.1	85.1	92.8	-7.8	-7.9	<0.001	Consumption
Have a CD stereo player	71.4	86.7	-15.3	63.3	87.1	-23.8	-8.5	<0.001	Consumption
Have a DVD player	22.7	32.7	-10.0	19.1	32.9	-13.9	-3.9	0.055	
Have a video recorder	75.5	86.8	-11.3	68.1	87.2	-19.1	-7.7	<0.001	Consumption
Have a computer	45.5	78.7	-33.2	40.8	79.0	-38.2	-5.0	0.030	Consumption
Have a (digital) camera	60.6	85.3	-24.7	57.5	85.5	-28.0	-3.2	0.136	
Have a video camera	44.2	68.6	-24.4	43.3	68.6	-25.4	-1.0	0.679	
Have a piano	7.1	32.9	-25.7	6.0	32.9	-26.9	-1.2	0.349	
Have a study desk	55.7	76.4	-20.7	42.8	77.1	-34.4	-13.6	<0.001	Consumption
Have a plot of land	24.2	70.8	-46.5	10.8	71.5	-60.7	-14.1	<0.001	Consumption
Have a house	24.8	74.0	-49.2	12.0	74.7	-62.7	-13.5	<0.001	Consumption
Total floor space	36.9	53.6	-16.7	32.4	53.9	-21.5	-4.8	<0.001	Consumption
Child in university	2.2	7.6	-5.3	0.7	7.6	-6.9	-1.6	0.016	Consumption

Second test to compare income-poor and consumption-poor I

- The test (Meyer and Sullivan, 2012a) compares characteristics of those who are added or removed from poverty by income-based and consumption-based poverty measures
- The test fixes a baseline poverty cutoff, such as 9.9% poverty rate in 2004 by disposable income
- The same property cutoff is applied to a consumption-based household data, so that the same number of households are classified as either income- or consumption-poor

Second test to compare income-poor and consumption-poor II

- Some households would be (1) both income- and consumption poor. The rest would 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, “only income-poor” and “only consumption-poor”)

Second test to compare income-poor and consumption-poor III

- A valid poverty measure would add to poverty households with *less* ownership of consumer durables, and other similar indicators of enhanced material well-being
- Consumption has advantage over income if “only consumption-poor” households have *lower* materials standards compared with “only income-poor” households

Table: Results of the second test (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 system kitchen	12.2	30.9	23.0	62.7	-7.8	<0.001	Cons.
Have a solar water heater	1.8	6.1	4.9	7.9	-1.1	0.280	
Have a water heater	21.2	39.0	26.8	57.8	-12.2	<0.001	Cons.

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 system kitchen	12.2	30.9	23.0	62.7	-7.8	<0.001	Consumption
Have a solar water heater	1.8	6.1	4.9	7.9	-1.1	0.280	
Have a water heater	21.2	39.0	26.8	57.8	-12.2	<0.001	Consumption
Have a microwave	87.7	94.8	85.4	93.8	-9.4	<0.001	Consumption
Have a rice cooker	77.7	80.5	74.4	83.2	-6.1	0.002	Consumption
Have a refrigerator	91.6	94.5	85.5	94.4	-9.0	<0.001	Consumption
Have a vacuum cleaner	92.9	95.7	86.2	94.7	-9.6	<0.001	Consumption
Have a washing machine	93.0	95.6	86.4	94.6	-9.2	<0.001	Consumption
Have a dishwasher	4.2	13.1	8.4	25.3	-4.7	0.001	Consumption
Have a sewing machine	42.2	60.0	50.0	74.4	-9.9	<0.001	Consumption
Have an air conditioner	69.2	80.4	70.9	85.6	-9.6	<0.001	Consumption
Have a car	72.9	85.6	79.1	89.8	-6.5	<0.001	Consumption
Have a mobile phone	85.3	92.2	81.8	92.2	-10.4	<0.001	Consumption
Have a fax	31.0	49.7	40.4	58.6	-9.3	<0.001	Consumption
Have a TV	90.9	94.1	86.0	92.8	-8.1	<0.001	Consumption
Have a CD a stereo player	70.0	81.6	73.4	87.8	-8.2	<0.001	Consumption
Have a DVD player	18.9	27.9	23.4	33.8	-4.5	0.026	Consumption
Have a video recorder	73.0	84.7	75.8	87.7	-8.8	<0.001	Consumption
Have a computer	37.7	62.6	55.6	81.5	-6.9	0.002	Consumption
Have a (digital) camera	56.5	78.1	70.6	86.8	-7.5	<0.001	Consumption
Have a video camera	42.9	57.2	55.4	70.1	-1.8	0.443	
Have a piano	4.8	16.4	12.7	35.2	-3.7	0.024	Consumption
Have a study desk	48.8	63.7	50.4	79.1	-13.3	<0.001	Consumption
Have a plot of land	11.4	43.0	22.0	76.1	-21.0	<0.001	Consumption
Have a house	12.5	45.7	24.9	79.3	-20.8	<0.001	Consumption
Total floor space	31.7	42.7	37.7	55.5	-5.0	<0.001	Consumption
Child in university	0.5	3.8	0.9	8.3	-2.8	<0.001	Consumption
Share of households	4.7	5.5	5.5	84.3			

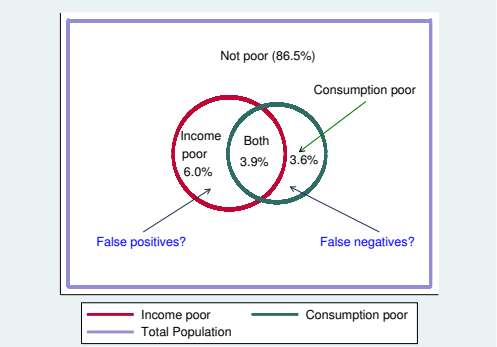
Conclusions I

- Using household data for Japan, I found that consumption-based measures showed less child poverty compared with income-based measures
- The lower rates of consumption-based poverty are primarily due to the income under-reporting, in agreement to evidence previously reported for U.S. and U.K. households
- I also compared income and consumption in their ability to identify households with lower material well-being

Conclusions II

- Out of 27 indicators of material well-being, consumption was always superior to income in identifying disadvantaged households with children, with most results statistically significant
- The use of income to identify child poverty may create two major problems:
  1. **False positives**: labeling as “poor” children who are really not the most disadvantaged
  2. **False negatives**: failure to identify as poor children who are really the most disadvantaged

Conclusions III



- Evidently, the number of “false positives” and “false negatives” is large among children in Japan
- This results, respectively, in the wasteful use of public funds to alleviate child poverty, and failure to provide support to children who are truly in need

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