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Rethinking Relative Measures of Poverty

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As modern societies confront economic liberalisation, ageing population, marital dissolution and increased labour force participation by women, there has been a greater demand for comparative research on poverty (Jesuit and Smeeding 2002). The most important decisions in poverty research concern the choice of the research method. As Hageraars (1991, 134) points out, both the population of [the] poor and the extent of their poverty are dependent to a large degree on the chosen definition. The methodological implications are important, for instance, for the targeting of the poverty alleviation programmes (Ladorchini et al. 2003).

In the following study, we will attempt to introduce a new method to measure relative income poverty. The aim is to find a solution which will combine information both on the depth of poverty and the quantity of the poor, i.e. the number of people living in poverty. Furthermore, we are seeking a yardstick which would be relatively simple and easy to understand, as we believe these properties would facilitate the use of the new method in sociological poverty research and political decision making.

We will begin by discussing the most common problems in measuring social exclusion and relative income poverty. The following sections focus on poverty alleviation policies and poverty measurement practices, as well as on different poverty indices and the properties of an ideal poverty measure. Then we will present our innovation, the cumulative poverty index (CUPI), together with a section discussing the estimations of the new index. The properties of the CUPI are analysed by comparing it to a number of commonly used poverty and inequality measures. Before introducing our conclusions, we will compare poverty trends and calculate simulations to test the CUPI against the most common relative income poverty measures.

What does poverty mean?

Gordon and Townsend (2002) define overall poverty as social exclusion. Unfortunately, social exclusion is also a polysemic concept (as is the concept of poverty itself), which has multiple meanings in different contexts and when used for different purposes. Social exclusion can entail multi-dimensional disadvantage, cumulative misery, multiple deprivation, and exclusion from modern market economies. Whatever definition social exclusion indicates, the person has limited capability to effectively participate in society. Within the given context, capability is a relative rather than absolute concept. More carefully, overall poverty can be seen as: 1) not having those things that society thinks are basic necessities, 2) not being able to do the things that most people

take for granted, and 3) being excluded from ordinary living patterns, customs, and activities (Gordon and Townsend 2002).

Typically, the lack of basic necessities is not interpreted as an absolute or physical lack of some commodities, but as a socially determined relative lack of resources, i.e. socially perceived necessities are seen to be more or less determined by social class (Forma et al. 1999). Thus, the changes in class structure of advanced capitalist democracies pose new challenges to poverty researchers. Declines in manufacturing and blue collar jobs, and increases in white collar employment, i.e. growth of the middle class and shrinking of the working class, have led to changes not only in social classes, but also in lifestyles and patterns of consumption, as well as in attitudes and values. What is considered as "basic necessities" is defined by a middle class characterised by an extension of home ownership and increased access to education.

There are also other perspectives on poverty, such as the definition given by Sen (1992, 110): "Poverty is not a matter of low well-being, but the inability to pursue well-being precisely because of the lack of economic means". Thus, poverty is primarily seen as an economic phenomenon, while social exclusion involves cultural, institutional and social dimensions. This kind of narrower definition of poverty, especially while expressed purely in monetary terms, is known as income poverty. Income poverty is a precondition for social exclusion, while (income) poverty does not necessarily lead to social exclusion. Therefore, it is fair to say that as long as incomes reflect capabilities, relative income poverty measures will, *per se*, capture social exclusion. However, as DeFina and Thanawala (2002) point out, trends in income poverty, however measured, are not necessarily related to progress against deprivation - or social exclusion for that matter - as more broadly conceived.

Poverty alleviation policies and poverty measurement in practice

Policies to alleviate poverty are evaluated by observing the changes in poverty statistics. Economic globalisation and the availability of gross national data have partly shifted the focus of poverty research from individual countries to international comparisons. They involve both analyses of the causes of poverty, and studies on the impacts of public policies. To facilitate the endeavour, both researchers and national governments have adopted relative income poverty as a standard measure to compare the incidence of poverty both over-time and across countries. Consequently, the interpretation of poverty as a relative concept implies the use of relative methods for poverty

measurement. Most recently the changes in the median income threshold and equivalence scales used by the EU have been attributed to political interests (Ritakallio 2001). There has also been a change in rhetoric. In the EU, the focus has shifted away from the poor to those living at *risk of poverty* or with *low incomes* (Atkinson et al. 2002).

Generally, the measurement of poverty consists of two phases: in the first phase the poor are identified from the population and in the second phase a poverty index is derived using the available information (Sen 1976). Despite a wide range of methods to measure income poverty, one method dominates the arena. Poverty is discussed as the share of people whose equalised incomes fall below a poverty line. People whose incomes remain below the line are considered too far down on the queue of scarce resources of income to be fully integrated into society (Shanahan and Tuma 1994). The measure indicating the percentage of the population that are poor is known as the head-count ratio. Since the use of the head-count ratio is very popular in practice, the more general poverty measurement reduces to the problem of identifying the poor from the population.

Eurostat measures the risk of poverty as 60 per cent of median incomes (<http://europa.eu.int/comm/eurostat/>). The OECD has used 50 per cent of median incomes as an indicator of income poverty. However, the scientific justification for the use of 60 per cent of the median equivalent income threshold or any other relative threshold based on the mean or median is not very convincing (Bradshaw 2001).

As a matter of fact, there is no evidence that gives ground to a particular income threshold. Any fraction of incomes is nothing more than an agreement on the level of resources which guarantee the least amount of income for "normal life". A kind of synthesis for different poverty line definitions is given in Hagernaas & Van Praag (1985). However, in practice the most popular choices for poverty lines are given in terms of certain percentages of mean or median incomes of the population. The pragmatic question is whether median or mean income is more effective in capturing the middle class's changing perception of basic necessities.

While a median income threshold lacks warranted objectivity, it does convey a meaningful interpretation of deprivation according to a particular society's cultural norms and customary prevailing standards of necessities (Sen 1979). The threshold based on a median is also more solid as it is not affected by an increase in high incomes (Jäntti and Danziger 2000, 327). The fact that a median income threshold has been recognised and used by the EU indicates that the concept of

relative poverty has come to overshadow absolute poverty, which remains the official method for measuring poverty in the U.S. The political acceptance of the head-count ratio based on median income in Europe has broadened the common understanding of poverty as a relative, rather than an absolute, condition. Moreover, the head-count ratio based on median income captures roughly the same phenomena in each society. The measure emerges from the distribution within a particular society, but does not amount to measuring inequality, or imply that poverty is by definition "always with us" (Foster 1998 337).

Using a median threshold is also subject to well-grounded criticism. A median income threshold, as a standard, comes closer to the definitions of absolute poverty, which does not take account of the changes in the economic and social context of the upper half of the income distribution. On the other hand, the threshold defined by the mean reflects income equalities caused by changes in the upper end of the distribution, and it may well be criticized for obscuring the difference between inequality and poverty measures. However, the difference is already blurred as poverty measures correlate with inequality measures to a large degree. This does not mean that the measures should be kept in different categories. Actually, they focus on more or less the same phenomenon, though from a slightly different perspective (Yitzhaki 2002).

Given the recent trend of increasing income inequality, it is justifiable to ask if the preference is given to the median instead of the mean for political reasons as well (LIS 2003). The very concept of relative poverty means that if somebody's income moves up, then to stay out of poverty somebody at the bottom needs more income.

The main problem in the head-count ratio is that it remains unaltered if the position of the poor worsens. The measure captures the number of those who "are losing their links with the greater world," as American political activist Michael Harrington (1981, 11) describes it, but it does not reflect the severity of their condition. The head-count ratio based on median income does not make a distinction between the desperately poor, with hardly any income, and those just below the poverty threshold. The measure violates both of the following axioms presented by Sen (1976):

MONOTONICITY AXIOM: Given other things, a reduction in income of a person below the poverty line must increase the poverty measure.

TRANSFER AXIOM: Given other things, a pure transfer of income from a person below the poverty line to anyone who is richer must increase the poverty measure.

Changes in the head-count ratio based on median incomes depend solely on which direction and how many people are crossing the poverty line, and it does not indicate how poor the poor are, and does not change if people below the poverty line become poorer. Consequently, the head-count ratio has deficiencies also in assessing the impact of taxes, transfers, and state benefits, for instance in those cases where income transfers are directed to both the poor and non-poor. The easiest way to reduce the head-count ratio is to target benefits to those people just below the poverty line, because they are the ones who are cheapest to move across the line (Osberg and Xu 1999).

The drawbacks described above prevent the use of the head-count ratio based on median incomes in the analysis of the impacts of specific policies on the poor. The problems will be aggravated if governments take more interest in planning and devising income transfers to alleviate the living conditions of the poor.

Other indices

The head-count ratio only distinguishes the poor from the non-poor. It is insensitive, for example, to the depth of poverty, and, therefore, this method has deficiencies when used in analyses which attempt to evaluate the impact of income transfers on poverty. In other words, a simple head-count ratio produces a rough picture of comparative historical variations of poverty but offers limited and less accurate information than more sophisticated methods (Brady 2002, 33). Ever since the pioneering work of Sen (1976), more sophisticated indices of poverty have been developed. A considerable number of axioms and different combinations of them have been employed to develop poverty indices that focus most often on poverty intensity and inequality among the poor. The main problem in defining a poverty index is that any attempt to do so requires that a threshold be established against which the incomes can be measured. The process may be characterised as identification of the poor, or discriminating the poor from the non-poor.

As discussed earlier, the head-count ratio (H) based on median (or the mean) income does not estimate the depth of poverty of the poor. The conventional method for addressing this concern is to measure the poor's average difference either from the median of income or the poverty threshold (Kakwani 1993). The resulting income gap (I) (or poverty gap) is standardised by the median

income or threshold of poverty to render it comparable across populations. The measure indicates the aggregate shortfall of the income of all the poor from the poverty threshold.

The income gap does capture the depth of poverty, but it is insensitive to the quantity of the poor. The problem has been solved simply by taking the product of H and I and by calling the outcome HI (Atkinson 1987). The idea is to measure the intensity of poverty by giving both of the components H and I equal weight in the index, which is often referred to as the "income gap ratio". The major weakness of the measure is that, if a relative poverty threshold is applied, it does not offer any meaningful interpretation of poverty beyond the arithmetical value of the index.²

Brady (2002) describes the income gap ratio as a simple and parsimonious measure which combines both the quantity and depth of poverty, yet Brady advocates his own invention, the sum of the ordinals (the sum of the head-counts for seven different median thresholds), as a measure, which provides a clearer and more easily interpreted graphic representation of poverty. However, this measure conveys, as Brady concedes, less precise information about the distribution of the poor than the income gap ratio.

The indices that have emerged do amend the imperfections of the head-count ratio based on median income and the original Sen index, but they fail the most trivial of tests, which inhibits their practical application. The measures are mathematically complicated and very difficult to understand for the layman. A major advantage of the head-count ratio with a median income threshold is that it is arithmetically simple. Therefore, it is easily understood and communicated. These factors have surely contributed to its present valuation.

There is a stock of econometric literature on measures which focus on income distribution among the poor. The numerous efforts to develop new poverty measures have resulted in a plethora of indices.³ They have the ability to order distributions in a better way than the income gap ratio, and this, not the precise numbers obtained, makes them useful, (Ravallion 1992, 39). In other words, these measures lack intuitive appeal, as does the income gap ratio.

² The income gap ratio has an interpretation as an indicator of the potential cost for eliminating poverty by targeting transfers to the poor (Ravallion 1992, 37-38). That applies only in situations where fixed poverty lines are used or the poverty line is set by the median instead of the mean.

³ Probably the best known decomposition of poverty severity measures is the Foster-Greer-Thorbecke (1984) measure, where the poverty gaps of the poor are weighted by those poverty gaps in assessing aggregate poverty.

As Myles and Picot (2000) argue, more advanced measures have not received wider circulation, in part due to the highly technical and mathematical quality of the literature. A major problem in poverty research is indeed the wide gap between theoretically appropriate measures and popular debate (Osberg and Xu 1999). New measures might have desirable theoretical properties and make significant theoretical advances but they have only little impact on public debate. The public debate continues to be based upon the poverty rate and the choice of a poverty line alone (Jesuit and Smeeding 2002).

Properties of ideal measures

One of the main problems in poverty research is that the theoretical concepts and measurement possibilities do not meet in a universal way. Therefore, the nature of the whole measurement exercise is determined by the objective of the analysis. As a consequence, a valid interpretation of poverty statistics is only possible under the preconditions and compromises made during the measurement exercise. A pick and choose method in poverty measurement leads to messy conclusions, as the different methods disagree on exactly who is identified as being poor.

While acknowledging the fact that there is not a perfect poverty measure, we can point to the wealth of literature on accepted criteria for suitable income measures of poverty in comparative research. According to Kumar et al. (1996), there are at least three aspects of poverty which have not been adequately explored: 1) overcoming the arbitrariness and subjective elements in the choice of a poverty index, 2) synthesizing the poverty measurement with applied welfare economics and public policy, and 3) statistical issues relating to the measurement of a poverty index based on sample survey data. Brady (2002) argues that measures of poverty should: a) measure comparative historical variation effectively; b) be relative rather than absolute; c) conceptualise poverty as social exclusion; d) assess the impact of taxes, transfers and state benefits; and e) integrate the depth of poverty and the inequality among the poor.

There has been a call for new measures of poverty to facilitate a second reinvigoration of research into poverty in sociology (Brady 2002, 34). We argue that this is only possible by introducing uncomplicated measures that have intuitive appeal. This paper makes an effort to develop an alternative measure for poverty which would capture both the quantity and quality of the poor, i.e. our aim is to count the number of poor in a way which also pays attention to the depth of poverty.

Our aim is to construct a simple method both for the research community and governmental use. Our main question is how different policy regimes cope with poverty alleviation, i.e. we are interested in alleviating poverty through income transfers. Therefore, we will focus on concepts which define poverty in monetary terms. The use of income data is also justified on the grounds of availability and reasonably good quality.

Cumulative poverty index

Every poverty measure mentioned above includes pros and cons and we should not treat them as alternative measures, but rather as measures of different aspects of poverty: e.g. the head-count ratio measures the prevalence of poverty and the income gap is a measure of the depth of poverty. However, the question remains - is there a simpler method to measure both the quantity of poor and the depth of their poverty?

Our solution is based on rethinking the poverty threshold. We don't require the poverty threshold to calculate the quantity of the poor, but we will calculate it afterwards.. Firstly, we calculate the mean equivalent income for all households and line them up in ascending order. Secondly, we define a new variable $CUPI(z) = E(Y) / E(Y | Y = z)$, where $E(Y)$ is the overall mean of incomes and $E(Y | Y = z)$ is the conditional mean of incomes with the income threshold z .

The cumulative poverty index ($CUPI(z)$) indicates how many times poorer on average the poor households (households with incomes not above z) are compared to all households on average (or the other way round: what is the share of the poor households' average income of all the households' average income). The $CUPI$ index is not calculated in two sequential steps where the poor are identified and their level of poverty aggregated. These steps are conflated in a process where the ratio of poor households' average income to all households' average income is calculated.

The calculation of the $CUPI$ results in a curve which describes the relative poorness of each individual in the population. The same information is also effectively contained in a curve that has been obtained by using the transformation $1/CUPI(z)$. This curve fulfils the requirements of a distribution function and can be interpreted as an approximation for perceived income distribution (cf. Kapteyn et al., 1978). Furthermore, the perceived income distribution is hypothesised to be approximately equal to an individual welfare function of income (Kapteyn & Wansbeek 1985).

Since the individual welfare function of income is a cardinal utility function, the CUPÍ also has a rationale in terms of welfare economics.

To make the definition of the CUPÍ even more transparent we can point to the connection between the Lorenz curve and CUPÍ. The Lorenz curve ordinate $\Phi(z)$, i.e. the proportion of income received by those individuals with incomes are less than or equal to z , can be expressed as $L(p) = \Phi(z) = pE(Y | Y = z) / E(Y)$, where $F(z) = p$ and F is the distribution function of incomes Y (Beach & Davidson 1983). Hence, we may express $CUPÍ(z) = p/L(p)$.

Figure 1 describes a typical Lorenz curve (see also Yitzhaki 2002). The line $\underline{Op}$ is assumed as the percentage of the poor in the population, while the line $\underline{pG}$ represents the poor's share of income. Therefore, we may express $CUPÍ(z) = \underline{Op} / \underline{pG}$ or describe z as the inverse of the slope of the line $\underline{OJG}$.

(Insert Figure 1 around here)

The $CUPÍ(E(z))$ also coincidences with the inequality measure u defined by Éltető and Frigyes (1968). The fact that the cumulated mean income curve (COMIC) corresponds to the non-standardised conditional mean income was mentioned in a footnote by Shorrocks (1983) as a useful analytical device. In the same paper Shorrocks defined the "generalized Lorenz curve" as a normal Lorenz curve multiplied by the mean of the distribution.

Estimation of the CUPÍ

There are two options for defining the mean income threshold for the CUPÍ. The first choice is to agree on a universal cut-off ratio, eg. 2.5 times less than average (see Figure 2 for distribution of the CUPÍ variable for Finland in year 2000). The second option draws on Townsend's (1979, 60) theory of a definite point in the distribution after which the exclusion starts to escalate. We may identify this point by calculating the CUPÍ and the resulting absolute poverty threshold with different values for the cut-off ratio (e.g. 2.8 or 2.5) and the appearance at the angular coefficient for the $CUPÍ(z)$. Figure 2 presents the distribution of the $CUPÍ(z)$ in the Finnish data for the year 2000.

(Insert Figure 2 around here)

The latter option involves assumptions and theoretical considerations which go beyond the scope of this article. Therefore we will focus on the first option, namely a poverty threshold defined with a universal cut-off ratio. By making rough estimations with empirical income distributions, our choice is to focus on a 2.5 cut-off ratio.

The poverty threshold can be easily fixed in terms of a CUPÍ cut-off ratio, but in practice the incomes corresponding to a particular cut-off value of the CUPÍ are also of interest to us. For the calculation of incomes z for a known CUPÍ cut-off ratio c , it is possible to use the distribution function of the CUPÍ to determine the population share below the cut-off ratio c , and then directly derive the corresponding income value from the distribution function of income. In practice, this point estimate of incomes corresponding to the cut-off ratio c is the most important and valuable statistic. However, if the sampling and measurement errors are considered, uncertainty must not be forgotten. The confidence limits are easily obtained - even though computationally intensive - by bootstrapping the income distribution and calculating the replications of the required point statistic. In principle, it should also be quite straightforward to derive the analytical confidence limits for the CUPÍ, at least if certain simplifying assumptions are made (cf. Beach & Davidson 1983).

A conservative estimate of an income value corresponding to a certain cut-off ratio of the CUPÍ is obtained by using the conditional mean of income, where a condition is given by some appropriate limits around the chosen cut-off ratio. Another possibility is to approximate the functional dependency between the CUPÍ and incomes (Y) around the chosen cut-off ratio of the CUPÍ (c). The empirical investigations suggest the use of the relation $\text{CUPÍ} = \alpha/Y$, where α is a parameter to estimate. This kind of non-linear model can be estimated using standard linear regression. First the new variable $X=1/Y$ must be formed using standard variable transformation. Then estimating the regression model - where the CUPÍ is a dependent variable, X is the regressor and no intercept in the model - results in an estimate for α . Then, for the particular cut-off ratio c , the corresponding Y is estimated by α divided by c .

The model would be in a more practical form if the parameter estimate gave the corresponding income value directly. This is obtained by reformulating the model to form: $\text{CUPÍ} = c\beta/Y$, where c is the cut-off ratio under examination and β is the parameter. Now the transformation for incomes gets the form $Z=c/Y$. In this kind of regression model - without an intercept, with the CUPÍ as a

dependent variable and Z as a regressor - the interpretation for estimated β is directly the income value corresponding to the cut-off ratio c .

Once the cut-off ratio between the average income and the poor's average income is fixed, and the number of those households (or individuals) to be included among the poor is calculated, it is possible to report the CUPi as the share of the poor in the total population (as a head-count ratio).

Conceptual analysis

At this stage we will analyse the CUPi (cut-off point 2.5) in relation to 18 different well-known poverty and inequality measures to gain more insight into the properties of the new measure. We will use the LIS database which is a collection of household income surveys (LIS 2003; Jesuit and Smeeding 2003). The database provides commensurate information on demographic, income and expenditure variables on three different levels: household, person and child. The measures were calculated for LIS-datasets representing 24 countries between 1984 and 2000. The method of analysis is linear correlation. The choice of countries was dictated by the decision to apply a modified OECD-equivalence scale which means the dataset must include a child component.

As Table 1 demonstrates, the correlation between the CUPi and other measures indicates that the CUPi is related to both inequality and poverty measures. The CUPi seems to correlate strongest both with inequality measures such as the Atkinson, Theil, and Gini coefficient and percentile ratio, and head count poverty measures based on 50 per cent of mean or median income.

(Insert Table 1 around here)

The results reflect the fact that the CUPi captures both the quantity and depth of poverty. On the one hand, the CUPi may be criticised for its inability to make distinctions between poverty and inequality measures. On the other hand we may argue that it is the only logical outcome for a measure which aims to amalgamate measures for the number of poor and the depth of their poverty. In fact, this is a strong argument for advocating the use of the CUPi in poverty and inequality research.

The major difference between the CUPi and more traditional measures of income poverty and income inequality is that it does not define a poverty line which indicates the level, or the definite minimum amount, of resources needed to keep an individual or household out of poverty. Thereby, the CUPi is not subject to criticism concerning e.g. the underlying moral and/or value judgements of minimum incomes. On the other hand the CUPi is concerned with large scale problems such as the poor's general level of income and the relation between the income level of the poor and the non-poor.

Trend analysis

Does the CUPi (cut-off 2.5) give us a different account of poverty trends than the head-count ratio based on median income? Given the intellectual energy devoted to the theory of poverty measurement and the resulting plethora of indices to choose from, it is tempting to ask: does it really matter which measure you use (Ravallion 1992, 41-42). The question boils down to the importance of measuring comparative historical variations effectively. All poverty measures will yield the same ranking if incomes (or consumption levels) have changed by the same proportion. Otherwise, differences between the measures can become pronounced. Different rankings produced by different poverty measures give information about the precise way in which the distribution of living standards has changed.

We will analyse differences in poverty trends between the CUPi (cut-off 2.5) and two of the most well known measures of relative income poverty, namely the head-count ratio based on 50 and 60 per cent of median income. The trends are calculated for four countries (Canada [CN], Germany [GE], Luxembourg [LX] and Sweden [SW]) by utilising LIS data from the year 1984 to the year 2000. Additionally, we will analyse the Finnish case more closely with income distribution data from each year from 1989 to 2000. Confidence limits have been calculated by employing the bootstrap method. We can expect variations between the measures since the head-count captures only the number of poor while the CUPi is also addressing the depth of poverty.

Figure 3 shows that the CUPi gives a different account of poverty than the head-count ratio based on median income in all countries. Also, the ranking of the CUPi in relation to head-count ratios varies across countries.

(Insert Figure 3 around here)

In Canada, the CUPi gives the highest percentage of poor while there are no significant changes in the poverty trend. The CUPi gives the same rate of poverty for Germany as the 60 per cent head-count ratio. The CUPi seems to increase more than the 60 per cent head count ratio. The result might be related to changes in income distribution due to German reunification. Luxembourg is the only country where the CUPi is positioned between 50 per cent and 60 per cent head-count poverty (most markedly in 2000). The CUPi indicates a more significant increase in poverty from 1991 to 1997 than the head-count ratio based on 50 per cent of the median. In Sweden, a deviation occurs in 1995 when the CUPi increases while the head-count poverty with a 60 per cent poverty line

decreases. The CUPÍ again comes closer to the head-count ratios in the year 2000. In Sweden, the CUPÍ goes more in line with the 50 per cent median and 60 per cent median income poverty.

A yearly-based comparison for Finland (see Figure 4) confirms the earlier observation that CUPÍ-trends are more connected to trends in 50 per cent head-count poverty than 60 per cent head-count poverty. The CUPÍ clearly gives a different account to the 60 per cent head-count ratio for the poverty trend in Finland from 1989 to 2000. In 2000, the CUPÍ was on a markedly higher level than in 1989 while the head-count ratios do not indicate a rise in poverty. Over that period, income inequality has increased, which could explain the CUPÍ-trend.

(Insert Figure 4 around here)

Simulation of CUPÍ

Finally, we will analyse the way in which changes in income transfers are reflected in different poverty measures. Again, we will employ head-count ratios based on 50 and 60 per cent of median income together with the CUPÍ (cut-off point 2.5). We will simulate the effect of changes in two central income transfer institutions which affect the position of the poor, i.e. child benefits and social assistance. The analysis is based on a static micro simulation model SOMA, which is similar to the EUROMOD model (Haataja 2003).⁴ The model is constructed to allow the simulation of the income transfer system in Finland (Sallila 2003).

(Insert Figure 5 around here)

By changing the values of the chosen parameters in the simulation process we are able to analyse the sensitivity of various poverty measures to income transfers. In the following, we will focus on headcount measures based on 50 and 60 per cent of median income and the CUPÍ (cut-off 2.5) by simulating changes in child benefits and social assistance, and calculating the effect of these changes to the above mentioned poverty measures.

As Figure 5 demonstrates, increases in child benefit for the first child actually leads to a higher number of poor households (actual value of the child benefits for the first child is 90 euros/month).

⁴ The model is not static in the sense that changes in income transfers do affect the position of the poverty line.

This means households with children are better off and nobody suffers, but still poverty seems to increase. The effect can be traced back to the changes in median income. This means only minor changes in median income will result in a large variation in the head-count ratio. That is due to the fact that a large number of households tend to end up around the median of the distribution. Therefore, the simulated effect of changing child benefit is particularly visible in headcount measures based on median income, while the CUPi seems to be more a more stable measure. Changing the value of child benefit has only a minor effect on poverty measured by the CUPi. Poverty by 50 per cent of median income seems to be especially sensitive to the value of child benefit.

(Insert Figure 6 around here)

The same problem occurs if we decrease the basic amount of means-tested social assistance (Figure 6, actual value of the basic amount of social assistance is 333 euros/month). The incomes of the poor are definitely lower than before simulation, but the number of poor by 60 per cent median seems to remain constant. Again, the CUPi appears a more credible yardstick. It reflects more accurately the actual deterioration of the economic situation of the poor in the event of cutting social assistance. Frankly speaking, problems with the median income threshold occur if there are both poor and non-poor among the recipients of a particular income transfer.

In conclusion, we may note that the CUPi offers more precise and more understandable estimations for the income transfer effects on poverty than methods based on median income. Therefore, it is more recommendable to use the CUPi instead of the head-count ratio in planning and targeting poverty alleviation programmes.

Conclusions

In conceptual terms, the major difference between the head-count ratio based on median income and the CUPi is that the CUPi does not measure the distance from a "norm", but focuses on the combined share of resources. The poverty threshold is not an individual line in the distribution but the poor's share of combined resources. In other words, the poor are considered as a group rather than as individual households. The head-count ratio based on median income emphasises the resources of a particular household (or individual) while the CUPi focuses on the poor as a group. The resources of the poor are tested against an equal share of resources.

A major asset of the CUPÍ is that it captures both the quantity of the poor and the depth of their poverty. In other words, the indicator satisfies both the monotonicity axiom and transfer axiom (in so far as the whole population is concerned). Income transfers to the poor will decrease the CUPÍ to the degree that they have more impact on the average income of the poor than on the overall average income; and what is even more important, income transfers to the whole population will decrease the CUPÍ only if there are more poor than non-poor among the recipients. That is due to the fact that the measure pools incomes of the poor rather than focuses on individual households. Consequently, it can also be argued that the CUPÍ conceptualises poverty as a more relative phenomenon than the head-count ratio based on median income.

Additionally, the CUPÍ is arithmetically simple and relatively easy to understand. The CUPÍ identifies those people as poor whose average incomes fall below the average income, e.g. 2.5 times smaller than the average income in the whole population. This is not an inequality measure in the sense that it does not reflect income inequalities above the average income. Neither does the CUPÍ signify that poverty is with us until the end of the time. The ratio scores zero if the average income of the poor rises above the given poverty threshold (the cut-off point for the CUPÍ).

At this point we may add that the CUPÍ does violate the moral axiom of poverty measures which states that income transfer from the 'poorer' poor to the 'richer' poor must increase the poverty measure. In other words, the CUPÍ – unlike for example the ordinal measure development by Sen (1976) -- is insensitive to income distribution among the poor. If the deeply poor should disproportionately affect the poverty measures, alternative methods should be used. One of these methods is the modification of the Sen index proposed by Shorrocks (1995) and known as the Sen-Thon-Shorrocks-index, which is a decomposition of the poverty rate, the average poverty gap ratio among the poor and the overall Gini index of poverty gap ratios (Osberg and Xu 1999). However, we may note that the CUPÍ may also be used as a method for defining a poverty threshold, and that information can be utilised to calculate other poverty and inequality measures.

Coming back to the criteria presented by Brady (2002), we can argue that the CUPÍ measures comparative historical variation more effectively, conceptualises poverty more comprehensively as social exclusion, and assesses the impact of taxes, transfers and state benefits more precisely than the head-count ratio based on median income. However, even the best income indicator can be found, in practice, to be incomplete, and may lead to an imprecise estimation of poverty. To

broaden the understanding of poverty, we should look for measures of multidimensional poverty and facilitate them with structural information e.g. from the UNDP human development index. The risk is, however, that multiple indicators may become incomprehensible.

In conclusion, we argue that the CUPi is a more effective poverty measure than the head-count ratio based on median income for not only identifying the poor and the determinants of poverty, but also for helping to design interventions and evaluating their outcomes. Moreover, it is simple and easier to understand than more sophisticated measures of income poverty.

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Table 1. Correlation of the CUPi (cut-off 2.5) with other measures of income poverty and income inequality measures for 24 LIS-datasets.

	Correlation with CUPi
Square of variation coefficient	0.54
Gini coefficient	0.97
Gini coefficient for poor (head-count ratio 50% of median) 1)	0.36
Gini coefficient for poor (Osberg et al. 1999) 2)	-0.95
Average poverty gap ratio among the poor (Osberg et al. 1999)	0.45
Sen-Shorrocks-Thon-Index (Osberg et. al. 1999)	0.90
Percentile ratio (90/10)	0.96
Percentile ratio (80/20)	0.97
Head-count ratio (50% of median)	0.96
Head-count ratio (60% of median)	0.91
Head-count ratio (50% of mean)	0.96
Head-count ratio (60% of mean)	0.92
Atkinson (e=0.5)	0.98
Atkinson (e=1.0)	0.85
Theil	0.96
Poverty-gap 50% of med/mean-income	0.80
Poverty-gap 60% of med/mean-income	0.84
Angular coefficient for income distribution (CUPi cut-off ratio 2.5)	0.55
Angular coefficient for CUPi-variable, point=2.5	0.61
CUPi-index (cut-off ratio 2.5)	1.00

1) Calculated only for poor households in the distribution.

2) Calculated for all households, incomes for non-poor set to zero.

Figure 1. Lorenze curve and CUPI

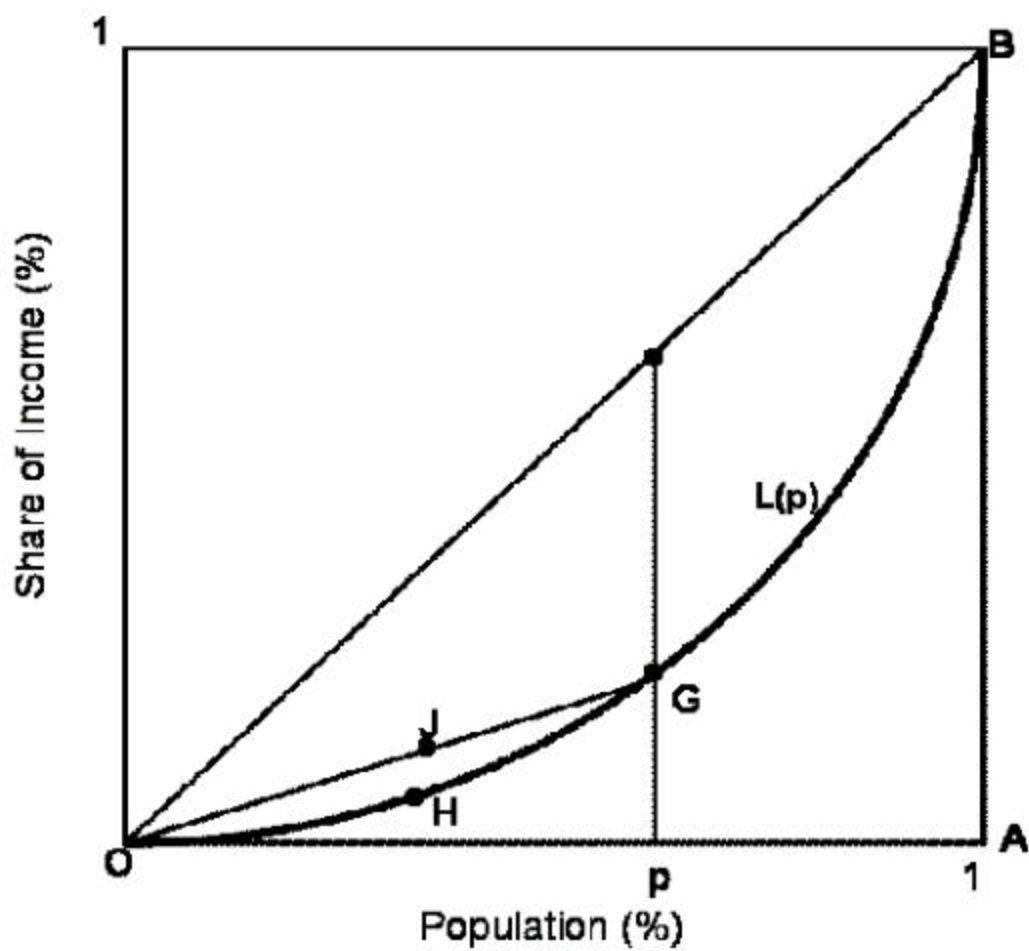


Figure 2. Distribution of the CUPI-variable (data: Finland 2000).

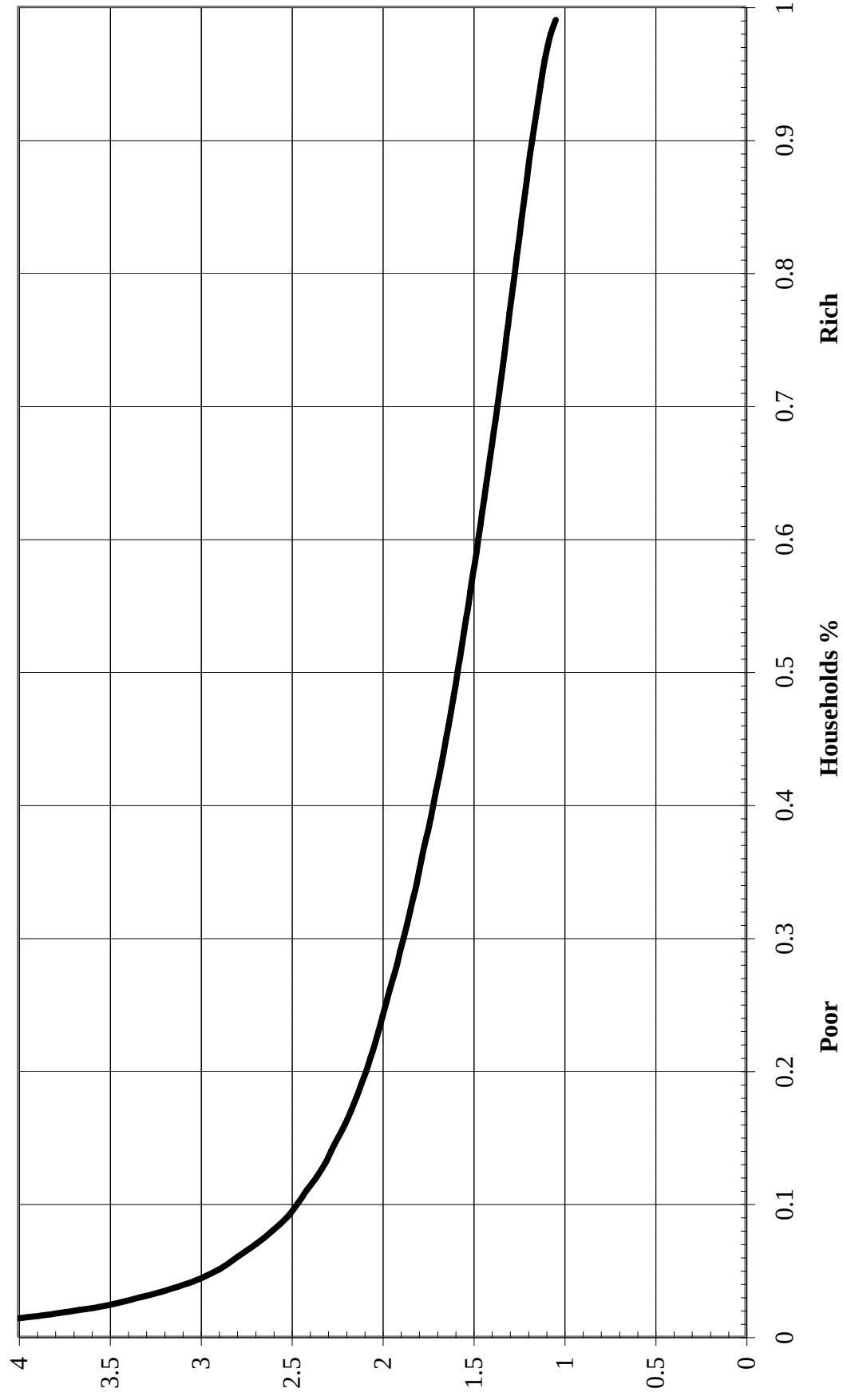


Figure 3. Historical variation of poverty measures in four countries.

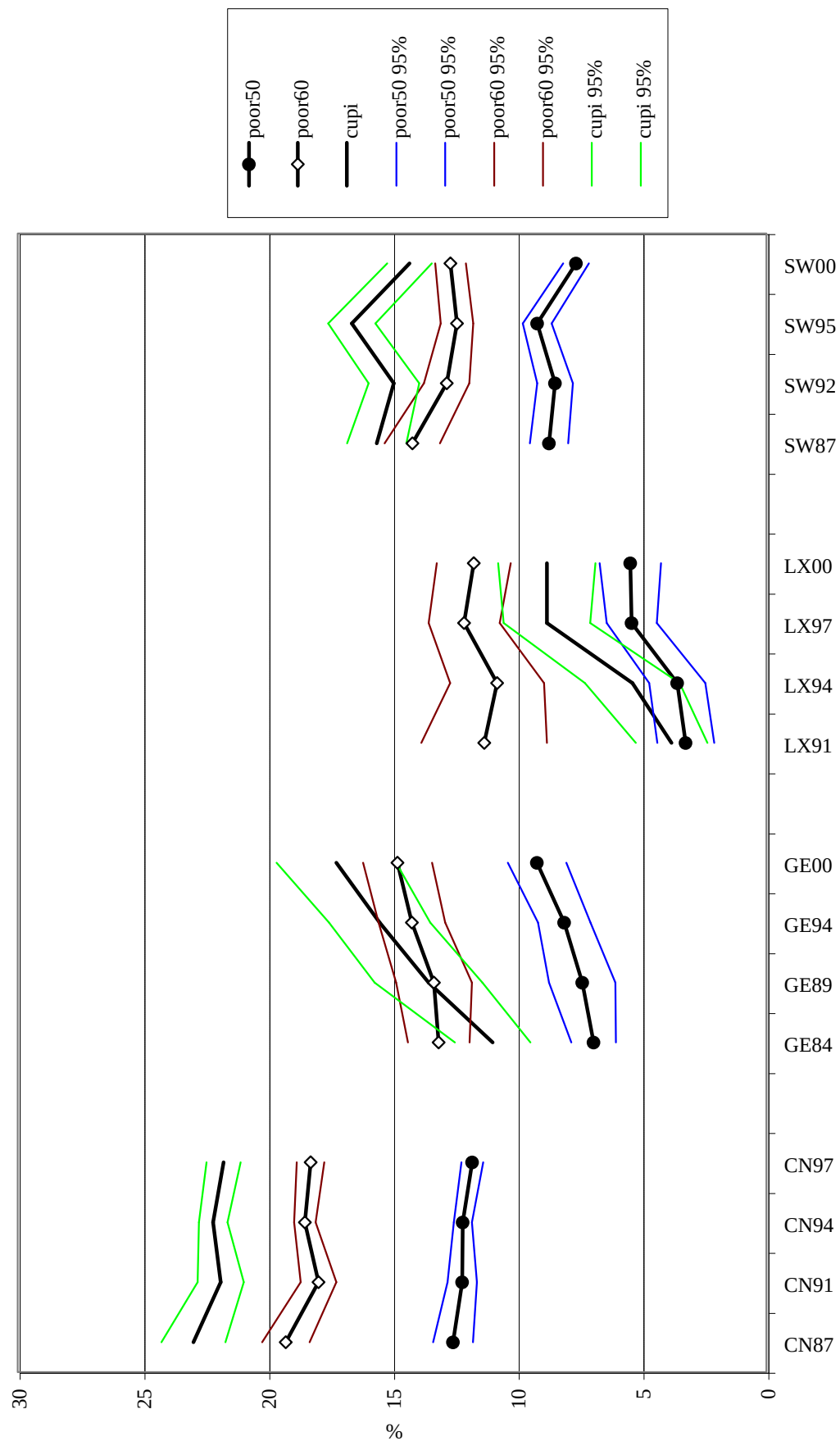


Figure 4. Poverty trends in Finland from 1989 to 2000.

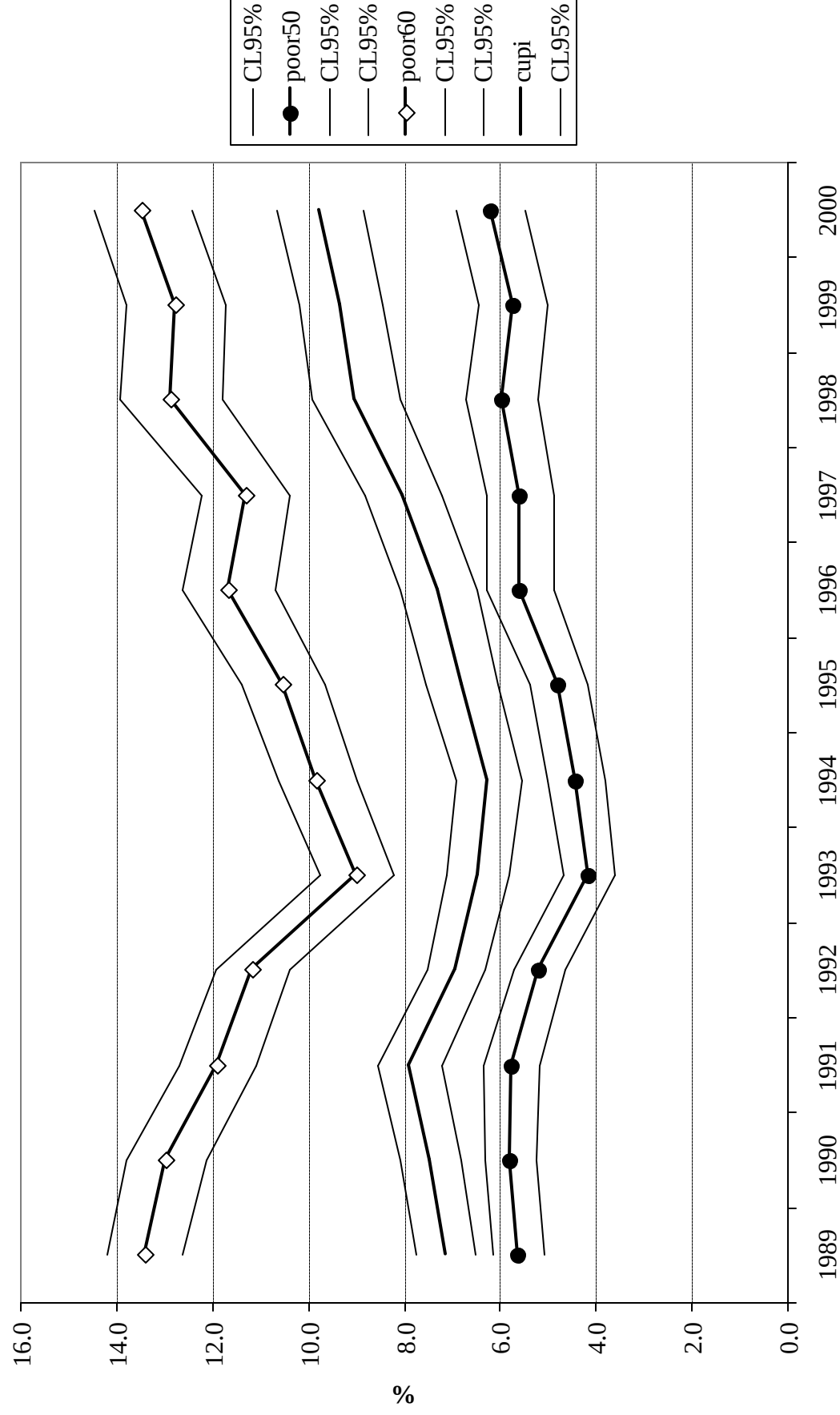


Figure 5. The simulated effect on various poverty measures of changing the value of child benefit for the first child.

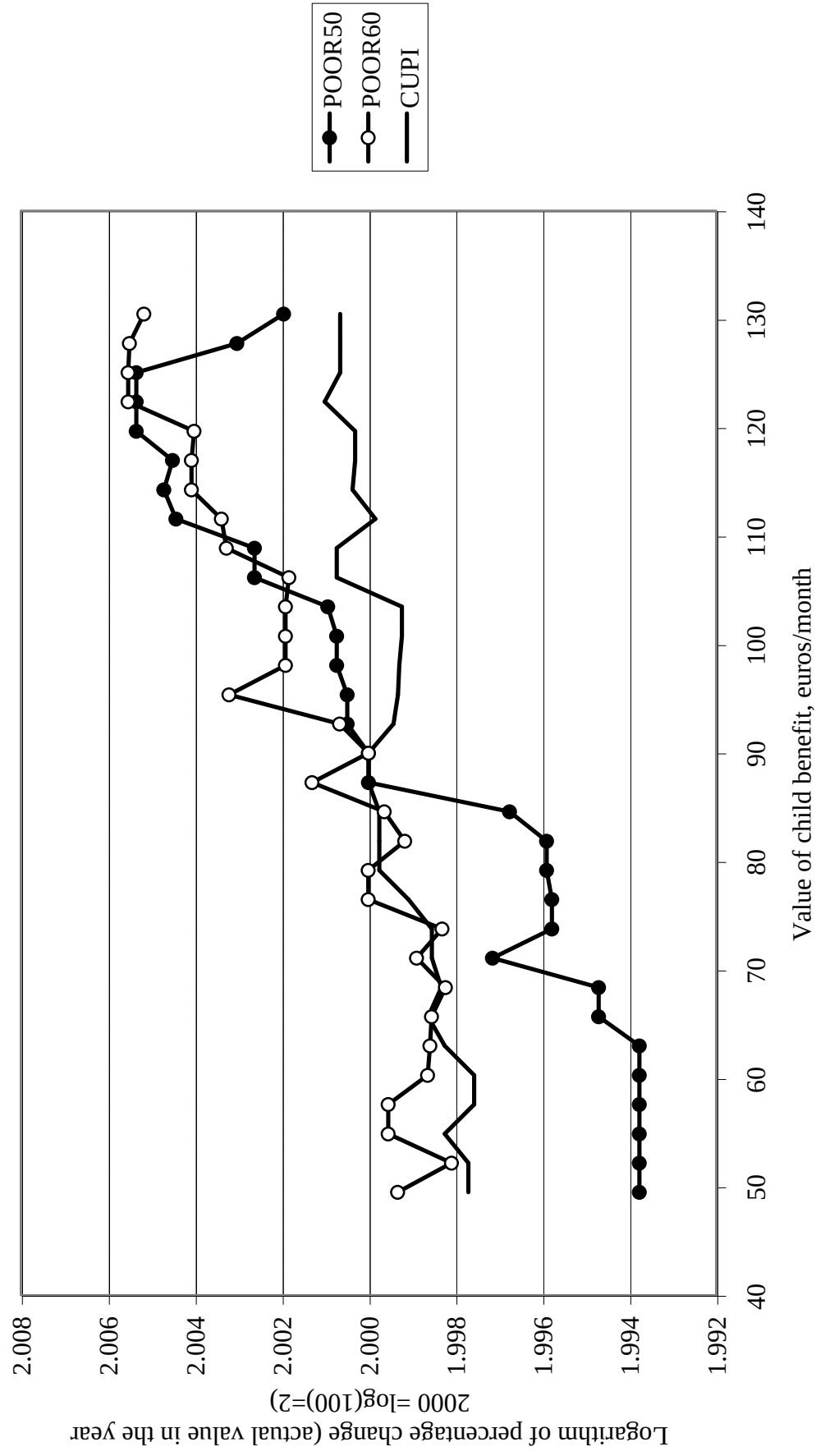


Figure 6. The simulated effect of changing the level of social assistance to various poverty measures.

