Poverty among children and the elderly in developing countries

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Introduction

This paper is concerned with the measurement of the relative poverty of people in different age groups in developing countries. In many instances it is useful to know, for example, whether a higher fraction of children are in poverty than are adults. However, it is difficult to make even simple poverty comparisons of this sort. A perennial difficulty is the passage from household data to individual welfare. We need to document the poverty and living standards of individuals, not households. Yet almost all of our data come from household surveys that collect data on the incomes or consumption expenditures of households or families. Although more could be done to collect data on individual income, consumption, and intrahousehold transfers, there are both conceptual and practical problems in directly observing individual levels of living. Many goods are pooled so that it is close to impossible to disentangle individual consumption levels, and there are important family public goods where consumption by one person does not exclude, or only partially excludes consumption by another.

In most practical work that documents levels of living and poverty, researchers make a minimum concession to differences in household size by working with income or consumption per capita. Such measures effectively assume that household resources are allocated according to need, that children are as needy as adults, and that households have needs in proportion to the number of household members, so that the existence of public goods generates no economies of scale. Although these assumptions are hard to defend, they—or another equally arbitrary set of assumptions about needs—are the basis for all statements of the form “children are poorer than adults,” “the fraction poor among children is higher than the fraction poor among the elderly,” or “large households are worse-off than small households.” Such statements are routinely made on

behalf of the various groups and can affect the policy agenda and the design of welfare programs, and yet it is unclear how well—or if at all—they are supported.

In this paper, we propose a simple method for examining the sensitivity of welfare comparisons to assumptions about needs. We apply the method first to South Africa, where current discussions of social welfare policy are much affected by such matters, and then to a diverse set of countries including Ghana, Pakistan, Thailand, Taiwan, and Ukraine. We use LSMS and other surveys to look across a wide range of experiences and examine how family size, composition, and living arrangements interact with assumptions about needs in the measurement of poverty and living standards of different groups.

We limit our discussion by excluding two important issues. One is the question of how resources are allocated within the household. There has been much good recent research on alternative allocation schemes, research that might one day lead to a set of practical proposals for inferring individual welfare from survey data. For the present, we confine ourselves to the more traditional approach that assumes there is no within household inequality in living standards. Individual living standards are measured by deflating total household resources by an equivalence scale, defined as a function of the size of the household and its demographic composition. The second issue that we do not consider is the estimation of equivalence scales. There is a large and long-standing literature on the measurement of equivalence scales from data on household expenditures, much of which is a morass of dubious identification and internal contradiction, see the discussion in Deaton and Paxson (1998). Our approach here follows Buhmann et al (1988), Coulter et al (1989, 1994) and Banks and Johnson (1994) in assuming a parametric form for the equivalence scale, and examining the consequence of changing the parameters. We assume that a

child cost a fraction α of what an adult costs, and that the elasticity of costs with respect to adjusted household size is a constant θ. We then use survey data to document the sensitivity of conclusions about group poverty and living standards to a range of assumptions about α and θ. This sensitivity analysis is a parametric alternative to the stochastic dominance approach proposed by Atkinson and Bourguignon (1987), which can be difficult to apply when, as in most developing countries, there are a large number of household types even in terms of adults and children.

The paper is organized as follows. Section 1 lays out the formulas, defines our welfare measures, and explores how they change with changes in the parameters. Section 2 turns to South Africa, which serves as a template for the analysis. We focus here on welfare and poverty among the elderly, on the one hand, and children, on the other. These are the two poorest groups in South Africa, and the relative welfare of these two groups has become an issue in current debates over social welfare policy. There is currently in place a social pension that pays large cash benefits to the elderly. Recent policy discussions focus on the provision of cash benefits for children, and whether it makes sense to meet budgetary restrictions by limiting the benefits to children up to the age of six. Although the relative poverty of children and the elderly is not the only issue in these discussions, it is an important one, and it gives a policy focus to our results. Section 3 presents a briefer application of the same methods to the other five countries in an attempt to look for general patterns of broad validity; it contains a summary of our findings.

1. Defining equivalence scales and per equivalent resources

We shall take household total consumption expenditure, x, as our starting point, and we seek a "deflator" that allows for the differing sizes and compositions of different households, so that x

divided by the deflator will correctly indicate the relative standard of living of individuals from different households. We characterize the household by the number of adult (elderly and non-elderly together) and child members, *A* and *K* respectively; children are typically defined as those aged fifteen or less. We define "equivalent household size" *E* by the formula

$$E = (A + \alpha K)^{\theta} \tag{1}$$

where α and θ are parameters, each of which lies between zero and one. With $\alpha = 1$, this formula has been used for similar purposes to ours by Buhmann et al (1988) using data from the Luxembourg Income Study, and by Coulter et al (1989) to look at income inequality in Britain. The full formula (1) has been used by Banks and Johnson (1994) and by Coulter et al (1994) to look at inequality in Britain, by a panel of the U.S. National Academy of Sciences to think about redrawing the poverty line, NRC (1995), and by Deaton and Paxson (1995) to look at the degree of poverty among the elderly in the US. The parameter α controls the costs of children relative to adults, so that $A + \alpha K$ is "effective" household size, while the parameter θ controls the degree of economies of scale with respect to effective size, converting effective household size into equivalent adults; note that the lower is θ, the greater the economies of scale.

In practice it is convenient to work, not with x/E, but with a version that is conveniently scaled so as to relate more directly to the usual welfare measure, household total expenditure per capita (PCX). For all $\alpha \leq 1$ and $\theta \leq 1$, the number of equivalents *E* is no greater than household size *n*, so that replacing x/n by x/E will involve a general increase in measured welfare. If poverty lines are not adjusted, this will automatically increase poverty measures in a mechanical and uninteresting way. However, we do not want to adjust the overall fraction of the population in poverty, but only to compare the fractions (for example) of children and adults in poverty. To

do so, we choose a "base" household type around which to "pivot;"for a household of the base composition, the welfare measure should not change with changes in α and θ. Furthermore, we wish to maintain as close a comparability as possible with PCX, so that we also require that for the base household, the corrected welfare measure should equal PCX. Both objectives are satisfied by choosing as our welfare measure the quantity x^*, defined by

$$x^* = \frac{x}{(A + \alpha K)^\theta} \cdot \frac{(A_0 + \alpha K_0)^\theta}{(A_0 + K_0)} \tag{2}$$

where (A_0, K_0) is the composition of the base household.

Another way of thinking about (2) is to note that the ratio $(A + \alpha K)^\theta / (A_0 + \alpha K_0)^\theta$ is the number of base households that are equivalent to a household of type (A, K). Since there are $(A_0 + K_0)$ persons in each base household, (2) is the expenditure per equivalent, base-household, person. In line with this interpretation, we refer to x^* as per equivalent expenditure, or PEX. As required, $x^* = x/n$ for all base households, as well as when $\alpha = 1$ and $\theta = 1$, so that PEX coincides with PCX. The base household could be chosen in a number of different ways, for example as the average numbers of adults and children per household in a given survey. In the calculations below we work with the three adult and three child household (3,3). The 3-adult 3-child household is an arbitrary base, but is not atypical in the countries which we analyze.

Changes in the parameters affect welfare measurement through the two derivatives

$$\frac{\partial \ln x^*}{\partial \alpha} = -\theta \left(\frac{K}{A + \alpha K} - \frac{K_0}{A_0 + \alpha K_0} \right) \tag{3}$$

and

$$\frac{\partial \ln x^*}{\partial \theta} = -\ln\left(\frac{A+\alpha K}{A_0+\alpha K_0}\right) \tag{4}$$

so that making children more expensive decreases welfare for households whose ratio of children to effective household size is larger than that of the base household, while decreasing the allowance for economies of scale (i.e. increasing θ), decreases welfare for households whose effective size is larger than that of the base household.

Since each member of the household is assigned the PEX of that household, the effects of changing the equivalence parameters on the welfare of specific groups is controlled by the average derivatives (3) and (4) for that group, so that it is living arrangements and their interaction with total expenditure that determines how group welfare responds to changes in costs and economies of scale. To illustrate, consider the average PEX of the elderly, given by the expression

$$\bar{x}_o^* = \sum_{h=1}^{H} n_o^h x^{*h} / \sum_{h=1}^{H} n_o^h \tag{5}$$

where the superscript *h* denotes a household, of which there are *H* in the population, and n_o^h is the number of elderly in household *h*. The effect of a change in (for example) the child care cost parameter α on the average welfare of the elderly is therefore given by the expression

$$\frac{\partial \ln \bar{x}_o^*}{\partial \alpha} = -\theta \sum_{h=1}^{H} w_{ox}^h \left(\frac{K^h}{A^h + \alpha K^h} - \frac{K_o}{A_0 + \alpha K_0}\right) \tag{6}$$

where the weights w_{ox}^h are the product of numbers and welfare levels,

$$w_{ox}^h = n_o^h x^{*h} / \Sigma n_o^h x^{*h}. \tag{7}$$

According to (6), the effect of a decrease in child costs on the average living standards of the elderly is positive or negative depending on whether the PEX-weighted ratio of children to effective household size is larger for elderly people than for the base household. In "Western" living arrangements, few children live with the elderly but, as we shall see, this is far from being the case in many poor countries, particularly in South Africa where it is common for children to live with one or other of their grandparents. The effects of child costs on other demographic groups are given by expressions identical to (6), but with different weights; for example, the derivative of average child welfare is given by replacing in (7) the numbers of the elderly in each household by the number of children. For changes in the economies-of-scale parameter θ, the formulas are again weighted averages, but this time of the logarithm of the ratio of effective household size to the effective household size of the base household.

Formulas for the effects of equivalence scales on poverty counts can also be derived and also depend on the derivatives (3) and (4). The formulas are somewhat less transparent (and harder to use) because they depend on the density of PEX near the poverty line for each group, something that would have to be estimated (for example by kernel density estimation). However, the effects of discrete changes in α and θ can be shown graphically. Figure 1.1 illustrates the case of a discrete reduction in θ, the parameter governing economies of scale. The two axes in the graph represent the logarithms of total household expenditure (on the vertical axis) and effective household size (on the horizontal axis). A population of households will be distributed across different expenditure levels and effective sizes. Although we have not done so, one can imagine drawing in contour plots on the graph that show where households in a given population tend to be concentrated. In the initial situation with small economies of scale (large θ_0), people who live

in households below the solid line are poor because the logarithm of their total household expenditure is less than θ times the logarithm of effective household size plus a constant that depends on the choice of base household. When we allow more economies of scale, θ falls so that the line demarcating poor and nonpoor rotates clockwise around the base household, whose welfare does not change by construction. Households in the horizontally shaded area become poor because they are small, so that they do not benefit from the economies of scale, and were previously close to the line. By contrast, those in the vertically shaded area, who were previously just below the line, are taken out of poverty by the greater economies of scale. The size of these effects depends on the joint density of effective household size and total expenditure, and in particular, on the fractions of people close to the line.

In the example shown graphically, the change in θ could increase or reduce the overall fraction of the population that is labeled poor. Whether poverty rises or falls depends on the numbers of individuals in households in the two shaded areas, and this in turn depends on the underlying distribution of households and the arbitrary choice of the base household type. However, we are not interested in how changes in α and θ alter overall poverty, but instead want to know how changes in α and θ affect the relative probabilities that people with different characteristics (in our case different ages) fall below the poverty line. This is not readily transparent from the graph, but can be seen by examining the empirical distribution functions—effectively the proportions poor for a range of poverty lines—of PEX for different age groups, and examining their sensitivity to changes in the scales.

Our general approach, in what follows, is to use data from household expenditure surveys to assess how changes in α and θ affect the poverty of the elderly relative to children and non-

elderly adults. The data for four of the countries are drawn from LSMS surveys. These are Ghana (1988), Pakistan (1991), South Africa (1993) and Ukraine (1995). More information on these surveys can be obtained from Grosh and Glewwe (1995). The Thai data are from the 1992 round of the Socioeconomic Survey, a survey that has been collected periodically by the Thai Statistical Bureau since 1976. The Taiwanese data are from the 1992 round of the Survey of Income Distribution collected annually by the Directorate General of Budget, Accounting and Statistics. All of these surveys collect detailed information on the expenditure of households and on the basic demographic information we need for this research. We measure expenditure as expenditure on all goods and services, including consumer durables. Consumer durables that are shared (such as household furnishing) are likely to be an important source of scale economies.

With the exception of Ghana, none of the surveys is a simple random sample of the population, and the surveys provide information on the weights, or "inflation factors" for each household. These weights must be used to modify formulas such as (5) and (6), to account for the fact that the surveyed households each represent different numbers of households in the population. Because (5) and (6) are already weighted averages, where the weights depend on the number of elderly, the number of adults, or the number of children in each household, we can modify the formulas straightforwardly by replacing the numbers of each group in each household by the product of the number and the household's survey weight, and then summing, not over the population, but over the sample. Indeed, many of the calculations are weighted averages of one sort or another, with the same quantities weighted in different ways, depending on which group is currently of interest. (The STATA code used for these calculations is available on request from the authors.)

2. Family composition and poverty in South Africa

The analysis of welfare for children and the elderly has a particular salience in South Africa. At the time of writing (1997), the largest social welfare program is a "social pension" that is paid to all women aged 60 or over, and all men aged 65 or over. There is a means test—which effectively excludes Whites—but which excludes relatively few Africans, so that in 1993, around 80 percent of all age-qualified Africans were in receipt of the pension, Case and Deaton (1998). The amount of the pension is relatively large, currently 470 Rand (about $100) per pensioner each month, a sum that is two to three times average per capita income for African households in rural areas.

The pension does much to lower poverty among the elderly, but is not directly targeted to children. Although many children live in households that contain a pensioner, many do not, and current discussions focus on the introduction of a social welfare payment to children. Although the proposals have not yet been implemented, the recommendations of the Lund Commission on Family Welfare have been approved in principle by the government of South Africa. The Commission called for a relatively small monthly payment to *children*. In early proposals, this would have been 50–75 rand per child, but this was deemed unaffordable, and there is currently serious consideration of restricting payments to children aged 6 and under (coupled with requirements on vaccination and health checks). Preliminary tabulations of the 1996 census have shown that there are fewer South Africans, and that fertility is lower than previously believed, so that it might be possible to pay as much as 100 to 150 Rand per young child, with questions of means testing still in abeyance. Within these policy discussions, one concern has been the relative economic status of the elderly and children, and whether young children are more likely to be poor than older

children. (Note that these are not the *only* reasons for focussing on young children; it is widely believed that income support for children is most crucial in the early years.)

Table 2.1 presents details on living arrangements and average levels of living for the various age groups for Africans and Whites separately; we do not present estimates for the other two racial groups, Coloureds and Indians, which typically lie between Africans and Whites. We distinguish four age groups; two groups of children, aged 0–6 and 7–15, the elderly, defined according to pension eligibility criteria, 60 and over for women and 65 and over for men, and a residual group of non-elderly adults, loosely referred to as "adults." The numbers shown in the table are averages, for individuals in different age groups, of the characteristics of their households. They are calculated as follows. For a quantity *y*, which might be the logarithm of PCX, or the number of children or adults in the household (as labeled along the top row), we calculate

$$\bar{y}_j = \sum_1^H n_j^h \omega^h y^h / \sum_1^H n_j^h \omega^h \qquad (8)$$

where *j* refers to the demographic group under consideration, labeled down the first column, *H* is the number of households in the survey, n_j^h if the number of people of type *j* in household *h*, and ω^h is the survey inflation factor for household *h*. Note that according to (8), the rows of the table use exactly the same household information, but differ only in the weights so that, to illustrate from the fifth column, when we weight by the youngest children, there are 7.71 persons in each household, but when we weight by the elderly, there are 6.40 persons in each household. Of course, the more natural interpretation is that we are averaging over young children in the first

example and over pensioners in the second so that, the average number of persons living with each small child—including the child—is 7.71, while the average for the elderly is only 6.40. The logarithm of PCX in the final column takes no account of the equivalences that are our main topic, and serves only as a starting point. It is presented in logarithmic form to facilitate comparisons across groups in terms of percentage differences.

Among Africans, small children live with more people (7.71) than any other group and the elderly with the least, only 6.40. Notably, there is very little difference in household size between non-elderly adults (6.44) and the elderly, a finding that contrasts sharply with "Western" living arrangements, here represented by the White South African population, among whom household size is 2.37 for people of pension age and 3.59 for other adults. Indeed, it is the tendency among Africans for children and the elderly to live together that generates the largest differences between the top and bottom of the table. Elderly Africans live in households with 0.94 young children and 1.53 older children, compared with only 0.02 younger and 0.10 older children for Whites. Correspondingly, younger and older African children live with 0.37 and 0.38 of an old person on average, compared with only 0.02 and 0.05 for Whites. Among Africans, each elderly person lives with only slightly fewer children than each non-elderly adult, 2.47 opposed to 2.49. This fact is consistent with Case and Deaton's (1998) earlier finding that African *households* with pensioners contain half a child more than *households* without pensioners, and reflects the fact that households with a large number of children are also those with a large number of young adults, so that averaging children across young adults raises the average number of children compared with averaging across non-pensioner household households.

The last column in the table documents the enormous disparities in PCX between White and African households; note that a difference in logarithms of 2 implies a more than sevenfold difference in PCX. Within African households, with no allowance for differential costs of children or for economies of scale, adults are on average 16 percent better off than the elderly, and 27 percent better-off than older children. The difference in average PCX between older and younger children is only four percent in favor of the former. We shall see later that the superior living standards of adults is robust to changes in equivalences, while the relative standing of children and the elderly is not.

Table 2.1 also presents the average ratio of children to adults, as well as the average logarithm of household size, each weighted by the PCX in the household in which the individual lives. According to equations (6) and (7), these determine the averages of the derivatives of PEX with respect to α and θ respectively evaluated at $\alpha = 1$ and $\theta = 1$, when PEX is equal to PCX. According to the "child ratio" column, both African and White children live in households where children are nearly half of all household members. For adults, the ratio of children is much smaller, around a quarter for Africans, and only 0.15 and 0.02 for non-elderly and elderly White adults. As a result, and taking a 3 adult and 3 child household as reference, for which the ratio is 0.5, the average PEX of adults will fall with a decrease in α, while that of children will remain unchanged. The logarithm of household size for the reference household is 1.80, so that the "ln size" column shows that reductions in θ from 1—increases in the allowance for economies of scale—has similar effects to decreases in α from 1, leaving average PEX for children almost unchanged, while decreasing PEX for adults who, on average, live in smaller households.

Table 2.2 turns from average welfare levels to poverty counts. We present the fractions of people in each demographic group who are poor, defined as living in a household whose PEX is less than 105 rand per equivalent a month, a figure that is chosen so as to roughly correspond to a (US) dollar per person per day. For each group. we show the results of the calculations for a matrix of nine pairs of values of α and θ, with each taking the three values 1, 0.75, and 0.5. According to the "everyone" row of the table, between 30 and 33 percent of South African Africans are poor. Of course, neither this result nor its variation with the parameters is of much interest. That a third of people are poor means only that we chose a poverty line that made a third of people poor. The variation in poverty rates with the parameters is conditioned by the choice of reference household so that when, as here, we choose a reference that is near the mean, parameter variation has little effect on the overall counts. Our interest is more in the composition of poverty, not in its level, and for this we must compare the groups in the top part of the table.

Note first that the headcount ratios based on PCX match the averages of the logarithms of PCX in Table 2.1; young adults have the lowest fraction poor, followed by the elderly, then older and younger children. The low poverty rates among adults are robust to assumptions about child costs and economies of scale, as is the fact that younger children are always somewhat more likely to be poor than older children. Of course, the latter is conditioned by the fact that we have not allowed different child costs for younger and older children, and the ordering could be reversed by making younger children slightly less expensive. The most interesting patterns in the table concern the relative poverty rates of children and the elderly, which are not robust to changes in the parameters. Fewer children are counted as poor if we make more allowance for economies of scale—reduce θ—or assume that children cost less—reduce α. In consequence, the fractions of

children who are poor decreases as we move from the bottom left to the top right of the matrix. The opposite happens for the elderly because, although they live in households that are relatively large and that have a relatively large number of children, at least by Western or White standards, they live in smaller households and with fewer children than the base household. As a result, when children are cheap and there are large economies of scale, we find fewer children in poverty and more old people in poverty, reversing the result obtained by using PCX as the welfare measure.

If we know nothing about the parameters except that they lie within the ranges we examine, we are then left without an answer to the question of whether the elderly or children are the group most subject to poverty. However, we would argue that neither (1, 1) nor (0.5, 0.5) are the most reasonable values, and that combinations along the other diagonal are more plausible. Since children tend to live in relatively large households, the major effects on rankings can come either by making allowance for economies of scale or for child costs, or some modest combination of both. In richer countries, where food is a small share of the budget, and household public goods are more important, we would tend to emphasize economies of scale without making much allowance for cheaper children. In poorer countries, as here, where food, which is largely private, is a large share of the budget, economies of scale are likely to be less important. If we accept this view, and confine ourselves to the diagonals of Table 2.2 that run from top left to bottom right, children are always poorer than the elderly.

Of course, these inferences are hostage to our choice of poverty line, but their robustness can be investigated in the standard way by examining poverty counts as a function of the poverty line for the different groups, which is the same as testing for first-order stochastic dominance by comparing the empirical distribution functions of PEX, see Deaton (1997, Chapter 3) for an

exposition and references to the literature. Figure 2.1 presents the results, again in matrix form for the different combinations of parameters. The graph in each cell of the matrix corresponds to an (α, θ) combination as before, and on each graph we plot the fraction poor for the four groups as a function of the poverty line, for poverty lines up to 250 rand a month, about two-and-a-half times the dollar a day cutoff.

The graph on the bottom left corresponds to using PCX as the welfare measure and we see that the original ranking, with poverty rates highest among children, next highest among the elderly, and lowest among non-elderly results, is robust to the choice of the poverty line, at least up to 250 rand per capita per day. More broadly, and within the (rather wide) range considered here, the fact that non-elderly adults are the group with the lowest fraction poor is unaffected by the choice of child costs or economies of scale. By contrast, and as we have already seen for a fixed poverty line, the ranking of children and the elderly depends on the values of the parameters. In the three figures to the bottom left, for (α, θ) combinations of (1, 1), (1, 0.75) and (0.75, 1), children have higher fractions poor than the elderly. For the combinations at the top right, (0.5, 0.5), (0.75, 0.5), (0.5, 0.75), where there are either large economies of scale, or low child costs, or both, children are relatively favored, and the elderly have the higher fraction in poverty. The intermediate cases that lie down the leading diagonal, (1 0.5), (0.75, 0.75), and (0.5, 1) are too close to call from Figure 2.1, but it is clear that the differences in poverty rates between the groups are relatively small.

If we need more information than is evident from Figure 2.1, it is useful to plot the differences in poverty rates as a function of the poverty line. Figure 2.2 does so for the difference in poverty rates between the elderly and children for the three cases from bottom left to top right,

where the switch from higher-poverty children to higher-poverty elderly was already clear in Figure 2.1. When $\alpha = \theta = 0.5$, the elderly are more likely to be poor and the line is above the axis (except in the irrelevant range below about 50 rand), and the reverse is true when $\alpha = \theta = 1$ and PCX is the welfare measure. In the intermediate case, where $\alpha = \theta = 0.75$, the line crosses the axis around 200 rand, so that at poverty lines below that level, children are more likely to be poor, while above it, the elderly are poorer. Figure 2.3 shows the more complicated case corresponding to the leading diagonal of Figure 2.1, where the sum of α and θ is 1.5. Although two of these lines cross the axis more than once, the story is similar to the case of (0.75, 0.75); the poverty rate among children is higher except at high poverty lines, though what counts as high depends on the choice of parameters. Note that the expenditure levels of the households in which old people live *include* the effects of the old-age social pension, which was in place in South Africa when the survey was conducted. The fact that relatively few elderly are seen in extreme poverty may be a result of the policy.

In many cases, we will not have to go further than Figure 2.1. The detail is sometimes useful, but it will often be enough just to know that the comparison of poverty rates for two groups is not robust to either the choice of parameters or to the poverty line, or both. In the South African case, there is a good deal of robustness within the relevant ranges. Non-elderly adults have lower poverty rates than either children or the elderly, and for modest allowance for child costs and economies of scale, children are more likely to be poor than the elderly, results that are only occasionally sensitive to the choice of poverty line within a wide range. However, if we think that large families are very heavily penalized by ignoring economies of scale and counting children as

adults, it is possible that the elderly—who live with fewer children and in smaller households than do children—are actually the poorer group.

2. Living arrangements and poverty in Ghana, Pakistan, Taiwan, Thailand, and Ukraine

In this section, we apply a less detailed version of the South African analysis to five other rather different countries. Our concern now is less with poverty rankings within any one country than with a search for patterns that are common and that might be useful more generally. Of course, there is no reason to suppose that such patterns will exist; there are large cross-country differences in family size, living arrangements, and in the way that income, family size, and family composition interact, for example the customs regulating when households with multiple earners should divide, or who takes care of widowed mothers.

Table 3.1 corresponds to Table 2.1 for South Africa and shows the living arrangements and summary welfare measures for the five countries. In this table, and henceforward, we revert to a standard definition of the elderly, those aged 60 and over. Average household size varies widely, from 9.29 in Pakistan and 7.05 in Ghana to 4.98 in Taiwan, 4.73 in Thailand, and 3.87 in Ukraine. (These averages seem large, but note that they are averages of household size over individuals, not over households, so that large households effectively get more "weight" when calculating the average.) Children always live in the largest households, and the elderly typically live with about half a child less than non-elderly adults—note how exceptional in this respect is the strong association between the elderly and children in African households in South Africa. The average adult in Pakistan lives with nearly four children, compared with three in Ghana, 1.3 in

Taiwan and Thailand, and less than one in Ukraine. The elderly live with about the same numbers of elderly in all the countries—including themselves, the variation is only from 1.58 (Ukraine) to 1.36 (Ghana)—but with sharply differing numbers of children (more or less reflecting fertility) and non-elderly adults. The average elderly Ghanian lives with more than two non elderly adults, while the average elderly Ukrainian lives with less than one.

The averages of the logarithm of PCX in the penultimate column (which are of course not comparable across countries) provide us with a first estimate of the relative standings of the various groups. With one exception—Pakistan, where the elderly have the highest average PCX—adults are better-off on average than either children or the elderly; in Ghana, adults are 10 percent better off than the elderly, and 20 percent better off than children; in Pakistan, 2 percent less well-off than the elderly, but 16 percent better off than children; in Taiwan, 7 percent better off than the elderly, and 15 percent better-off than children; in Thailand, 13 percent better-off than the elderly, and 26 percent better-off than children; and in Ukraine, 17 percent better off than the elderly, and 12 percent better off than children. Apart from the Ukraine, these results also show that, when we use PCX to measure welfare, children tend to be worse-off than the elderly (as well as non-elderly adults). Of course, this is a conclusion that we might expect to change as we allow for differential child costs and for economies of scale.

The final column of Table 3.1 shows some (essentially arbitrary) poverty rates based on PCX. The poverty lines are chosen in a variety of ways in the different countries. For Ghana, Pakistan, and Thailand the poverty lines are approximately to one (US) dollar a head per day; for Taiwan, it is half of median PCX, and for Ukraine, it is set to give around 20 percent poor. Nothing depends on these numbers (we shall explore a range of poverty lines below), but they are use-

ful to give a first look at relative poverty rates for the demographic groups within each country. As it turns out, these rankings match exactly the rankings of PCX, with adults least likely to be poor (except in Pakistan), and then the elderly and children (except in Ukraine).

Figures 3.1 through 3.5 explore the sensitivity of the poverty rates both to variations in the poverty lines and to variations in the parameters θ and α, replicating Figure 2.1 for each country. In spite of the differences from one country to another, the figures have several broad similarities. Poverty rates among non-elderly adults are lower than those among children or the elderly, and this is true no matter what poverty line we choose, or what allowance we make for economies of scale or child costs. (The previous exception, of Pakistan, where with $\alpha = \theta = 1$ the elderly were the least poor, turns out not to be robust for other parameter values.) When PCX is the measure of welfare, children are usually the group with the highest poverty rate, but as we allow for greater child discounts, and greater economies of scale, they are replaced by the elderly. The rate at which this replacement takes place varies from country to country. For example, the graphs for Thailand in Figure 3.4 are almost identical to those for South Africa in Figure 2.1; children have the highest poverty rates for moderate values of α and θ, and the elderly only become the poorest at large discounts in the top right of the diagram. By contrast, in Taiwan, the elderly have the highest probability of being poor in all figures except (1, 1), the PCX case, and in Ukraine, the elderly are always the poorest group. At the other extreme is Pakistan, where children are always the poorest group, except at the other extreme of (0.5, 0.5), which is the only case in the diagram where the elderly have the highest rate of poverty.

There are four important general points that come out of these graphs, taken together with the South African experience in Section 2.

(1) Although there are wide differences between countries in family size and structure, it is generally the case that children live in large households. As a result, the measured welfare of children is increased by allowing either for the lower cost of children, or for economies of scale, or for both. The elderly live with fewer children and in smaller households, and so benefit less from such allowances. In consequence, the position of the elderly relative to children worsens the lower are the costs of children, and the higher are economies of scale. These relativities are less determined by the individual parameters α and θ, than by their sum. However, there is considerable variation across countries in the point at which the sum of α and θ becomes small enough to make the elderly the group more likely to be poor.

(2) In most cases, non-elderly adults are less likely to be poor than either children or the elderly, and this is true no matter what assumptions are made about child costs, economies of scale, or the level of the poverty line. There is therefore a life-cycle shape to the probability of being poor, high in childhood, lower in adulthood, and higher again in old age. Note that all of the results in this paper use data on consumption, not income or earnings, so that we are not simply looking at the life-cycle profile of earnings. Instead, the results show that households cannot, or do choose not to smooth consumption per equivalent over life. Even allowing for the lower costs of children, the typical life-cycle hump shape of consumption results in lower per equivalent consumption when there are children or elderly in the household. Note however that we have made no allowance in this paper for the possibility that the elderly, like children, may need less consumption to meet the same level of living, for example because they have lower work-related expenses, such as clothing or transportation.

(3) Without further information about economies of scale and the costs of children, our results do not permit a clear ranking of elderly and children by their probabilities of being poor. In spite of many years of research, there is no non-controversial identification assumption that will permit the estimation of child costs from household budget data. There exist more plausible bases for the measurement of economies of scale based on locating them in the presence of household public goods, but the empirical work, instead of providing good estimates, yields sharply paradoxical results, see Deaton and Paxson (1998). In the absence of convincing empirical evidence, we are left with conjectures based on intuition or indirect evidence. It is plausible that child costs are lower relative to adults in poorer countries; indeed, it has even been argued that children have negative economic costs at low levels of development, and that the switch to positive costs with economic growth and "Westernization" is the cause of the demographic transition, Caldwell (1982). It is also plausible that economies of scale are larger in richer countries, as the share of the budget switches from food, which is largely a private good, towards shared goods and services, such as housing or entertainment. In terms of our parameters and the associated diagrams, this would suggest that the sum of α and θ might be roughly constant across countries, with a movement from low α and high θ at low levels of development—the bottom right of the diagrams—to high α and low θ among the richer countries. This is the diagonal in the figures that often fails to yield an unclear ranking of children and the elderly. For the poorer countries (Ghana, South Africa, Pakistan, and Thailand,) we look in the bottom right diagram, where the elderly are most likely to be poor in Ghana, children are most likely to be poor in Pakistan, and the ranking is ambiguous in Thailand and South Africa. For the richer countries, we look in the top left diagram and here the elderly are more likely to be poor (Ukraine and Taiwan).

(4) The use of per capita household expenditure (PCX) as a welfare measure, which is standard "best-practice" by the World Bank and others, will most likely overstate the incidence of poverty among children, and understate that among the elderly. Indeed, the results in the previous paragraph suggest that higher poverty rates among the elderly is the more common case, so that the contrary finding based on PCX is seriously misleading.

List of works cited:

Atkinson, Anthony B., and François Bourguignon, 1982, "The comparison of multi-dimensioned distribution of economic status," *Review of Economic Studies*, **49**, 183–201.

——, 1987, "Income distribution and differences in needs," in George R. Feiwel, ed., *Arrow and the foundations of the theory of economic policy*, New York University Press, 350–70.

Banks, James, and Paul Johnson, 1994, "Equivalence scale relativities revisited," *Economic Journal*, **104**, 883–90.

Buhmann, Brigitte, Lee Rainwater, Guenther Schmaus, and Timothy 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**, 115–42.

Caldwell, John C., 1982, *Theory of Fertility Decline*, London, New York. Academic Press.

Case, Anne C., and Angus Deaton, 1998, "Large cash transfers to the elderly in South Africa," *Economic Journal*, forthcoming.

Coulter, Fiona A. E., Cowell, Frank A., and Stephen P. Jenkins, 1992, "Differences in needs and assessments of income distributions,"*Economic Journal*, **102**, 1067–82.

——, 1994, "Parametric equivalence scales and scale relativities," *Economic Journal*, **104**, 891–900.

Deaton, Angus S., 1997, *The Analysis of Household Surveys: a microeconometric approach to development policy*, Baltimore. Johns Hopkins University Press for the World Bank.

Deaton, Angus, and Christina H. Paxson, 1998a, "Poverty among the elderly," in David Wise, ed., *Inquiries in the economics of aging*, Chicago, Il., Chicago University Press for the National Bureau of Economic Research, forthcoming.

——, 1998b, "Economies of scale, household size, and the demand for food," *Journal of Political Economy*, forthcoming.

Grosh, M. and P.A. Glewwe, 1995, "A guide to LSMS surveys and their data sets," LSMS Working Paper 120, Washington: World Bank.

National Research Council, 1995, *Measuring poverty: a new approach*, Washington, D.C. National Academy Press.