International Trends in Poverty
- How Rates Mislead and Intensity Matters

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Abstract

Although a large academic literature has discussed why the poverty *rate* is a poor summary index of trends in poverty, it is still used in much applied policy analysis. This paper begins by summarizing briefly why poverty *intensity* is a better measure of poverty. Using Luxembourg Income Study data on trends in poverty since the 1970s in Sweden, Canada, the USA and UK, it demonstrates that in about 40% of year to year comparisons, the conclusion one would draw about trends in relative poverty differs qualitatively if one uses the poverty rate or poverty intensity as the measure. For absolute poverty in the UK, the poverty rate and poverty intensity change in opposite directions every time.

Since the choice of index of poverty matters, both for measurement and for analysis, the paper concludes by demonstrating that poverty intensity can be represented graphically by the "Poverty Box", and showing that trends over time, international comparisons and analysis of the impact of changes in the proportion of workless households can all be easily communicated using this tool.

1. Introduction

Is poverty increasing or decreasing?

Because most governments are, at least in their rhetoric, committed to reducing poverty, a downward trend in poverty is often seen as vindication of policy choices. Conversely, major policy initiatives of the late 1990s such as "ending welfare as we know it" in the USA or "making work work" in the UK will be seen as failures if poverty remains constant or, worse, increases. However, it is obviously crucial to know when "success" or "failure" has occurred, which implies that analysts need to have a good measure of "poverty", in order to assess whether it has in fact increased or decreased over time.

There is a large academic literature on the measurement of poverty (see, for example, Zheng, 1997) which discusses why the poverty *rate* is a poor summary index of trends in poverty. All the same, it remains the statistic used by some of the best policy analysts currently writing. As examples, one can cite Freeman (2001) and Dickens and Ellwood (2001) who have recently discussed poverty trends in the USA and the UK. Although both studies are the product of very well known authors and are otherwise excellent in many respects, both focus entirely on trends in the poverty rate (i.e. the percentage of the population with incomes below the poverty line) and, using the poverty *rate* as the measure of poverty trends, both make quite unambiguous assertions about poverty.[1] Their emphasis on the poverty rate is particularly disconcerting because the policy issue addressed by both papers is, essentially, what to do about families with zero labour market earnings.

In all countries, households without any labour market earnings tend to be the poorest of the poor. A major function of the transfer system is to alleviate the depth of their poverty, even if it is clear that transfer

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[1] Dickens and Ellwood (2001: 4 - 12) have an excellent discussion of the differences between relative and absolute poverty lines and the influence on measurement of poverty of the definition of income and of family/household unit. However they take it totally for granted that poverty should be measured as the percentage of the population whose income falls below the poverty line (however income and poverty line are defined). Freeman (2001) simply focusses on the poverty rate, calculated using the US official poverty line.

payments are typically insufficient to move their incomes above the poverty line. Some workless households face disability, skills and other barriers to labour market participation so severe that it is not realistic ever to expect significant earnings, but for other households the picture is much less clear. The issue which concerns Freeman (2001) is the extent to which the robust labour market demand of the USA in the late 1990's can be depended upon to continue to produce declines in American poverty. Dickens and Ellwood (2001) focus on the extent to which the rise in workless households in the UK (in contrast to a fall in the USA) explains the differential trend in poverty in the two countries. The policy issue they address is whether the different level and structure of government aid for workless households in these two countries might influence labour supply. In both papers, therefore, the well-being of individuals excluded from the labour market, with the greatest depth of poverty, should be a crucial issue – but the poverty rate is a measure of poverty which is insensitive to this issue.

Why do some of the best applied economists continue to use a potentially misleading measure of poverty ? Although poverty measurement is a pointless exercise if the measures proposed are not actually used in any real world policy debate, it is potentially a dangerous exercise (i.e. for the poor) if a misleading index is chosen.

Presumably, all analysts of poverty would agree that one could, nonetheless, take the poverty rate as an acceptable index of poverty trends:

(a) if alternative measures are inferior in a technical sense;

(b) if, in actual practice, choice of index does not matter - i.e. if alternative, ethically preferable measures of poverty show the same trend over time;

(c) if alternative measures are so hard to communicate to a general audience as to be unintelligible or

(d) if alternative measures of poverty trends have much the same policy implications as the poverty rate.

This paper argues that none of these conditions are satisfied. Section 1 briefly introduces a measure of

poverty intensity which is technically preferable to the poverty rate as a measure of poverty. Section 2 demonstrates that in describing international trends in poverty, because the poverty gap can change quite quickly, it is relatively common for changes in the poverty rate to disagree with changes in poverty intensity. Section 3 presents the "poverty box" in order to make the point that a simple visual presentation of trends in poverty intensity can be more informative than analysis based on the poverty rate. Section 4 then uses the idea of poverty intensity to discuss the same issue of zero earnings households which is addressed by Freeman and Dickens/Ellwood. The approach throughout this paper is (hopefully) one of simplicity, based on the hypothesis that one reason why bad measures of poverty continue to be used is because excess technique has been a barrier to widespread communication. Section 5 concludes.

1. Is there a better Index of Poverty than the Poverty Rate ?

In the popular press and in much policy analysis work, the poverty rate (the percentage of the population whose incomes lie below the poverty line) is the most commonly encountered poverty measure, supplemented occasionally by reference to the average poverty gap ratio (the average percentage shortfall of poor individuals' incomes below the poverty line). However, Sen (1976) noted that the former measure is insensitive to the depth of poverty and the latter ignores the number of poor individuals (and neither statistic is transfer sensitive). He proposed a new poverty index and a set of desirable axioms for evaluating a poverty index. Since then, research on poverty indices has received considerable attention.[2] As the Sen index is not replication invariant, not continuous in individual incomes, and fails to satisfy the strong transfer axiom, Shorrocks (1995) proposed a modified Sen index which is identical to the limit of Thon's (1979) modified

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[2] See, among others, Atkinson (1987), Besley (1990), Blackorby and Donaldson (1980), Donaldson and Weymark (1986), Foster, Greer and Thorbecke (1984), Foster and Shorrocks (1988, and 1991), and Takayama (1979). Kakwani (1980), Foster (1984), Hagenaars (1986, 1991), Seidl (1988) and Zheng (1997) have provided useful surveys of this literature. Methods of statistical inference of different poverty measures have been provided by Bishop, Chow and Zheng (1995), Rongve (1997), Preston (1995), and Zheng, Cushing and Chow (1995).

Sen index as the number of observations goes to infinity - which this paper refers to as the SST index of poverty intensity.[3]

Hagenaars (1986,1991) and Zheng (1997) have summarized the properties that an ethically defensible index of poverty should possess[4]. A particularly important consideration is that an acceptable measure of poverty should always register an increase in poverty whenever a pure transfer of income is made from someone below the poverty line to someone who has more income. This property is not possessed by the poverty rate.

The poverty rate is a bad index on axiomatic grounds and there are several important policy implications of its deficiencies. When decreases in the poverty rate are used as the criterion for social policy, administrators who want to demonstrate "success" will always be tempted by the option of "creaming" the poverty population. By redistributing benefits or services away from the very poorest (who are so far below the poverty line they are likely to stay poor anyhow) to those just below the poverty line (who have the greatest chance of being moved over the line) administrators can improve the poverty *rate*, even while deepening the deprivation of the worst off - which is surely not a socially desirable outcome.

Use of the poverty rate criterion may also affect measurement choices. Myles and Picot (2000:4)[5] have commented: "A typical frustration of policy-makers is that incremental efforts to raise the incomes of the most indigent often have little impact on the poverty *rate*. The temptation in this situation is to move the goal posts to a lower poverty standard in the (usually misguided) hope that a lower cut-off will register the change. Changes that affect the most indigent are always reflected in measures of poverty *intensity* ".

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3 See Jenkins and Lambert (1997) and Zheng (1997) for further discussion about the limit of Thon's index.

4 Generally summarized as focus, monotonicity, symmetry, replication invariance, transfer sensitivity and replication invariance - see Zheng (1997).

5 Because the SST index is defined in terms of poverty gaps it is robust under data contamination in the sense of Cowell and Victoria-Feser (1996), and especially so when the poverty line is set with reference to median income.

The use of a better measure of outcomes may obviate the tendency to "move the goalposts" and it may also reduce false pessimism about antipoverty policy. As Focus (1998:4) commented: "According to conventional wisdom, US antipoverty programs have not 'worked.'". However, this perception was driven by trends in the poverty *rate*. In practice, policy makers are under pressure both to "show results" and to provide aid to the most indigent. If they follow Rawls (1971) and focus programmes on the least well off, their successes will be often statistically invisible, since the poverty rate does not reflect the improvement in well being that comes with a reduction in the poverty gap. A better measure of poverty - like poverty intensity - may therefore also be important in avoiding "false negatives" in policy analysis.

This paper therefore advocates use of the SST index of poverty intensity, which combines the poverty rate, average poverty gap ratio and inequality in poverty gaps. Osberg and Xu (2000) show that it can be decomposed as[6]:

$$(1) \qquad P(Y; z) = (RATE)\ (GAP)\ (1+G(X)).$$

It is often useful to transform Equation (1) into:

$$(2) \qquad \ln(P(Y; z)) = \ln(RATE) + \ln(GAP) + \ln(1+G(X)),$$

where the term $\ln(1+G(X))$ is an approximate of $G(X)$ based on the first-order Taylor series expansion.

When comparing poverty over time or across jurisdictions, the percentage difference in poverty intensity can therefore be expressed as the sum of the percentage differences in the poverty rate, average poverty gap ratio (among the poor), and Gini index of inequality in the poverty gap ratios (among all people).

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6 "RATE" is the percentage of the population with incomes below the poverty line (sometimes called the head count ratio), "GAP" is the average percentage gap between the incomes of the poor and the poverty line and G(X) is the Gini index of inequality of the poverty gap among all people, where the poverty gap of the nonpoor is set to zero.

(3) $$\ddot{A}\ln P(Y; z) = \ddot{A}\ln(RATE) + \ddot{A}\ln(GAP) + \ddot{A}\ln(1+G(X)),$$

where Äln (1 + $G(X)$) is an approximation of Ä$G(X)$.

In practice, changes over time (or differences between countries or Canadian provinces) in the inequality of poverty gaps [1+$G(X)$] are empirically very small, especially when compared to differences in the poverty rate and average poverty gap[7]. Hence, for most practical purposes the percentage change in poverty intensity can be approximated as the sum of the percentage changes of the poverty rate and the average poverty gap ratio.

Section 3 of this paper will use Equation 1 to motivate a straightforward graphical interpretation. Poverty intensity, like the volume of a box, is the product of three factors - RATE, GAP and (1+G(X)). Indeed, since the final term (representing inequality in poverty gaps among all persons) is virtually constant in empirical work, the Poverty Box can be represented in two dimensions as the product of RATE and GAP - i.e. the area of a rectangle, whose height is the average poverty gap ratio and whose width is the poverty rate. Since humans are better at extracting relative size information from graphs than from arrays of numbers, the Poverty Box offers an efficient way of presenting aggregate information, as well as enabling readers to disentangle the influence of changes in the rate, or the gap, on total poverty intensity.

2. Do Different Poverty Indices Give the Same Indication of Trends ?

Alternative measures of poverty will typically give different indications of the *level* of poverty, but this

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[7] Across LIS countries the coefficient of variation of poverty rates is .493, and for average poverty gap ratios it is .185. However, the coefficient of variation of (1+$G(x)$) is only .014 (Osberg and Xu, 2000:72). For Canadian provinces and US states in 1997 the CV is 0.341 for the SST index, 0.384 for the poverty rate, 0.141 for the poverty gap ratio and 0.011 for (1+G(X)) - see also Osberg and Xu (1999a). The "common sense" verbal explanation for the unimportance of inequality among the poor in an aggregate measure of poverty intensity is that the differences in income among the poor are small when compared to income differences among the non-poor. The upper bound on the incomes of poor people is the poverty line. The lower bound, (leaving aside measurement error), is subsistence. The dollar value of the difference is not large, particularly when compared to the dollar differences among the non-poor population. See Osberg and Xu (2000:57) and Xu and Osberg (2000) for geometric proof.

does not matter much for policy purposes if they all move in the same direction at the same time. However, as section 1 has discussed, there are strong grounds for preferring poverty intensity to the poverty rate as a measure of poverty - and the choice will matter if changes in rate and intensity do not coincide. This section uses Luxembourg Income Study data to examine whether they do. It presents estimates of poverty intensity, the poverty rate and the poverty gap for the four countries for which long term time series are available [Canada (1971, 1975, 1981, 1987, 1991, 1994 and 1997), Sweden (1975, 1981, 1987, 1992 and 1995), United Kingdom (1974, 1979, 1986 1991 and 1995), and United States (1974, 1979, 1986, 1991, 1994 and 1997)] supplemented occasionally with data from Germany (1981, 1983, 1989 and 1994).

In order to focus on the appropriate index of poverty, this paper submits to the constraints of the data and assumes that all individuals within households share equally in household resources, and have no claim on the resources of other households[8]. Since the focus of welfare comparisons is the distribution of income among persons we use the LIS definition of total family money income after tax (disposable income)[9] as the basis for calculation of the after tax money income "equivalent income" of all individuals within families. In the literature, a number of equivalence scales have been used to account for the economies of scale of household consumption [Burkhauser et al. (1996), and Phipps and Garner (1994), among others, have examined some of the implications of alternative choices]. The issues raised by different equivalence scales are important, but to keep this paper focussed and to facilitate comparisons with other research,[10] we simply

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8 Admittedly, these are strong assumptions about the social context of income flows since the effective resources available to each person depend on the degree of inequality in the intra-household distribution of consumption. See Phipps and Burton (1995:194)

9 Disposable income consists of the sum of gross wages and salaries, farm self-employment income, non-farm self-employment income, cash property income, sick pay, disability pay, social retirement benefits, child or family allowances, unemployment compensation, maternity pay, military/veteran/war benefits, other social insurance, means-tested cash benefits, near cash benefits, private pensions, public sector pensions, alimony or child support, other regular private income, and other cash benefits; minus mandatory contributions for self employed, mandatory employee contribution, and income tax.

10 See, for example, Buhmann et al. (1988), Coulter et al. (1992), Burkhauser et al. (1996), and Figini (1998) for comparison of the LIS, OECD and other equivalence scales. Figini (1998, p. 2) notes that "OECD and other two-parameter equivalence scales empirically used show a similarity of results [in measurement of inequality] to one parameter equivalence scales with elasticity around 0.5."

use the LIS equivalence scale, which calculates the equivalent income of each household member as:

$$Y_i = Y_f / N^{0.5}$$

Here Y_f is total household income after tax,[11] and N is the number of persons in the household.

Tables 1 and 3 examine whether the choice of poverty index matters for perceptions of the trend in poverty. Both tables present the SST index of poverty intensity and its components – the poverty rate, the average relative poverty gap ratio and the inequality in poverty gap ratios. The two tables differ because Table 1 follows much of the international literature and uses a relative conception of the poverty line, drawn at half the median equivalent individual income, while Table 3 freezes the real value of the poverty line at its 1974/75 level in each country. In consequence, in Table 1 the poverty line in each country changes over time with trends in the median income, which implies relatively large movements during periods of robust growth in median income (as in the early 1970s) but very little movement during periods when median incomes stagnate. In contrast, in calculating the results of Table 3, the 1974/75 poverty line in each country is updated only for movements in the local consumer price index, so it represents a poverty line that is "absolute" over time, but not across countries.

In defining poverty as the want of necessities, Adam Smith was quite clear that the definition of "necessity" depends on prevailing social norms:

> "Under necessaries, therefore, I comprehend not only those things which nature, but those things which the established rules of decency have rendered necessary to the lowest rank of people." (Vol. 2, Bk. V, Ch. II, Pt II, Art IV - 1961:400).

Most authors since then have accepted the proposition that poverty norms differ across countries. Criticism of a relativist approach to poverty measurement has typically focussed on the issue of change over time - whether improvements in the general standard of living should be thought of as decreasing poverty. Table 2 illustrates how much difference, in practice, a relative or an absolute approach to updating the poverty line

[11] "Disposable Personal Income" in the LIS data sets.

actually makes[12].

As comparison of Tables 1 and 3 indicates, using a relative or an absolute poverty line will affect the level of poverty recorded in any particular year[13], but for present purposes the issue is whether the same direction of change is observed in poverty intensity as in the poverty rate.

Table 1 indicates that if one wanted to know whether relative poverty had increased in the early 1990s or not, one would very often not get the same answer from the poverty rate and poverty intensity measures. In the early 1990s, only in the US and in Germany do the indices agree on trends. In Canada, the UK and Sweden, the poverty intensity and poverty rate statistics disagree. A fall in the average poverty gap in Canada between 1991 and 1994 meant that poverty intensity also fell, even as the poverty rate rose marginally. In the UK, a fairly substantial increase in the average poverty gap between 1991 and 1995 produced an increase in poverty intensity, despite a fall in the poverty rate. In Sweden there was no change in the poverty rate from 1992 to 1995, but poor people were much worse off and poverty intensity rose as a consequence.

Over all, Table 1 enables twenty two year to year comparisons of a country's poverty. In four of these [USA 1974-79 and 1986-91, Sweden 1992-95, UK 1974-79] there is no change in the poverty rate, but because the poverty gap changes the well being of poor people also changes and the poverty intensity measure reflects that fact. In another five instances [Canada 1991-94, UK 1979-86 and 1991-95, Germany 1981-84 and 1984-89] the direction of change of the poverty rate is actually opposite to the direction of change of poverty intensity, because there has been a sufficiently large movement in the average poverty gap in the opposite direction to the change observed in the poverty rate. In short, in about 40% (=9/22) of year to

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[12] Osberg (1999:13,20) notes that from 1980 to 1994 average incomes in North America rose, because above median incomes increased, but the bottom half of the income distribution had a real income decline in the US and only a small gain in Canada. Median incomes stagnated in real terms in both countries. However, the updating method made a big difference in the 1960s and early 1970s. Prior to 1980, growth of median real incomes meant that updating the official US poverty line only for price increases produced a decline from its initial level of 49% of median income to about 35% (for a four person family) - see Ruggles (1990:30-61); Osberg (1984:61-72)

[13] In order to focus on how important updating for real income change may be, Table 3 fixes the poverty line at its real value in 1974/75. Hence, the entries for 1974/75 in Tables 1 and 3 are identical.

year comparisons, the conclusion one would draw about trends in poverty differs qualitatively if one uses the poverty rate or poverty intensity as the measure. Since we have good grounds for believing that poverty *intensity* is a better summary index, this implies that the poverty *rate* is very often a misleading indicator of trends in relative poverty.

Table 3 is based on an absolute poverty line. It is notable that the strong growth in real incomes in Canada in the early 1970s produces a much more dramatic decline in poverty (measured both as the poverty rate and poverty intensity) between 1971 and 1975 than is apparent in Table 1. Since the Luxembourg Income Study data on which this paper is based begin in 1974/75 for the other countries, one cannot directly observe in Table 3 comparable trends for the early 1970s in the USA, UK and Sweden, but other evidence indicates that absolute poverty declined substantially in the early 1970s.

Considering that Tables 1 and 3 report over twenty years of data, it is perhaps remarkable that the differences between the two tables after 1975 are not larger. Certainly one cannot say that the failure of poverty to disappear is due to the use of a relative standard of poverty in Table 1. Although any amount of real growth in a distribution of income of unchanged inequality will build in a tendency for both the rate and intensity of poverty to decline together (and hence agree on trends), there are both ups and downs in poverty, by either measure, in each country. However, the pattern of disagreement between measures is fascinating.

In the years examined in Table 3, Canada, the USA and Sweden all show the same direction of movement in the rate and intensity of poverty from year to year. If all one wants to know is the direction of movement for absolute poverty in these three countries, one can use either the poverty rate or poverty intensity. For the UK, however, the poverty rate and poverty intensity change in opposite directions every time - which implies that the rate of absolute poverty is an absolutely misleading index of poverty trends in the UK.

From 1974 to 1979, there was a large increase in the poverty gap in the UK, and since the fall in the poverty rate was small, poverty intensity rose. From 1979 to 1986, the increase in the poverty gap was even

larger, again outweighing the decline in the poverty rate, so poverty intensity rose. However, poverty intensity fell between 1986 and 1991, due to a decline of about a third in the poverty gap ratio, even as the poverty rate rose. From 1991 to 1995 the decline in the poverty rate was again dominated by an increase in the average poverty gap ratio, so poverty intensity rose.

The discrepancies between changes in poverty rate and poverty intensity measures (particularly for the UK) should get us thinking about *why* the poverty rate and the poverty gap might move indifferent directions. The cyclical and structural evolution of low wage labour markets and the demand and supply for skills are of great importance for poor households with some labour force attachment, who are often just below the poverty line. However, standard labour supply and demand models imply that the poverty rate and poverty gap are likely to move in tandem, which implies that one should not observe a discrepancy between changes in poverty intensity and the poverty rate. Explaining the discrepancies which are observed may therefore push analysis in other directions.

For example, using poverty intensity as a measure enables one to ask whether there has been "triage" approach to social policy. Large changes in social policy and benefit entitlement can occur in short periods of time, and are of greatest importance for households excluded from the labour market. If one observes (as in the UK 1979-86) a sharp increase in the average poverty gap combined with a decrease in the poverty rate, is this because resources have been transferred away from the most deprived, who have been written off as "no-hopers" in favour of a focus on the marginally poor?

In short, a focus on poverty intensity may shift analytic attention. The "bottom line" is that in an important number of cases - particularly for comparisons which involve poverty trends in the UK - the choice of index of poverty does matter, both for measurement and for analysis.

3. But can it be communicated ?

Why is the poverty rate still the statistic of choice for many analysts, despite its defects?

One important reason may be the perception that better measures are too complex to be communicated to a wider audience. If the whole point of measuring poverty is to affect the policies that might affect poverty, then a poverty index that cannot be understood by the public and by policy makers is pointless. Simplicity of presentation is therefore crucial. Although some writers in the literature on poverty measurement have emphasized the generality of stochastic dominance techniques and others have advocated ethically flexible measures such as the Foster-Greer-Thorbecke index, many policy makers may consider these to be highly abstract and devoid of intuitive understanding.

As already noted, however, poverty intensity has a straightforward graphical interpretation. Like the volume of a box, it is the product of three factors - RATE, GAP and (1+G(X)). Indeed, since the final term (representing inequality in poverty gaps among all persons) is virtually constant in empirical work, the Poverty Box can be approximated in two dimensions as the product of RATE and GAP - i.e. the area of a rectangle, whose height is the average poverty gap ratio and whose width is the poverty rate.

On the theory that "a picture is worth a thousand words", Figure 2 presents the Poverty Box for the UK in 1974, 1979, 1986, 1991 and 1995. Although Figure 2 takes up more space on the printed page than the corresponding section of Table 1, that investment in printing costs will be worthwhile if readers gain a corresponding increase in information content. In general, humans are very good at deriving accurate relative size information when it is presented as graphs, but have relatively poor accuracy when confronted with tables of numbers.

In the particular case of UK poverty trends, Figure 2 is fairly clear in showing that there was a rise in poverty in the UK from 1974 to 1979 and from 1979 to 1986, despite a stable or declining poverty rate. Figure 2 also shows that although the poverty gap fell from 1986 to 1991, the increase in the poverty rate was so large that it is clear that poverty increased in aggregate. And when the data actually does have conflicting trends, it is worthwhile for graphical methods to show this also. For example, from 1991 to 1995, looking only at the poverty rate one would say there has been a clear decline in poverty, but since the average

poverty gap rose, one has to look a bit more carefully to see that poverty intensity also rose, although not by much.

As well as making comparisons over time, the poverty box can usefully illuminate the differences among countries at a point in time. Figure 3 plots the USA, UK, Canada, Germany and Sweden in 1994/95. The relative magnitude of poverty in the United States comes through very clearly. In 1994/95, it is also clear that by both the poverty intensity and poverty rate measures, the US has more poverty than the UK, which has more poverty than Canada. However, although Sweden in 1995 has a lower poverty rate than Germany, the average poverty gap in Sweden was considerably larger, implying that poverty intensity in Germany was actually lower than in Sweden. In cross sectional comparisons, as well as in comparisons over time, the choice of poverty index matters.

4. But can a better measure of poverty help policy analysis?

Even if one grants that poverty intensity is an analytically better measure of poverty, which often moves counter to changes in the poverty rate and which has a clear graphical interpretation, is it useful in an analytic sense ? Can a measure of poverty intensity better illuminate important policy issues?

One of the most important policy issues in poverty analysis is employment. Whether or not it is "work incentives", job availability, inadequate skills or whatever - the determinants of the work effort of the poor are hotly debated. Policy makers have to weigh their shreds of empathy for those who cannot work against public hostility to the presumed number who do not want to work - and there are substantial differences across countries in both the working hours of poor people and in public attitudes[14].

In some countries, a substantial rise in the proportion of households with zero earnings has been responsible for much of the upward trend in poverty. Table 4 examines persons in households with a head of

[14] For example, using the World Values Survey, Phipps (1999:36-37) found that 34% of Canadian men (29% of women) thought "laziness" was the reason some people lived in need - fractions that are significantly less than that in the US (40%, 38%), but more than in the UK (28%, 25%) and much more than in Norway (15%, 7%)or the Netherlands (18%, 12%).

working age and presents data on poverty among households with no earnings and among households with some earnings. Although it indicates that in aggregate terms "work pays" in all countries [in the sense that poverty intensity among working households is much less than among the workless], it is also clear that there are considerable differences among countries. Since aggregate poverty intensity is a weighted average of workless households - whose poverty intensity is typically very high, but who are a small fraction of the population - and poverty intensity among working households and since these two groups differ so much in relative size and in the level of their poverty, unbundling the size and dimensions of changes in worklessness is crucial.

In aggregate, poverty among working age households was fairly constant from 1974/75 to 1994/95 in Canada and the USA (albeit at relatively high levels), but increased substantially in Sweden and the UK [15] - one would like to know why, and the first step for an analyst is to get an impression of the facts that need explaining..

The UK stands out both for the size of its increase in poverty intensity- 5.6 points (= 8.3 - 2.7) - and for the substantial increase in workless households. Back in the "bad old days" of the Welfare State under Old Labour in 1974, 95.3% of British working age households had some work - a fraction very similar to that in Canada (95.2%), the USA (95.0%) and Sweden (96.2%). A lasting legacy of the Thatcher years seems to have been a very substantial increase in the proportion of working age British families with no earnings[16] - the big jump (from 7.5% to 17.2%) between 1979 and 1986 has not been followed by a lasting decline and over the period as a whole worklessness rose from 4.7% to 20.4% - i.e. by 15.7%.

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[15] Using a much larger sample, Osberg and Xu (2000: 72) observe: "there is no clear trend to greater poverty intensity - no "immutable natural law" of greater immiserization - to be observed in the LIS data. Simply counting the number of times one observes in Table 2 a decrease in poverty intensity (16) compared to the number of times an increase in poverty intensity is observed (14), the result is pretty much a draw. The number of statistically significant declines (6) and increases (7) are nearly matched. Even in an increasingly globalized international economy, different social choices and different social outcomes are to be observed."

[16] Gregg, Hansen and Wadsworth (1999) discuss UK trends in much more detail.

International data offer an interesting point of approach to the issue of worklessness since the increase between 1974/75 and 1994/95 was much more modest in Canada (3.5%) and Sweden (5.8%). The percentage of working age households with zero earnings rose least of all in the USA (1.8%) and fell again by 1997. It is therefore hard to think of general technological trends as the cause of the UK increase, since such trends are pretty common across nations. Macro economic events, and their long term residue, differ more across nations and may offer a more fruitful hypothesis. The big UK increase between 1979 and 1986 coincided with very high unemployment. Furthermore, as the US unemployment rate dipped down to the 4% range in 1997, worklessness in the USA, and the poverty that goes with it, dropped back to 1974 levels (which motivated the Freeman (2001) paper on the potential limits on macro economic demand as an anti-poverty strategy).

On the other hand, in aggregate terms the unemployment rate in the UK has declined substantially in recent years, so there must be some more complicated story to tell about the interaction of aggregate demand and social policy in producing poverty. In thinking about what that story might be, how should one describe the trends that need to be explained ?

In the international data of Table 4, the biggest increase in worklessness comes in the country for which the poverty rate is the most consistently misleading indicator of poverty trends, so it is particularly important to use poverty intensity as the index of poverty trends when analysing the impact of worklessness. It is also important to present data in a way that accurately represents the relative magnitudes involved.

Table 4 usefully illustrates the contrast between poverty among working and workless households, but in comparing columns of figures it is easy to lose sight of the relative sizes of the respective populations. Looking, for example at Canada in 1997, it is easy to see in Table 4 that poverty intensity among working households (4.5) is far less than among workless households (43.4). However, although poverty is more intense among workless households, they comprised only 7.7% of the working age population. Hence it is not so easy to see from Table 4 that 8.3 % of the population lives in poor working households (.083 = .087 *

.923), which is considerably greater than the 5.4% who live in poor workless households (.054 = .704 * .077).

Figures 4 to 10 are drawn to illustrate how the Poverty Box approach offers a way of visually presenting information in a way that can illuminate the relative size and dimensions of poverty. In these Figures, the horizontal axis measures the fraction of the population in each group and the vertical axis measures the average poverty gap[17]. Within each group (in this case, working and workless households) a poverty box is drawn which reflects the poverty rate and average poverty gap of the poor, among that group. As before, within each group poverty intensity can be represented as proportional to the area of a box whose height is the average poverty gap and width is the poverty rate - and the sum of the areas of the poverty boxes will be total poverty intensity - but the advantage of Figures 4 to 10 is that it shows where that total amount of poverty is coming from.

Figure 4 for Canada in 1997, for example, helps one to see that working poverty is just as important in aggregate as workless poverty, despite the very high rate of poverty (70.4%) among workless households and the relatively low rate of poverty among households with some earnings (8.7%), and despite a comparable difference between the average poverty gap for workless households (40.2%) and that for working households (26.4%). *Because* only 7.7% of working age Canadian households in 1997 have no earnings, the relevant population sizes are such that one is very likely to be misled by looking only at the *rate* and *gap* data in Table 4.

Figures 5, 6 and 7 presents comparable figures for the UK in 1974,1986 and 1995 to illustrate the role which differing rates of worklessness play in determining aggregate poverty. Again, the 1974 data in Figure 5 illustrate the importance of thinking about the relative size of populations, when considering rates. Looking at the huge difference in poverty *rate* between workless households (70.2%) and working households (3.5%) in

[17] To conserve space, the horizontal and vertical axes are truncated at 50% of the total population and poverty line, respectively.

1974 in the UK, one would be likely to miss the fact that slightly more people were actually members of working poor households than workless poor households - but Figure 5 brings out that dimension of the issue, as well as the difference in average poverty gap.

A comparison of Figure 5 and Figure 6 shows both the increased poverty gap between 1974 and 1986 for both working and workless households, and the increase in percentage of workless households in the UK. Although the *rate* of poverty among workless households actually fell (from 70.2% to 39%), the workless population rose so dramatically (more than a three fold increase) that the number of workless poor increased substantially. As well, although the average poverty gap rose for both working and workless households, the increase was significantly greater for the working poor. Figure 7 shows how the continuing rise in UK poverty intensity from 1986 to 1995 was not primarily due to changes in the average poverty gap, which remained fairly steady (rising slightly for the workless from .278 to .285, while falling a bit for the working poor from .287 to .262). The big action came in an increase in the poverty rate, which was quite substantial for workless households (from 39.0% to 53.9%) and smaller for the working poor (from 5% to 5.8%).

Figures 8, 9 and 10 present US data for 1974, 1986 and 1997. The proportion of the under 65 population with zero earnings was fairly small and did not change much over this period, and their rate of poverty was very large and similarly unchanging, while the poverty rate and gap of working households was much lower throughout - but in every year there is actually more poverty among working households since there are so many more of them. As well, comparing these figures over time brings out the increasing distance between the poverty gap of workless households and working households - an increasing “incentive” to employment that seems to have been ineffective in changing the percentage of workless households (1997's percentage workless (5.1%) is nearly identical to that in 1974 (5.0%)).

5. Conclusion

This paper has argued that poverty intensity is a better measure of poverty than the poverty rate. It has presented evidence from Luxembourg Income Study data to show that in a significant number of cases these two indices disagree qualitatively on the time trend of poverty within countries. It has suggested use of the "Poverty Box" as a simple way of illustrating the components of changes in poverty intensity, and has presented examples of its use in the analysis of the implications of trends in worklessness across countries. Hopefully, with better measures of trends in poverty, societies will be able to make better decisions about the policies that can reduce poverty.

Table1
Poverty Intensity and Components-All Cohorts

	Poverty Intensity	Poverty Rate	Relative Poverty Gap	(1 + Gini Gap)
Canada 1971	10.9	16.0	0.358	1.906
1975	8.5	13.8	0.321	1.919
1981	7.2	12.3	0.302	1.928
1987	6.8	12.0	0.293	1.929
1991	6.3	11.4	0.285	1.934
1994	6.1	11.5	0.276	1.933
1997	7.0	11.9	0.306	1.932
United States 1974	10.7	15.9	0.355	1.904
1979	10.2	15.9	0.335	1.906
1986	11.9	17.9	0.354	1.886
1991	11.7	17.9	0.343	1.891
1994	12.6	18.5	0.360	1.888
1997	10.6	16.8	0.333	1.901
1997 (using OECD scale)	10.4	16.7	0.329	1.903
United Kingdom 1974	3.2	9.0	0.180	1.950
1979	3.8	9.0	0.218	1.953
1986	4.6	8.4	0.278	1.961
1991	6.4	14.5	0.232	1.920
1995	6.6	13.2	0.259	1.935
Sweden 1975	3.2	6.4	0.257	1.970
1981	3.0	5.2	0.294	1.972
1987	4.7	7.3	0.328	1.960
1992	4.5	6.5	0.352	1.963
1995	5.4	6.5	0.424	1.960
Germany 1981	2.9	5.6	0.263	1.970
1984	2.8	6.5	0.223	1.964
1989	3.5	5.6	0.314	1.967
1994	5.2	8.5	0.310	1.953
1994 + DDR	4.4	7.5	0.298	1.959

note:The poverty line is measured as ½ the median equivalent income where the equivalence scale used is the LIS scale (the square root of the total number of people in the household).
Poverty Intensity = Rate × Average Gap × (1 + Gini (gap))
Source: Author's calculations using the Luxembourg Income Study.

Table 2
Comparison of Relative and Absolute Poverty Lines
Family Income at Poverty Line for a Family of Four

	Relative	Absolute	relative/absolute
Canada (Can $) 1971	3,938	4,956	0.795
1975	6,860	6,860	1.000
1981	12,680	11,720	1.082
1987	17,830	16,212	1.100
1991	21,376	19,594	1.091
1994	22,320	20,292	1.100
1997	23,560	21,388	1.102
United States (US $) 1974	5,764	5,764	1.000
1979	8,676	8,488	1.022
1986	13,490	12,814	1.053
1991	16,404	15,924	1.030
1994	17,512	17,328	1.011
1997	20,766	18,766	1.107
United Kingdom (£) 1974	1,336	1,336	1.000
1979	2,870	2,752	1.043
1986	5,040	4,748	1.062
1991	7,698	6,484	1.187
1995	8,758	7,242	1.209
Sweden (Kroner) 1975	25,914	25,914	1.000
1981	48,350	47,866	1.010
1987	76,650	71,290	1.075
1992	125,292	99,182	1.263
1995	128,576	108,880	1.181

note: Each poverty line is shown in each country's currency, current values.

Table 3
Poverty Intensity and Components-All Cohorts
Absolute Poverty Line (1974/75 line adjusted for inflation)

		Poverty Intensity	Poverty Rate	Relative Poverty Gap	(1 + Gini Gap)
Canada	1971	15.9	23.6	0.363	1.856
	1975	8.5	13.8	0.321	1.919
	1981	6.0	10.4	0.297	1.940
	1987	5.4	9.6	0.289	1.944
	1991	5.1	9.2	0.283	1.947
	1994	4.8	9.1	0.270	1.947
	1997	5.7	9.5	0.309	1.945
United States	1974	10.7	15.9	0.355	1.904
	1979	9.7	15.2	0.334	1.910
	1986	10.9	16.5	0.348	1.896
	1991	11.0	17.0	0.343	1.897
	1994	12.4	18.2	0.360	1.890
	1997	8.8	13.7	0.335	1.919
United Kingdom	1974	3.2	9.0	0.180	1.950
	1979	3.3	7.8	0.217	1.961
	1986	4.0	6.2	0.330	1.969
	1991	3.7	8.1	0.232	1.960
	1995	4.2	6.4	0.336	1.968
Sweden	1975	3.2	6.4	0.257	1.970
	1981	3.0	5.0	0.301	1.973
	1987	4.1	6.0	0.348	1.966
	1992	3.1	3.9	0.397	1.976
	1995	4.4	4.9	0.447	1.968

note:The poverty line is measured as ½ the median equivalent income where the equivalence scale used is the LIS scale (the square root of the total number of people in the household).
Poverty Intensity = Rate × Average Gap × (1 + Gini (gap))
Source: Author's calculations using the Luxembourg Income Study.

Table4
Poverty Intensity[1] and Components-All Cohorts
Working and Workless Households - Households Heads <65 Years of Age

	Poverty Intensity		Poverty in workless[2] households				Poverty in working[2] households		
		% in workless hhlds	Poverty Intensity	Rate	Gap	% in working hhlds	Poverty Intensity	Rate	Gap
Canada 1971	10.8	4.8	60.0	86.3	0.485	95.2	7.4	11.2	0.343
1975	8.1	4.2	52.3	83.3	0.434	95.8	5.5	9.2	0.306
1981	7.5	4.3	46.5	76.5	0.414	95.7	5.1	9.1	0.289
1987	7.6	5.3	38.0	69.3	0.359	94.7	5.4	9.6	0.288
1991	7.3	6.4	36.5	69.5	0.340	93.6	4.7	8.8	0.274
1994	7.2	7.7	33.9	68.6	0.318	92.3	4.4	8.5	0.265
1997	8.3	7.7	43.4	70.4	0.402	92.3	4.5	8.7	0.264
United States 1974	10.6	5.0	52.6	78.1	0.461	95.0	7.7	11.5	0.346
1979	10.2	5.0	49.8	73.7	0.455	95.0	7.4	12.5	0.307
1986	12.3	6.3	49.7	73.1	0.468	93.7	8.9	14.1	0.331
1991	12.4	6.4	51.9	76.7	0.472	93.6	8.8	14.4	0.319
1994	13.4	6.8	56.6	78.7	0.500	93.2	9.1	14.8	0.322
1997	11.1	5.1	54.3	74.9	0.495	94.9	8.0	13.9	0.299
United Kingdom 1974	2.7	4.7	25.5	70.2	0.234	95.3	1.3	3.5	0.184
1979	1.8	7.5	30.5	57.0	0.323	92.5	1.8	4.4	0.213
1986	6.0	17.2	19.8	39.0	0.278	82.8	2.9	5.0	0.287
1991	7.7	15.6	27.4	63.0	0.270	84.4	3.2	6.6	0.245
1995	8.3	20.4	26.3	53.9	0.285	79.6	3.0	5.8	0.262
Sweden 1975	3.8	3.8	28.2	38.7	0.404	96.2	2.8	4.5	0.308
1981	4.1	3.4	21.0	22.8	0.496	96.6	3.4	5.9	0.298
1987	6.0	3.3	19.4	18.9	0.545	96.7	5.5	7.8	0.363
1992	5.5	6.6	25.3	28.7	0.485	93.4	4.0	5.6	0.363
1995	6.6	9.6	23.6	24.6	0.521	90.4	4.6	5.8	0.410

[1]The poverty line is measured as ½ the median equivalent income where the equivalence scale used is the LIS scale (the square root of the total number of people in the household).
[2]A working household has positive earnings from wages/salaries or self-employement.
Poverty Intensity = Rate × Average Gap × (1 + Gini (gap))
Source: Author's calculations using the Luxembourg Income Study.

References:

Atkinson, A.B. (1987). "On the Measurement of Poverty," *Econometrica*, 55, 749-764.

Besley, T. (1990). "Means Testing versus Universal Provision in Poverty Alleviation Programmes," *Economica*, 57, 119-129.

Bishop, J.A., K.V. Chow, and B. Zheng (1995). "Statistical Inference and Decomposable Poverty Measures," *Bulletin of Economic Research*, 47, 329-340.

Blackorby, C., and D. Donaldson (1980). "Ethical Indices for the Measurement of Poverty," *Econometrica*, 48, 1053-1060.

Buhmann, B., L. Rainwater, G. Schmaus, and T.M. Smeeding (1988). "Equivalence Scales, Well-Being, Inequality, and Poverty: Sensitivity Estimates across Ten Countries using the Luxembourg Income Study (LIS) Database," *Review of Income and Wealth*, 34, 115-142.

Burkhauser, R.V., M. Smeeding, and J. Merz (1996). "Relative Inequality and Poverty in Germany and the United States Using Alternative Equivalence Scales," *Review of Income and Wealth*, 42, 381-400.

Cowell, F.A. and M.P. Victoria-Feser (1996) "Poverty Measurement with Contaminated Data: A Robust Approach." *European Economic Review*, Vol. 40, 1996, pp. 1761-1771.

Coulter, F.H.E., F.A. Cowell and S.P. Jenkins (1992). "Equivalence Scale Relativities and the Extent of Inequality and Poverty," *Economic Journal*, 102, 1067-1082.

Dickens, Richard and D. Ellwood (2001). "Whither Poverty in Great Britain and the United States? The Determinants of Changing Poverty and Whether Work Will Work", John F. Kennedy School of Government, Harvard University, Faculty Research Working Papers Series, April 2001.

Donaldson, D., and J.A. Weymark (1986). "Properties of Fixed Population Poverty Indices," *International Economic Review*, 27, 667-688.

Figini, P. (1998). "Inequality Measures, Equivalence Scales and Adjustment for Household Size and Composition," Paper presented at the General Conference of the International Association for Research in Income and Wealth, Cambridge, August 1998.

Focus (1998) "Revising the Poverty Measure" Special Issue, *Focus*, Volume 19, Number 2, Spring 1998, University of Wisconsin-Madison, Institute for Research on Poverty

Foster, J.E. (1984). "On Economic Poverty: A Survey of Aggregate Measures," *Advances in Econometrics*, 3, 215-251.

Foster, J.E., J. Greer, and E. Thorbecke (1984). "A Class of Decomposable Poverty Indices," *Econometrica*, 52, 761-766.

Foster, J.E. and A.F. Shorrocks (1988). "Poverty Orderings," *Econometrica*, 56, 173-178.

Foster, J.E. and A.F. Shorrocks (1991). "Subgroup Consistent Poverty Indices," *Econometrica*, 59, 687-709.

Freeman, Richard B. (2001). "The Rising Tide Lifts...?", Working Paper 8155, National Bureau of Economic Research, March 2001

Gregg, P., K. Hansen and J. Wadsworth (1999) "The rise of the workless household" in *The State of Working Britain"* P. Gregg and J. Wadsworth (editors) Manchester University Press, Manchester, 1999

Hagenaars, A.J.M. (1986). *The Perception of Poverty*, North Holland, Amsterdam.

Hagenaars, A.J.M. (1991). "The Definition and Measurement of Poverty," in L. Osberg (ed.), *Economic Inequality and Poverty: International Perspectives*, M.E. Sharpe, Armonk, New York, 134-156.

Jenkins, S.P. and P.J. Lambert (1997). "Three 'I's of Poverty Curves, with an Analysis of UK Poverty Trends," *Oxford Economic Papers*, 49, 317-327.

Kakwani, N. (1980). *Income Inequality and Poverty: Methods of Estimation and Policy Applications*, Oxford University Press, New York.

Myles, J. and G. Picot (2000). "Poverty Indices and Poverty Analysis" *Review of Income and Wealth* Series 46, Number 2, June 2000, Pp.161-180

Osberg, L. (1984). *Economic Inequality in the United States*, M.E. Sharpe Inc., Armonk, New York.

Osberg, L. (1999) "Long Run Trends in Economic Inequality in Five Countries - A Birth Cohort View " Paper presented at CRESP Workshop on "Equality, Security and Community", Vancouver, October 21, 1999 and Jerome Levy Economics Institute conference on "The Macro Dynamics of Inequality in Advanced and Developing Countries", Annandale on Hudson, New York, October 28, 1999; Dalhousie Working Paper 2000-1, Halifax, January, 2000.

Osberg, L. and K. Xu (2000). "International Comparisons of Poverty Intensity: Index Decomposition and Bootstrap Inference,"Journal of Human Resources. Volume 35, Number 1, Winter 2000, pp. 51-81; errata corrected Volume 35, Number 3, Summer 2000

Osberg, L. and K. Xu (1999). "Poverty Intensity - How Well Do Canadian Provinces Compare?," *Canadian Public Policy*, 25(2), 1-17.

Phipps, S. (1999) "An International Comparison of Policies and Outcomes for Young Children" CPRN Study No. F/05, Canadian Policy Research Network, Ottawa, 1999.

Phipps, S. and P. Burton (1995) "Sharing Within Families: Implications for the Measurement of Poverty Among Individuals in Canada." *Canadian Journal of Economics*, Vol. 28, No. 1, pp. 177-204.

Phipps, S. and T.M. Garner (1994). "Are Equivalence Scales the Same for the United States and Canada?," *Review of Income and Wealth*, 40, 1-18.

Preston, I. (1995). "Sampling Distribution of Relative Poverty Statistics," *Applied Statistics*, 44, 91-99.

Rawls, J. (1971) *A Theory of Justice*, Harvard University Press, Cambridge, Massachusetts

Rodgers, J.L. and Rodgers, J.R., (1991) "Measuring the Intensity of Poverty Among Subpopulations: Applications to the United States", *Journal of Human Resources*, 26, 338-361.

Rongve, I. (1997). "Statistical Inference for Poverty Indices with Fixed Poverty Lines," *Applied Economics*, 29, 387-392.

Ruggles, P. (1990) *Drawing the Line: Alternative Poverty Measures and their Implications for Public Policy* The Urban Institute Press, Washington D.C.

Sen, A.K. (1976). "Poverty: An Ordinal Approach to Measurement," *Econometrica*, 44, 219-231.

Seidl, C. (1988). "Poverty Measurement: A Survey," in D. Bos, M. Rose, and C. Seidl (eds.) *Welfare and Efficiency in Public Economics*, Springer-Verlag, Berlin.

Shorrocks, A.F. (1995). "Revisiting the Sen Poverty Index," *Econometrica*, 63, 1225-1230.

Smith, A. (1776; 1961) *The Wealth of Nations* (1904 edition by Edwin Cannan), Methuen and Co., London, 1961

Takayama, N. (1979). "Poverty, Income Inequality, and Their Measures: Professor Sen's Axiomatic Approach Reconsidered," *Econometrica*, 47, 747-759.

Thon, D. (1979). "On Measuring Poverty," *Review of Income and Wealth*, 25, 429-440.

Xu, K. and L. Osberg (2000) "How to Decompose the Sen-Shorrocks-Thon Poverty Index: A Practitioner's Guide" *Journal of Income Distribution* (forthcoming) Volume 10, issue 1 .

Zheng, B., B.J. Cushing, and K.V. Chow (1995). "Statistical Tests of Changes in US Poverty, 1975 to 1990," *Southern Economic Journal*, 62, 334-347.

Zheng, B. (1997). "Aggregate Poverty Measures," *Journal of Economic Surveys*, 11, 123-161.

Figure 1
Relative/Absolute Poverty Line

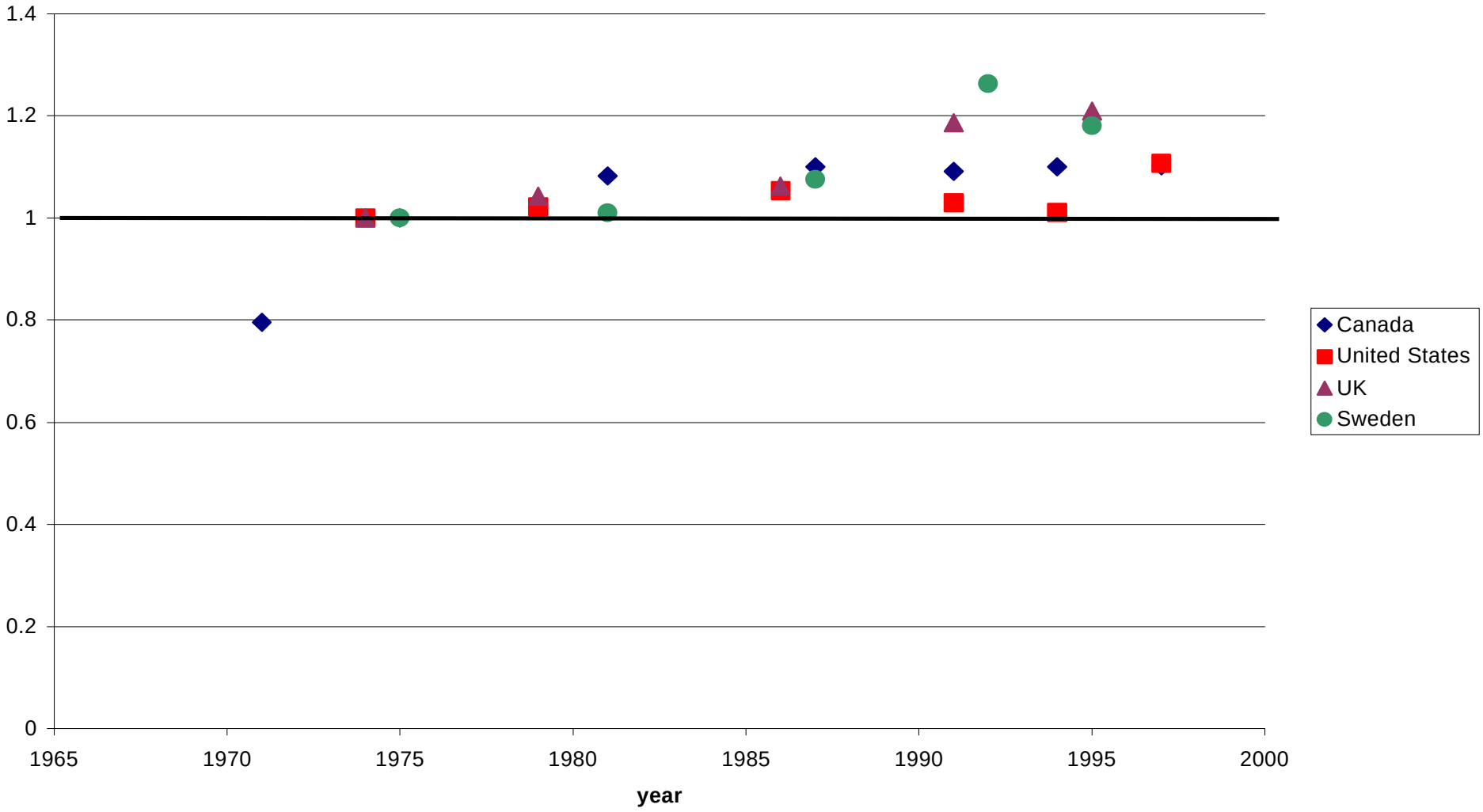
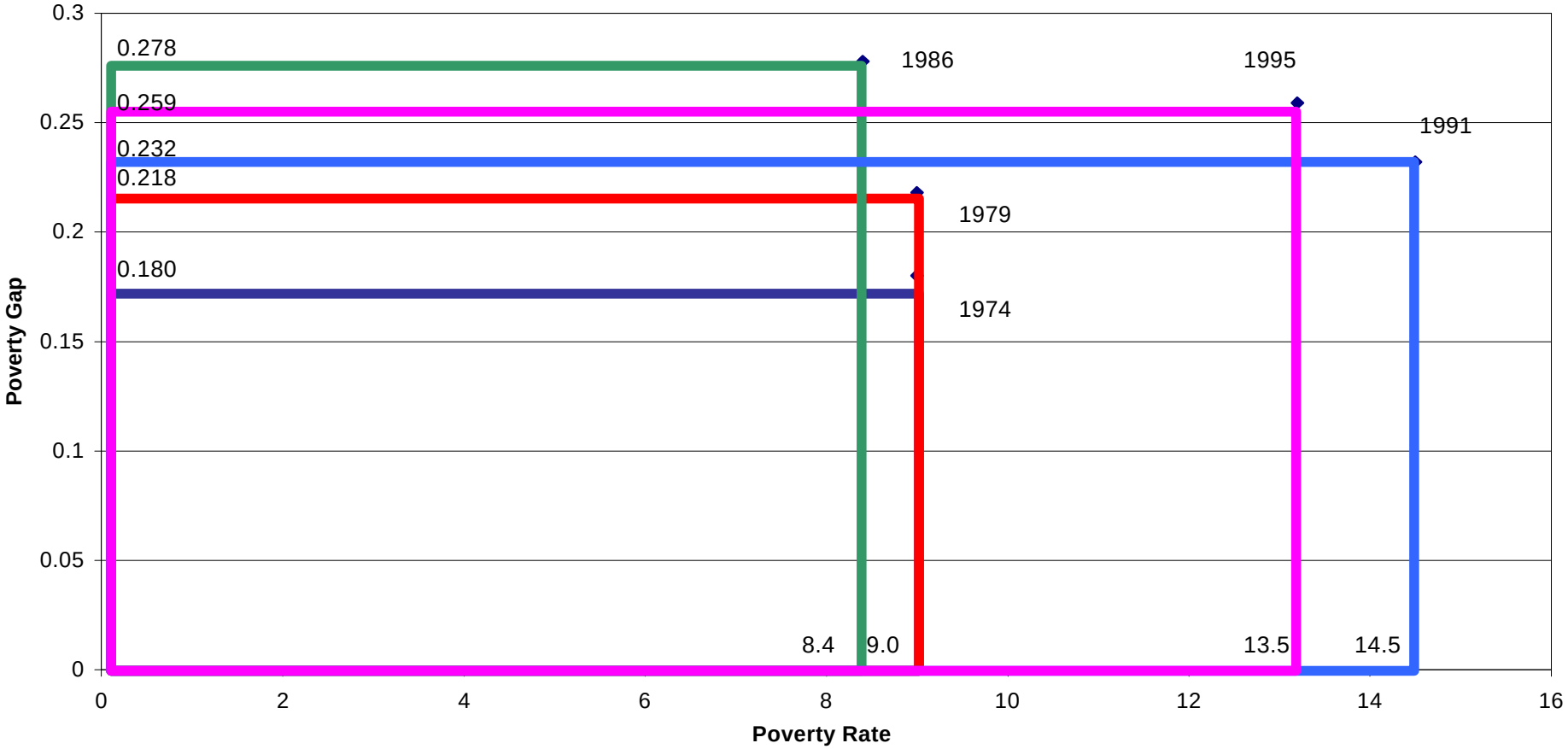
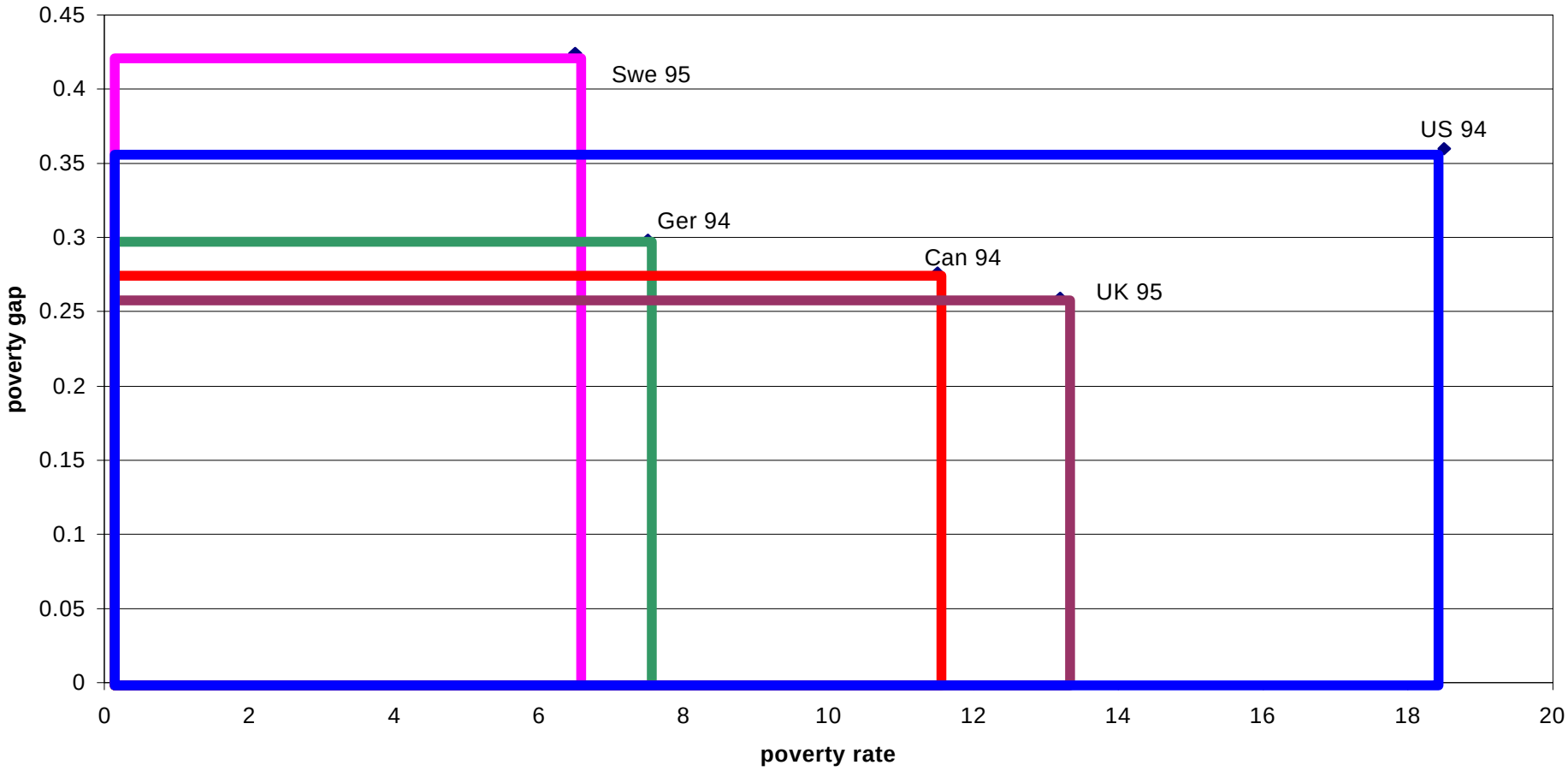


Figure 2
United Kingdom
The Poverty Box
1974,79,86,91,95



The poverty line is measured as ½ the median equivalent income where the equivalence scale used is the LIS scale (the square root of the total number of people in the household).

Figure 3
The Poverty Box in International Perspective
Canada, United States, Germany, Sweden and the United Kingdom 1994/95



The poverty line is measured as ½ the median equivalent income where the equivalence scale used is the LIS scale (the square root of the total number of people in the household).

Figure 4
The Poverty Box - Working and Workless Households
Canada 1997

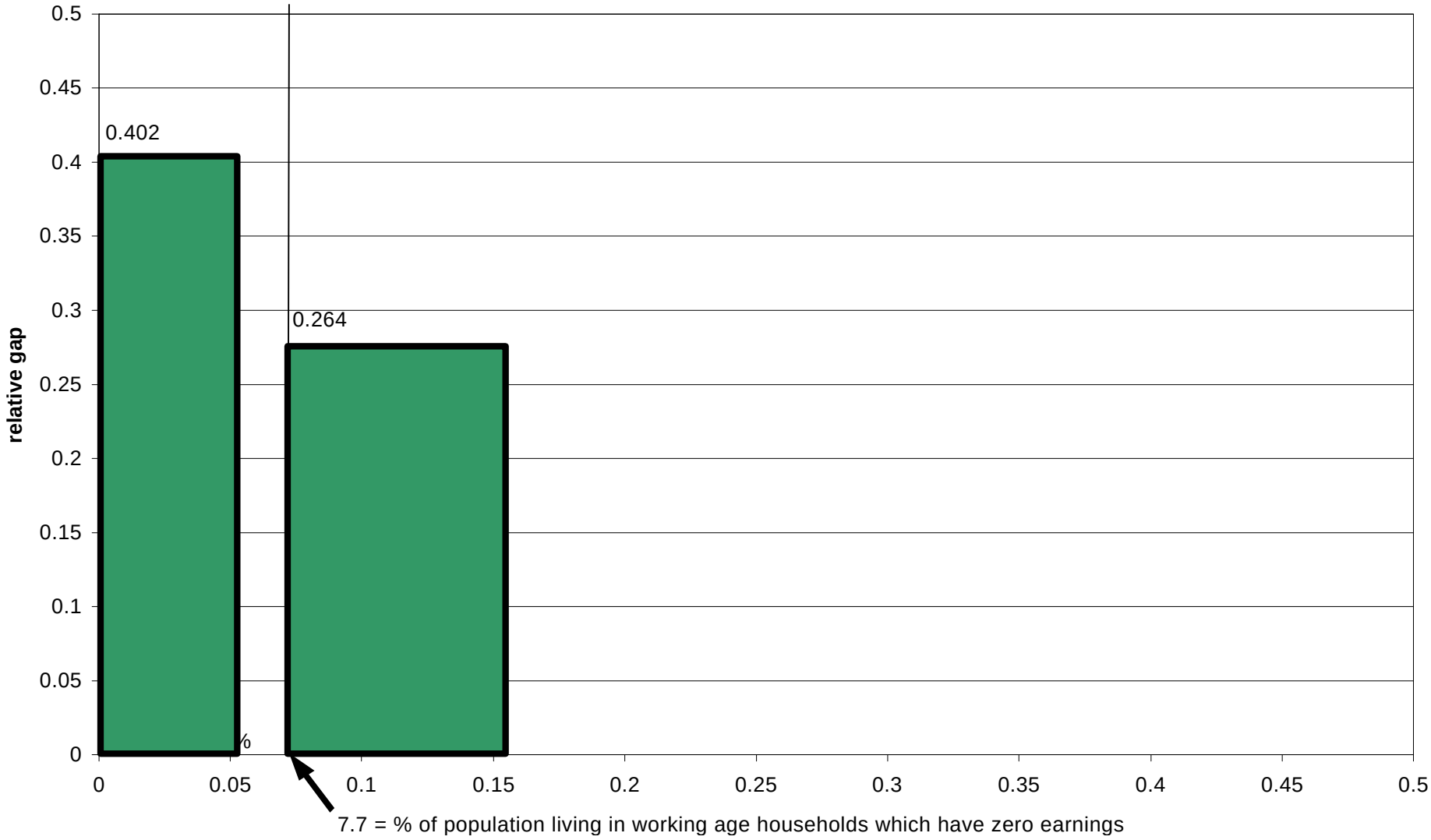


Figure 5
The Poverty Box - Working and Workless Households
United Kingdom 1974

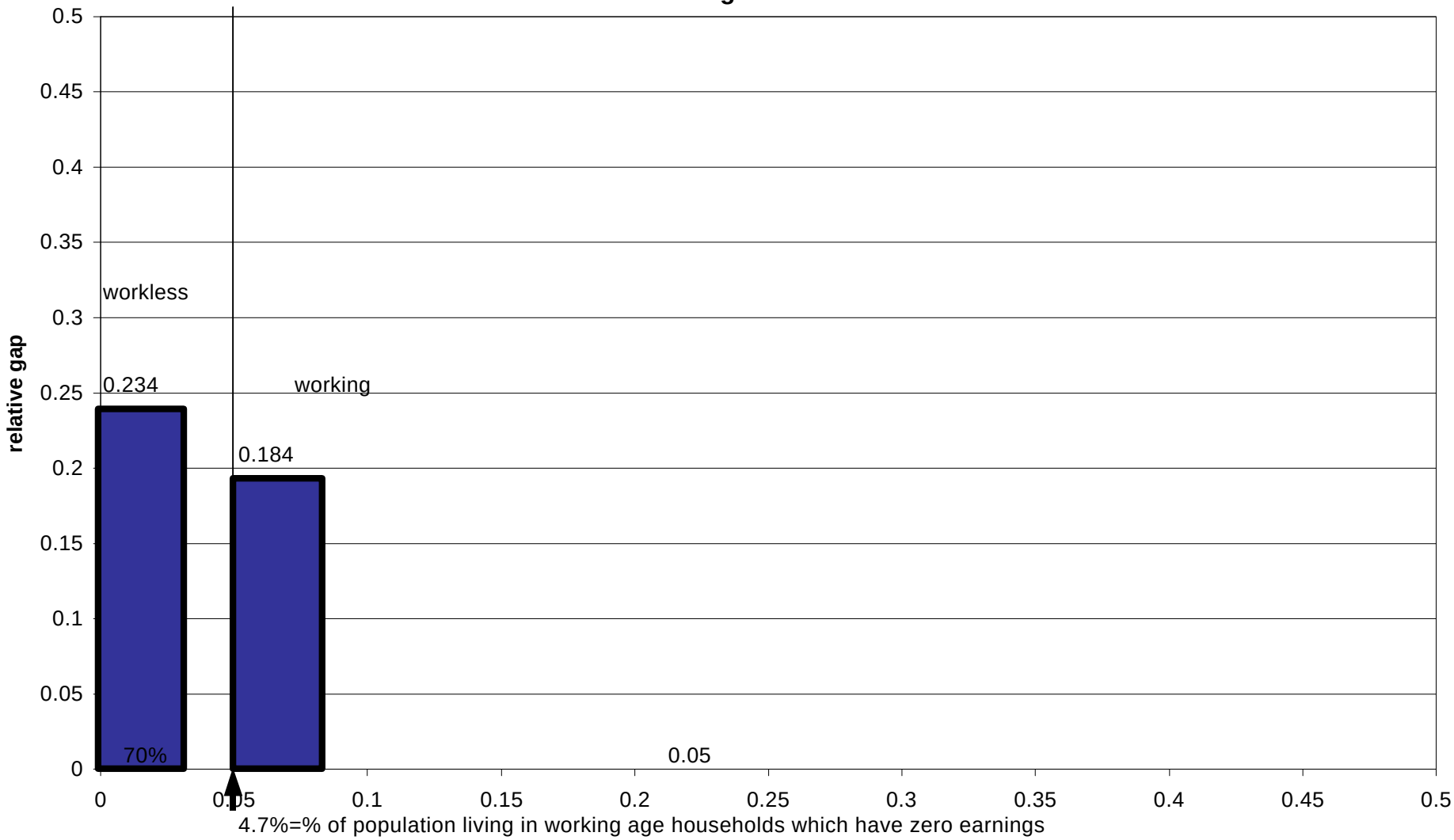


Figure 6
The Poverty Box - Working and Workless Households
United Kingdom 1986

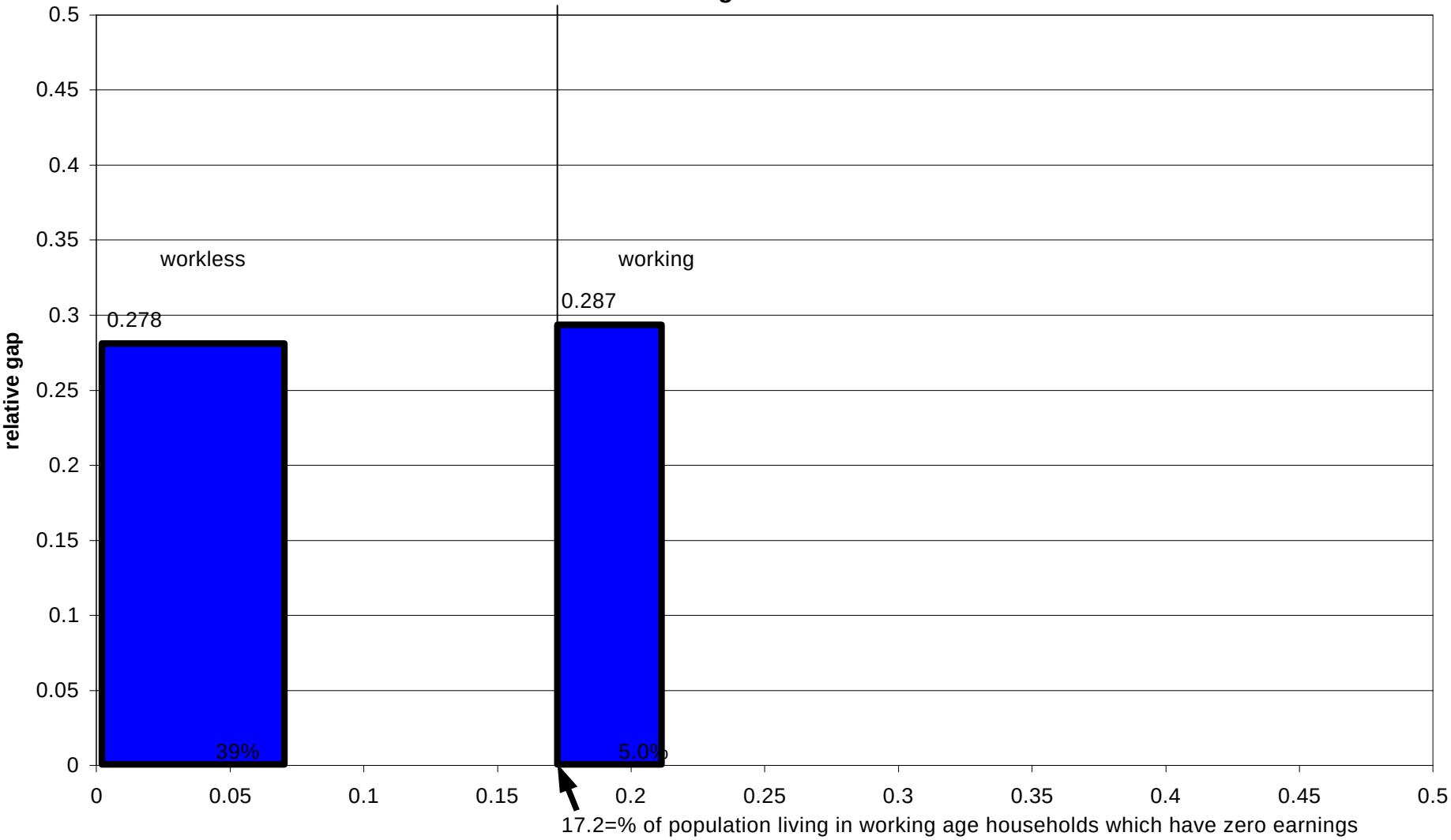


Figure 7
The Poverty Box - Working and Workless Households
United Kingdom 1995

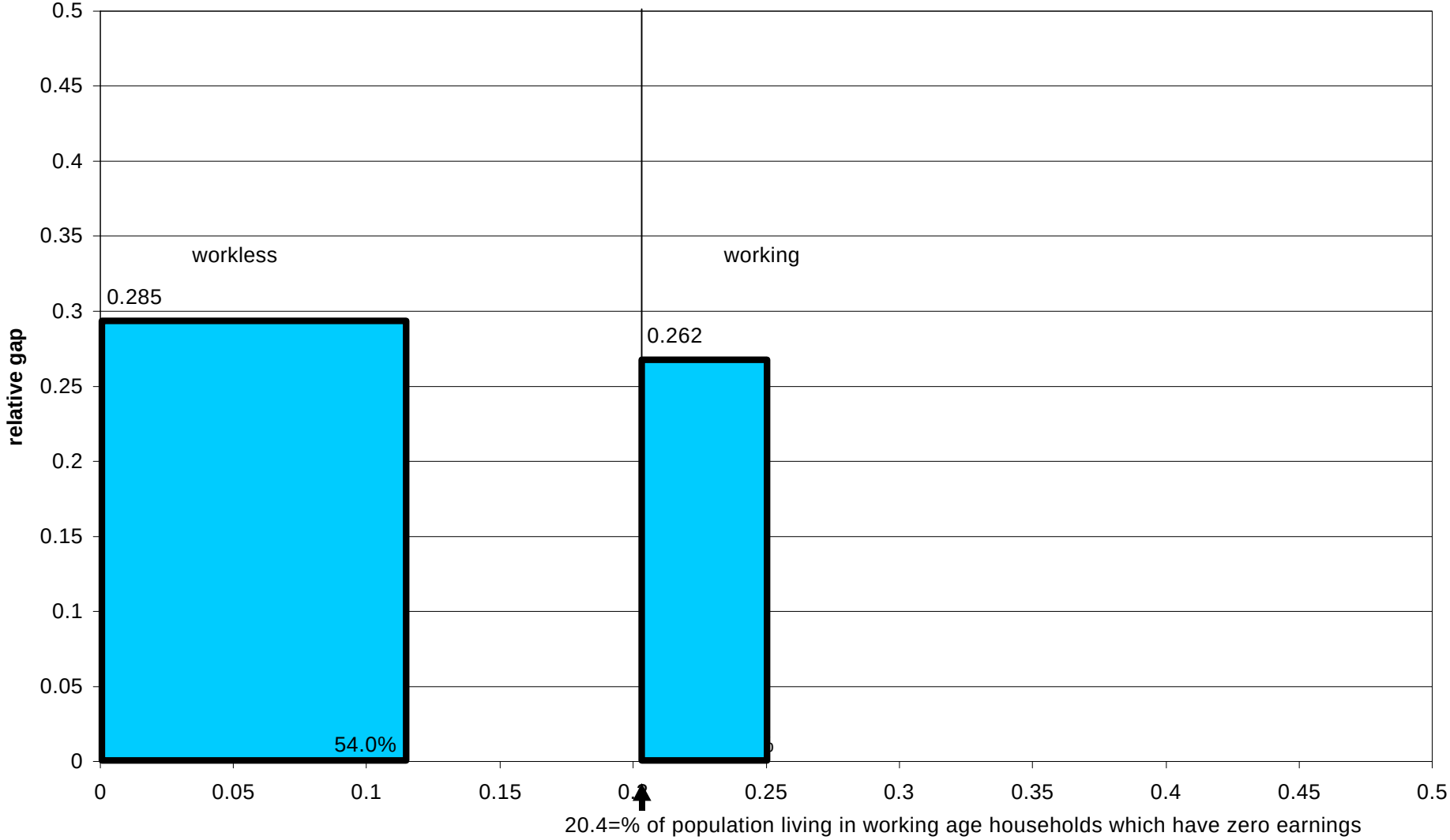


Figure 8
The Poverty Box - Working and Workless Households
United States 1974

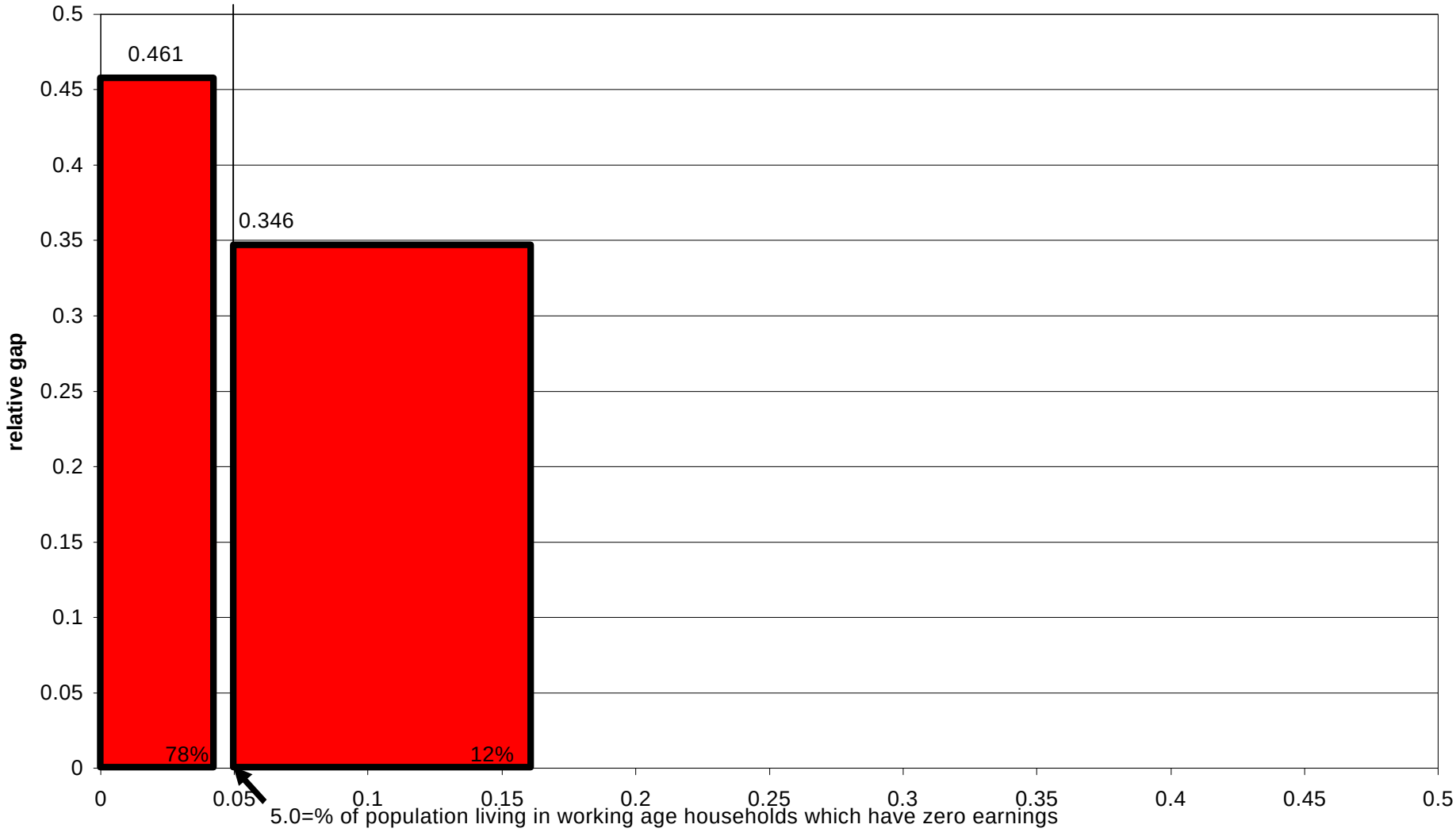


Figure 9
The Poverty Box - Working and Workless Households
United States1986

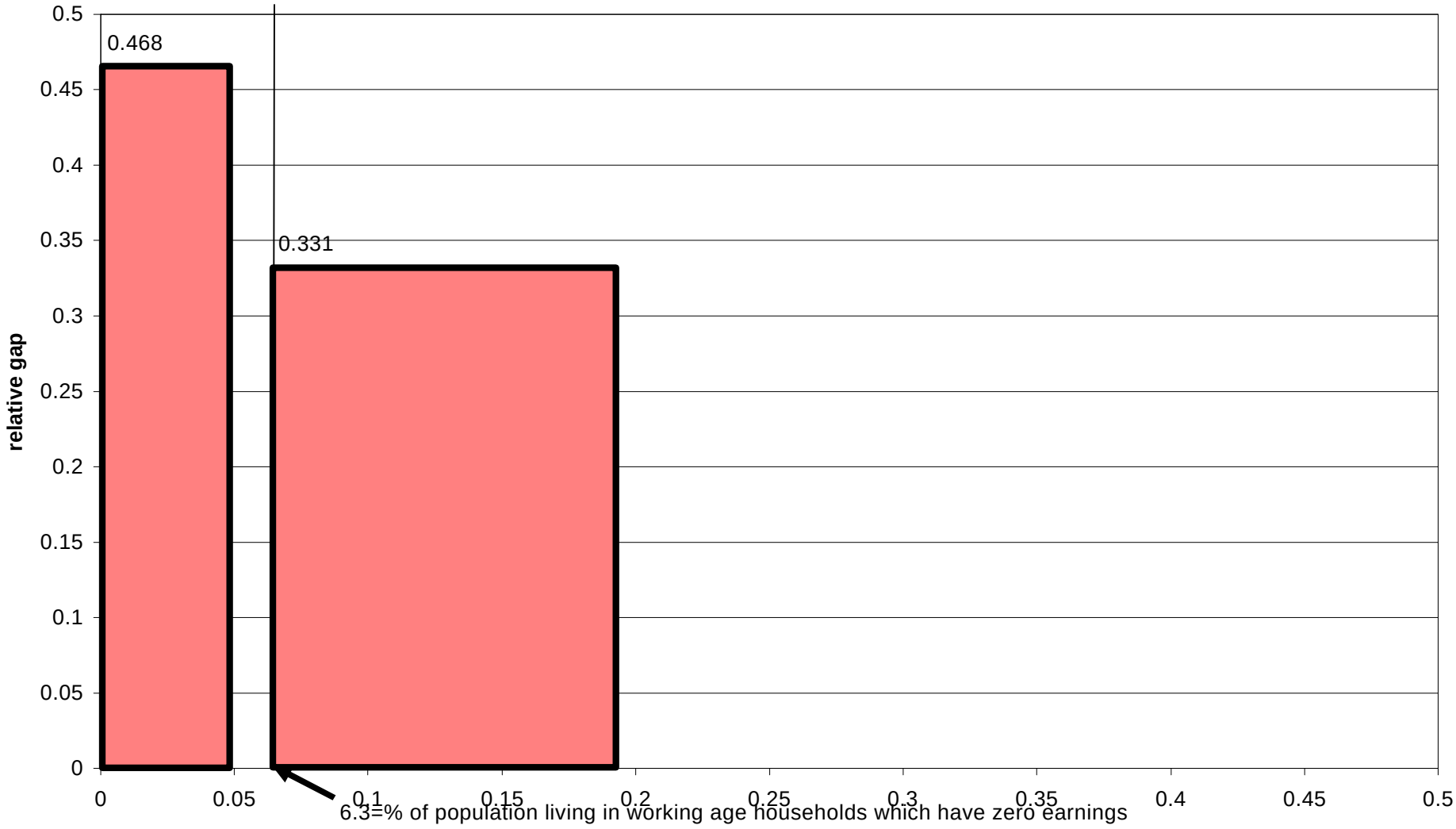


Figure 10
The Poverty Box - Working and Workless Households
United States 1997