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Poverty and Undernutrition in Indonesia during the 1980s

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Because of sustained growth in average real consumption, a modest improvement in overall equity, and gains to the rural sector — particularly the poorest of the poor — poverty and undernutrition continued to be alleviated during Indonesia's recent period of macroeconomic adjustment.

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Indonesia adjusted rapidly to sharply falling external terms of trade during the 1980s — using a classic package of currency devaluation, budgetary and monetary restraint, and regulatory relaxation.

How did the country fare in its efforts to alleviate poverty and undernutrition during that period?

It is difficult to measure poverty at one point in time — much less compare poverty in two periods — but Ravallion and Huppi answer that question using two large, comparable sets of household data for 1984 and 1987. They tested a wide range of possible poverty lines and poverty measures — and the sensitivity of key results to many of the underlying assumptions about poverty.

They found robust evidence that poverty continued to decline during the period.

Although caloric intake data are far from ideal, they found evidence that the extent of undernutrition also fell significantly. For a caloric intake level which 37 percent of the population failed to attain in 1984, they found that only 27 percent of the population failed to attain it in 1987.

Why was this so? Gains to the rural sector contributed greatly to the alleviation of poverty. Gains to the urban sector and population shifts from the rural to the urban sector also helped but were quantitatively less important than direct gains to the rural poor.

Increases in average real consumption and an improvement in overall equity both helped to reduce poverty. In addition, Indonesia's recent economic history had created conditions favorable to alleviating poverty so long as modest growth in private consumption per capita could be maintained during the adjustment period.

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1. Introduction

The 1970s saw a significant decline in the proportion of Indonesia's population who did not attain minimal nutritional and other consumption needs (Rao, 1984; CBS, 1984). Concern has been expressed about whether this success in poverty alleviation has been sustained through the far more difficult 1980s.¹ The various external shocks of the 1980s included sharp falls in the price of the country's main export and source of public revenue, oil. During 1986 alone, this amounted to about a one third drop in the country's external terms of trade. It is now widely agreed that the government's policy responses to these shocks were effective in stabilizing the main macroeconomic aggregates. However, we know little about their effects on poverty.

Rapid macroeconomic adjustment programs in LDCs can have adverse effects on the poor, and there has been some casual speculation that this may have happened in Indonesia. The public expenditure cuts were certainly severe; the government's total real expenditures fell by about nine percent between 1985/86 and 1986/87. However, a good deal of the immediate burden of adjustment fell on domestic savings and investment rather than private consumption, which did sustain a modest but still positive (per capita) growth rate over the period. Poverty will not increase when mean consumption is maintained, provided that (and it is an important proviso) the poor do not lose from changes in the distribution of consumption.²

What then happened to Indonesia's distribution of consumption in the 1980s? Existing evidence is inconclusive. It appears that the government did try to avoid its expenditure cuts falling too heavily on programs (both current expenditures and investments) in which the poor may

be expected to participate disproportionately. Its efficacy in achieving this end is less obvious.³ The currency devaluations and the boom in non-oil exports may have offered some protection to the rural sector.⁴ However, the extent to which this included the rural poor is unclear; while it is plausible that many of Indonesia's rural poor tend to be net producers of tradeable goods (and hence gain from real devaluations), there are also likely to be many poor households in both urban and rural areas who are not. There have been reports of a decline in real wage rates in rural Java, though there is some conflicting evidence.⁵

It is also far from obvious that adverse income effects of short-run macroeconomic adjustment on the poor will be reflected in their consumption. It is not implausible that most of the poor do have strategies of some sort for coping with short-run income declines, such as through adjustments in their labor market behavior, intertemporal consumption behavior and/or their participation in the "moral economy".⁶ What is less clear, and of greater importance, is how well these coping strategies perform in practice.

This paper examines what happened to aggregate poverty and undernutrition in Indonesia during the period 1984 to 1987. The twin objectives are: i) to describe empirically how poverty and undernutrition changed over this period, and ii) to examine the proximate causes of those changes. In pursuing both objectives we also hope to illustrate the usefulness of a number of recent theoretical advances in poverty analysis. Section 2 gives an informal discussion of the methodological issues to do with how poverty and undernutrition are to be measured, concentrating particularly on sensitivity to measurement assumptions and the relevance of recent developments in the "dominance approach" to poverty analysis. The

paper's main empirical results are presented in Section 3 where we give poverty assessments for various indicators of the standard of living of the poor. While the primary objective of this paper is to measure and describe how poverty and undernutrition in Indonesia changed over this period, it is of interest to go at least slightly further into the causes of those changes. Section 4 attempts to do this by asking what contributions sectoral gains and population shifts (on the one hand), economic growth and changes in inequality (on the other) made to aggregate poverty alleviation. The importance of Indonesia's favorable distributional parameters at the beginning of the period is also discussed. Section 5 uses the results of Section 4 to make an alternative assessment of how poverty changed over the period. The alternative method does not assume that the levels of household consumption are comparable across the two data sets. In the light of the paper's results, Section 6 discusses Indonesia's prospects for future poverty alleviation. Section 7 offers some conclusions.

2. Measuring Poverty and Undernutrition

A fundamental question which arises when assessing poverty is that of how an individual's "standard of living" is to be measured. Individuals and the states of their environments will differ in many ways which might be deemed relevant in principle, but are not quantifiable. A similar comment applies to measures of undernutrition, where variability in nutrient requirements (both between people and over time) is important, but is difficult to quantify. Though we shall discuss these problems later, for the moment we shall assume that a measure is available for individual living standard (generally) or nutritional intake (as a particularly important

aspect of living standard). The problem we face now is how to compare distributions of that measure which, in this instance, are the observed survey distributions at two dates.

There is now a large theoretical literature on the measurement of poverty, establishing a number of desirable properties for such measures.⁷ The popular "headcount index" satisfies very few of those properties. There has been much recent interest in a class of measures proposed by Foster, Greer and Thorbecke (FGT) (1984). This is a single parameter index which can be made to satisfy the main axioms of poverty measurement through a suitable choice of that parameter. Each member of the FGT class of poverty measures is identified by the value taken by the parameter α and the corresponding measure is denoted P_α .⁸ Three members of the FGT class are considered in this study:

- (i) The FGT poverty measure for $\alpha = 0$. This is simply the headcount index, given by the proportion of the population with a standard of living below the poverty line. Thus, if forty percent of the population are deemed to be poor then $P_0 = 0.4$.
- (ii) The poverty measure for $\alpha = 1$. This is the average poverty gap in the population, expressed as a proportion of the poverty line. Thus a value of $P_1 = 0.1$ means that, when the aggregate deficit of the poor relative to the poverty line is averaged over all households (whether poor or not), it represents 10 percent of the poverty line.
- (iii) The measure for $\alpha = 2$. This is a distributionally sensitive measure, based on the sum of the squared poverty gaps of the poor. This measure satisfies the main axioms for a desirable poverty measure in the literature, including Sen's (1976) (Weak)

"Transfer Axiom" which requires that when a transfer is made from a poor person to someone who is poorer, the measure indicates a decrease in aggregate poverty. In view of the desirable properties of this measure we shall simply refer to it as our "preferred measure".

However, while the search for better cardinal measures of poverty and undernutrition has advanced far over the last fifteen years or so, there is still widespread concern about arbitrariness in the choice of a poverty line, or nutrition cut-off point, and in the choice of a specific functional form for the poverty measure. For example, the popular FGT measure P_2 discussed above uses only one of a number of possible functional forms that might be suggested, all satisfying the main axioms for a desirable poverty measure (Atkinson, 1987). Fortunately, for many (though not all) of the purposes of measurement, including some policy analyses, all that one is really concerned about is the ordinal ranking of distributions in terms of poverty or undernutrition. For example, the main question of interest may be: did poverty increase as a result of (say) structural adjustment? As a rule, one will be able to answer this question with much less information, including fewer arbitrary assumptions, than are needed for making the cardinal comparison: how much has poverty changed?

Rather than confine ourselves to a particular poverty line and poverty measure, we shall draw on recent results on the use of dominance conditions in ordering income or expenditure distributions in terms of poverty.⁹ For this purpose one can consider a very broad class of poverty measures, which encompass the main contenders found in the literature. And, instead of only allowing one or two specific poverty lines, one can consider a range of such lines up to some maximum. As long as the class of poverty

measures satisfies certain rather mild conditions (notably that the measures are continuous, separable, symmetric and weakly monotonic), poverty will have unambiguously fallen between two dates if the cumulative distribution of income for the latter date lies nowhere above that for the former date, over the entire interval up to the maximum allowable poverty line (Atkinson, 1987, Condition IA). This is called the first-order dominance test. If the result of that test is ambiguous, then we know that different poverty lines and/or measures will rank the distributions differently; some will indicate a decrease in poverty while others will not. When such ambiguity exists according to the first-order dominance test, then stronger (higher order) dominance conditions may prove useful. Sen's Transfer Axiom is an important example of the sorts of further conditions which may then prove to be revealing in deciding whether poverty has gone up or down. When applied to the poverty measure, this axiom yields the second-order dominance test which basically requires that the area under the cumulative distribution function up to the maximum poverty line is greater (or no less) over the entire range of admissible lines (see Atkinson, 1987, Condition IIA).

A similar approach can be used to assess changes in the extent of undernutrition, when (as is certainly the case) there is uncertainty about nutritional requirements and their interpersonal distribution. Provided that the interpersonal distribution of requirements has not changed, first-order dominance of the caloric intake distribution for one date over another implies an unambiguous change in the aggregate headcount index of undernutrition (Kakwani, 1988). This holds no matter where the caloric norm is located. Furthermore, second-order dominance of one intake distribution over another implies an unambiguous ranking according to a broad class of undernutrition measures, including measures which attach higher weight to

more undernourished persons, such as those discussed by Kakwani (1988) and Ravallion (1988b). We shall only attempt to make ordinal comparisons of undernutrition, following the dominance approach.

3. The Data and Results

The SUSENAS tapes give data on household consumption (from both market expenditures and own production) for 50,000 randomly sampled households at each date. Following past practice for Indonesia, we shall mainly base our poverty assessments on distributions of household consumption per person, adjusted to February 1984 urban prices using the Consumer Price Index (CPI). The CPI is far from ideal for our purposes. The index is only constructed for urban areas and its composition is inappropriate for the poor. We have, however, re-weighted the CPI so as to better reflect the consumption pattern of the poor, and have also built an allowance for urban-rural price differentials into the index.¹⁰ Appendix 1 discusses the data and their limitations in greater detail. For present purposes, the most worrying features of these data are the possibility that the rate of inflation in rural areas may be underestimated by the CPI and that SUSENAS data imply a growth rate of real private consumption per capita which is higher than implied by the national accounts. We shall return to these points later.

As noted above, the determination of a poverty line is always likely to be contentious, and so it is important to have some idea of how sensitive poverty assessments are to this choice. This study considers a range of poverty lines, embracing most of the alternatives found in the literature on poverty in Indonesia (see, for example, the survey in CBS,

1984). Results are presented here for the two main poverty lines: a 1984 expenditure of Rp 11,000 per month per person and one of Rp 15,000. The lower poverty line is chosen to correspond to that used in past Bank studies, after adjusting for inflation (Rao, 1984, 1986). We take this to be the preferred poverty line.

Table 1 gives our cardinal estimates of poverty in Indonesia for various poverty measures and for both poverty lines. All three measures (including the preferred "distributionally sensitive" measure) and both poverty lines indicate a significant decrease in poverty for both urban and rural sectors.

For the lower poverty line we find that the proportion of the population who are poor decreased from about one in three at the beginning of the period, to slightly over one in five by 1987; this is a substantial contraction over just three years. The corresponding absolute number of poor persons declined from 52 million to 36 million. The poverty gap measure implies that the aggregate consumption shortfall of the poor declined from about Rp 937 per month per head of Indonesia's population (representing about 5.5 percent of national mean consumption) to Rp 464 in 1987 (about 2.3 percent of the national mean). Such calculations are, however, contingent on the precise poverty line chosen. The higher poverty line in Table 1 also indicates significant declines in poverty, though the numbers are a good deal less dramatic.

Are the qualitative results robust to the choice of poverty line and measure? Figure 1 gives the cumulative frequency distribution of consumption for the two dates. The 1984 distribution lies entirely above the 1987 distribution. Thus the first-order dominance condition holds and so one can conclude that all well-behaved ("monotonic") poverty measures and

all possible poverty lines will show an unambiguous decrease in aggregate poverty between the two dates. This was found to hold for both urban and rural areas.

From Figure 1 we can also assess the sensitivity of this conclusion to possible underestimation of price increases facing the poor. The 1987 poverty line (in 1984 prices) which would be needed for the 1987 headcount index of poverty to equal that in 1984 is Rp 12,818. Thus, an additional inflation rate of at least 16.5 percentage points (on top of the CPI based estimate of about 20 percent) would have been needed over the three years to reverse the conclusion that poverty has decreased by this measure. Similarly, the true inflation rate would need to be about 14.1 points higher over the three years to equalize the headcount indices for the two dates at the higher poverty line. Thus the conclusion that poverty has decreased would be robust to even quite substantial measurement error in the CPI; the inflation rate would need to have been underestimated by at least 50 percent to reverse our conclusion.

A potentially important observation about the results in Figure 1 is that the poverty lines are found on a steep segment of the consumption distribution. This is illustrated more clearly by the density function of consumption given in Figure 2. (This is a non-parametric estimate using a Gaussian kernel). The lower poverty line is very close to the mode, where the slope of the consumption distribution function reaches its maximum. This has two implications of interest here:

i) Estimates of the headcount index of poverty will be particularly sensitive to the exact location of the poverty line, as our comparison of the lower and upper poverty lines in Table 1 has suggested.

ii) Poverty levels will be very responsive to horizontal shifts in the distribution of consumption; indeed, when the poverty line is at the

mode, the response of the headcount index to an additive gain or loss at all consumption levels will be at its maximum. As the results of the following section will demonstrate, the response of poverty in Indonesia to multiplicative shifts (in the form of distributionally neutral changes in the mean) was also high in the mid-1980s. This will be seen to have implications for understanding the effects of recent economic growth on poverty.

Is our qualitative result on the change in poverty over this period robust to the choice of an indicator of the standard of living? Three alternatives will be considered: income, food expenditure share, and caloric intake.

Figure 3 gives the distributions of household income per person. A comparison of the entire frequency distribution again reveals that the first-order dominance condition holds. No matter where one draws the poverty line, or what poverty measure one uses (within a broad class), aggregate poverty in terms of incomes unambiguously fell between 1984 and 1987. This conclusion is also robust to even substantial measurement error in the CPI.

Keeping in mind the problems of comparing surveyed consumption and income levels over time, it is of interest to consider another alternative measure of the standard of living. It is well known that a household's apportionment of consumption expenditure between food and non-food goods is an indicator of that household's real consumption level; the share devoted to non-food goods is generally found to be a monotonic increasing function of real consumption. However, that function will only be the same for households who are homogeneous in relevant respects; the real consumption level corresponding to a given food share will generally vary according to

relative prices, demographic factors and tastes. Differences in relative prices and (possibly) tastes between urban and rural areas could well be the most important factor mitigating the welfare interpretation of inter-household differences in food shares in Indonesia. For this reason it is probably better to consider urban and rural areas separately.

Figure 4 gives the cumulative frequency distributions of the share of non-food goods in total consumption for each of urban and rural areas for each date. First-order dominance still holds up to high non-food shares, so a wide range of poverty lines and measures will continue to indicate a decrease in poverty in both sectors over this period. The proportion of the rural population with a food share in excess of 75 percent (a commonly used poverty line) fell from 39.2 percent in 1984 to 35.8 percent in 1987, while for the urban sector it fell from 10.5 to 8.5 percent. The decline is not as dramatic as that suggested by the CPI adjusted consumption and income data, but it is still evident in the distribution of food shares.

Did undernutrition also diminish? Figure 5 gives the distributions of calorie intake per person for the two dates. The 1987 distribution lies below that for 1984 up to a high intake level (the ranking only reverses for the upper nine percent of persons). First-order dominance thus holds up to high caloric norms. The "second-order dominance condition" discussed in Section 2 holds over the entire distribution, so that it can be concluded that a broad class of undernutrition measures show an improvement whatever the underlying distribution of requirements. These results were also found to hold in both urban and rural areas. The quantitative shift in the caloric intake distribution is quite substantial at the lower end; for example, the estimated proportion of the population consuming less than 1500 calories per day decreased from 37 percent in 1984 to 27 percent in 1987.

4. Proximate Causes

We do not intend to go very deeply here into the reasons for Indonesia's evident success at alleviating poverty during a period of macroeconomic adjustment. But some clues are offered by the following statistical decompositions of the reduction in aggregate poverty.

Sectoral Gains and Population Shifts

The results of Section 3 indicate significant poverty alleviation in both urban and rural sectors. There was also a shift in population over the period, with a declining share in the poorer rural sector (the proportion of the population living in rural areas fell from 76.5% in 1984 to 73.6% in 1987). What was the relative contribution of these factors to the reduction in poverty?

Using the P_a class of poverty measure, the change in aggregate poverty between the two dates can be decomposed into sectoral gains, population shifts, and interaction effects, as follows:

$$P_a^{87} - P_a^{84} = (P_{au}^{87} - P_{au}^{84})n_u^{84} + (P_{ar}^{87} - P_{ar}^{84})n_r^{84}$$

gain to urban sector at 1984 population share	gain to rural sector at 1984 population share	
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$$+ \sum_{i=u}^r (n_i^{87} - n_i^{84})P_{ai}^{84} + \sum_{i=u}^r (P_{ai}^{87} - P_{ai}^{84})(n_i^{87} - n_i^{84}) \quad (1)$$

gain due to population shifts at 1984 sectoral poverty levels	aggregate interaction effects between sectoral gains and population shifts	
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where P_{ai}^t denotes measured poverty in sector i ($i=u,r$ for urban and rural)

at date t ($t=1984,1987$), with corresponding population share n_i^t . The aggregate interaction effect can be interpreted as a measure of the correlation between population shifts and changes in poverty.

Using this formula, Table 2 gives the urban/rural decomposition of the aggregate poverty alleviation gains. For the headcount index, using the lower poverty line, we find that about 10 percent of the aggregate reduction in poverty was due to a lower prevalence of poverty amongst the urban sector (while accounting for about one quarter of the population). On the other hand, 85 percent was due to the lower rural poverty, while about 7 percent was due to the higher urban population share. The net interaction effect is -2 percent.

It can be seen from Table 2 that both population shifts and gains to the urban sector made positive contributions to aggregate poverty alleviation during the period for all measures, and were dampened only slightly by the negative interaction effect. The quantitative importance of the sectoral gains to rural households is notable, particularly when the measure focuses more on the poorest of the poor ($\alpha=2$). The gains to this sector accounted for the vast majority of aggregate poverty alleviation, and generally more than the sector's population share (there is one exception for the headcount index at the higher poverty line). Lower poverty lines and monotonic poverty measures tend to enhance considerably the importance of gains to that sector; at the lower poverty line and for the preferred poverty measure, the gains to the rural sector represented over 90 percent of the aggregate gain.

In the light of this result, it is of interest to take a closer look at the distribution of gains within that sector. For this purpose, all households were classified by their principal source of income, as recorded

in the SUSENAS, giving 21 distinct sources for each of urban and rural areas (Huppi and Ravallion, 1989). Significant reductions in all poverty measures (generally at least as high as the sector means) were experienced by the poorest rural subsectors, notably farm laborers and self-employed farm households. While 11 and 57 percent of all rural persons in the sample were principally employed in these two subsectors respectively, they accounted for 17 and 61 percent of the aggregate drop in the preferred poverty measure using the lower poverty line (Huppi and Ravallion, 1989).

Growth, Inequality and Poverty

An alternative way to decompose the poverty alleviation gain is in terms of the parameters of the aggregate consumption distribution. Roughly speaking, one can identify two proximate causes of a change in poverty: a change in the mean consumption level at given inequality, and a change in the inequality of consumption around the mean; the former can be thought of as the "growth effect on poverty" while the latter is the "distributional effect"¹¹. However, the qualitative effect on poverty of a reduction in inequality at a given mean is not obvious a priori; for example, while a transfer of income from someone at the poverty line (or only slightly above it) to someone well below will reduce inequality, it will also increase the headcount index of poverty.

To derive a useful decomposition formula for resolving this issue empirically, let P_G^{87*} denote the poverty level that would have occurred in 1987 if the change in mean consumption since 1984 had not been associated with any change in relative consumption levels; i.e., P_G^{87*} is obtained by applying the 1987 mean to the 1984 Lorenz curve. Similarly, let P_G^{87**}

denote the poverty level that one would have found in 1987 if only the Lorenz curve had shifted since 1984, leaving the mean unchanged. The observed change in poverty between two dates can then be decomposed into "growth" and "distributional" effects as follows:

$$P_{\alpha}^{87} - P_{\alpha}^{84} = (P_{\alpha}^{87*} - P_{\alpha}^{84}) + (P_{\alpha}^{87**} - P_{\alpha}^{84}) + \text{residual} \quad (2)$$

change in poverty due to change in the mean holding 1984 Lorenz curve constant	change in poverty due to shift in the Lorenz curve holding 1984 mean constant
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However, one should be cautious in drawing policy implications from this decomposition. Distributionally neutral growth is not the same thing as growth with distributionally neutral policies. The laizze-faire growth path of an economy need not be distributionally neutral, and so policy interventions aimed at reducing relevant inequalities may well be essential to attaining even distributionally neutral growth. The "growth-equity" decomposition is a simple descriptive device intended to throw light on the proximate causes of poverty alleviation; a deeper analysis of those causes would be needed to draw sound policy implications.

Turning to the Indonesian data we find that the period 1984-1987 saw a simultaneous increase in mean consumption and a reduction in the overall inequality of consumption, in both urban and rural sectors. The three year growth rate in urban consumption implied by the SUSENAS was 12.1 percent, while the rural rate was 14.6 percent. Table 3 gives the Lorenz curves. The 1987 Lorenz curves unambiguously dominate those for 1984 in both sectors and, of course, nationally. Thus all well-behaved inequality measures will indicate a reduction in inequality over the period.^{12,13} The

aggregate Gini coefficient (for example) dropped from 0.331 in 1984 to 0.321 in 1987.¹⁴

Table 4 gives our estimates of the relative contributions to poverty alleviation of growth and greater equity, using the decomposition formula in equation (2).¹⁵ The shifts in the Lorenz curve contributed to poverty alleviation in almost all cases; the exception for rural areas using the higher poverty line is probably due to the fact that the rural mean for 1984 was actually slightly below that poverty line.¹⁶ In all cases considered in Table 4, the majority of the reduction in poverty can be attributed to higher mean consumption at given relative consumptions; the contribution of greater equity (upward shifts in the Lorenz curve) is small for the headcount index, though it accounts for a far higher proportion of the change in the preferred measure of poverty.

It is of interest to also consider the point elasticity of poverty in 1984 to distributionally neutral growth. Following Kanbur (1987a) and Kakwani (1989b), it can be readily shown that the elasticity of the P_α poverty measure w.r.t. the mean of the distribution, holding the Lorenz curve constant is given by:

$$\begin{aligned}\eta_\alpha &= -zf(z)/P_0 < 0 \text{ (for } \alpha = 0\text{)} \\ &= \alpha(1 - P_{\alpha-1}/P_\alpha) < 0 \text{ (for } \alpha \geq 1\text{)}\end{aligned}\tag{3}$$

where $f(z)$ denotes the probability density of consumption at the poverty line z . This also has to be estimated; details can be found in Appendix 2.

Table 4 also gives the base period point elasticities with respect to mean consumption. All poverty measures are found to respond elastically to higher mean consumption holding the Lorenz curve constant. In each case, the (absolute) elasticities are highest with respect to the lower poverty

line and in urban areas. For a given poverty line and sector, the growth elasticity is highest for the preferred measure of poverty and lowest for the headcount index.

On the Role of Initial Conditions

The results in Table 4 suggest that, by the beginning of the adjustment period, aggregate poverty in Indonesia was ready to respond quite elastically to any further economic growth. Initial conditions of the period may thus have been favorable to maintaining the momentum of poverty alleviation, in spite of lower growth. We now investigate that conjecture more closely.

The growth elasticity of poverty is a function of the parameters of the underlying consumption distribution.¹⁷ Consider first the mean. Differentiating (3) with respect to the mean μ , it can be readily verified that:

$$\begin{aligned} \frac{\partial \eta_a}{\partial \mu} &= -\eta_0^2 / \mu < 0 \quad (\text{for } a = 0) \\ &= \frac{(\eta_a - \eta_{a-1}) \mu^{a-1}}{\mu^a} \quad (\text{for } a \geq 1) \end{aligned} \quad (4)$$

The last derivative is not necessarily negative for all $a \geq 1$, though it is found to be so for $a = 1, 2$, for these data (Table 4). This result can be interpreted as an "acceleration effect" of growth on poverty; a higher mean implies a more elastic response (in absolute value) of poverty to further growth. (And, conversely, at low average consumption, higher growth rates will be needed to achieve the same proportionate poverty alleviation impact).

Under plausible assumptions about how the Lorenz curves have shifted over time, it can also be shown that, for these data, the (absolute) elasticity of the FGT class of poverty measures with respect to the mean (again holding the Lorenz curve constant) is a monotonic decreasing function of the initial Gini measure of inequality;¹⁸ differentiating (3) with respect to the Gini coefficient G one finds that (analogously to (4)):

$$\begin{aligned} \frac{\partial \eta_a}{\partial G} &= - \eta_0 \epsilon_0 / G > 0 \quad (\text{for } a = 0) \\ &= \frac{(\epsilon_a - \epsilon_{a-1}) a P_{a-1}}{G P_a} > 0 \quad (\text{for } a \geq 1) \end{aligned} \quad (5)$$

where ϵ_a denotes the elasticity of the P_a poverty measure to Lorenz dominating changes in the Gini coefficient.

It can thus be argued that a past history of fairly equitable growth (resulting in a relatively "high" mean and "low" inequality) resulted in a "high" elasticity of poverty to future growth in Indonesia. The growth experience over the 1970s and early 1980s would appear to have created a sound foundation for maintaining poverty alleviation from the more modest growth of the mid-1980s. This finding also has implications for Indonesia's poverty alleviation prospects after 1987, as will be considered further in Section 6.

5. An Alternative Poverty Assessment.

The methods we have used so far will have overestimated poverty alleviation in Indonesia if growth rates in mean real consumption have been underestimated. The SUSENAS does imply a considerably higher growth rate of real consumption per capita than do the national accounts; 15 percent over

the three years for the former as opposed to 5 percent for the latter. The reason for this large discrepancy is quite unclear, and there does not appear to be any sound basis for deciding which is closer to the truth.

However, the results of Tables 3 and 4 also allow us to make an alternative assessment of how poverty changed during the period, avoiding the potentially contentious issues concerning the comparability of the levels of SUSENAS expenditures across the two dates. For this purpose we can use the SUSENAS to assess how overall inequality changed during the period. This assumes that the samples at both dates were representative of the populations, though this seems plausible (see Appendix 1 for further discussion). From Table 3 we can then conclude that there was no deterioration in overall inequality; indeed equity improved slightly and in a way which would have reduced poverty. This use of the SUSENAS data requires comparisons of consumption or income relativities across dates, not absolute levels. Since inequality did not increase, any positive growth in per capita consumption would (as a rule) have reduced poverty (and, indeed, since inequality fell slightly, a modest contraction in mean consumption would have been possible without an increase in poverty). From the point elasticity estimates in Table 4, the national accounts' growth rate for consumption per capita implies that the headcount index at the lower poverty line (for example) would have fallen by about 10 percent over the period (to a first-order approximation). The preferred poverty measure, on the other hand, would have declined by about 17 percent. While these figures are a good deal less than those implied by the SUSENAS, they still indicate a far from negligible impact on poverty. The above calculations also ignore the desirable effect of lower inequality on aggregate poverty. The qualitative conclusion that poverty declined is robust to relaxing the requirement that even inflation adjusted SUSENAS expenditures are level comparable over time.

6. Implications for Future Poverty Alleviation Prospects

Naturally we cannot say anything with similar confidence about what has happened to poverty in Indonesia since early 1987 (the last available SUSENAS survey), or what is likely to happen in the future. But some aspects of the methodology we have used here can throw light on the issue. Our 1987 results also allow us to estimate the elasticities of poverty to any future distributionally neutral growth in mean consumption, in a similar manner to those we have used in the 1984-87 analyses. We find that the 1987 growth elasticities are also high; and, indeed, higher than those for 1984. For example, our estimates are -4.1 for the 1987 elasticity of the poverty gap measure with respect to mean consumption using the lower poverty line (as compared to -2.9 for 1984 from Table 4); similarly, for our preferred measure we obtain an elasticity of -4.8 (-3.4 for 1984). Furthermore, from national accounts for 1987 and 1988 it appears that growth rates of real consumption per capita have increased. Both these factors - the higher growth elasticities of poverty and the higher growth rates - imply increasing poverty alleviation through any distributionally neutral growth since early 1987.

Sustainable future consumption growth in Indonesia will clearly require that investment is revived, after the cuts of the mid 1980s. But it is possible for the poverty alleviation benefits of even substantial consumption growth to be lost entirely through a sufficient contemporaneous deterioration in overall equity. As we have seen, there was a modest decrease in inequality over 1984-1987. Is this likely to have abated since then?

The sharp increase in rice prices during 1987 and 1988 (associated with poor harvests and a reluctance by the government to import rice) is probably the main recent event which could mitigate continued poverty alleviation. The effect on aggregate poverty of higher rice prices is not obvious. Ravallion and van de Walle (1988) found for Java in 1981 that even if rice price increases were allowed to be passed on fully to the incomes of the (typically poor) rice producers, all distributionally sensitive poverty measures would respond adversely to higher rice prices. The effects are, however, ambiguous for other measures of poverty which are not sensitive to the welfare of the poorest of the poor, such as the headcount index. Still, the latter measure is known to be inadequate, and the preferred measures favor a presumption that higher rice prices will (ceteris paribus) increase poverty. It remains to be seen whether adverse effects on the poor of changing relative prices have been sufficient in size, or persistent enough, to seriously jeopardize continued poverty alleviation through growth in Indonesia.

A further issue begging which has not been addressed here is whether there exists a subset of the poor who will be unable to escape poverty in the future, solely by their participation in Indonesia's seemingly robust aggregate economic growth. The results of this study suggest that many of the poor have been able to do so in the 1980s. But the data studied here cannot tell us about any persistently poor persons who may have benefitted little from growth, and are not so large in numbers or so easily interviewed as to show up in sample averages; that would require repeated and painstaking observation of a single sample. For this group, direct policy intervention may remain their only hope.

7. Conclusions

The measurement of poverty at one point in time is fraught with difficulty, and the comparison of two points in time adds even further problems. We have followed past work on poverty in Indonesia and elsewhere in basing poverty measures on distributions of household consumption per person. We have adjusted for inflation using the Consumer Price Index, though we have modified the underlying expenditure weights to accord more closely to spending patterns of the poor. Recognizing the uncertainties involved in poverty measurement, an effort has been made to use a wider range of both poverty measures and poverty lines. Here we have drawn on insights from the recent literature on poverty analysis using dominance conditions to establish partial orderings of distributions.

From our comparisons of income and consumption distributions over time we conclude that aggregate poverty in Indonesia decreased over the period 1984 to 1987. This holds for both urban and rural areas. In a neighborhood of commonly assumed poverty lines for Indonesia, the magnitude of the decline in poverty over the period is impressive; 22 percent of the population are identified as poor in 1987 using a consumption poverty line for which 33 percent were poor in 1984. Such numbers can, however, be quite sensitive to how poverty is measured, particularly the choice of a poverty line: for example, 46 percent are deemed to be poor in 1987 using a poverty line for which 56 percent were poor in 1984. But, we find that the qualitative conclusion that poverty declined over the period holds for a very broad class of poverty measures, and a wide range of poverty lines. Indeed, it would hold even if one knew nothing about the poverty line, and so allowed it to be anywhere between the lowest and highest consumption

levels! Underestimation in the rate of inflation over the period would need, in our view, to be implausibly high to alter the conclusion that poverty decreased.

A significant (though less dramatic) decline in poverty in both urban and rural areas is also indicated if one uses the share of total consumption devoted to non-food goods as the indicator of welfare, thus avoiding the problems of adjusting for inflation. The proportion of the population who devoted three-quarters or more of their total consumption to food fell from 32 percent to 28 percent over the period. Furthermore, our qualitative conclusions are robust to relaxing the assumption that the household level consumption data are even level comparable across dates; poverty is also found to have decreased (though again by a less dramatic margin than CPI adjusted consumptions indicate) if one bases the comparisons of mean consumptions solely on national accounts, only using the household level data tapes to compare relative consumptions at any one date.

Though the caloric intake data is less than ideal (with some underestimation being likely at both dates), there is strong evidence that the extent of undernutrition also fell significantly. This holds for both urban and rural sectors, over a very wide range of alternative measures of undernutrition and it holds for any (unknown) interpersonal distribution of nutritional requirements, provided that this did not also change over the period. The shift in the caloric intake distribution was far from negligible at its lower end; we find, for example, that 27 percent of the 1987 population did not attain a caloric intake which 37 percent had failed to reach in 1984.

In summary, while legitimate doubts can be raised about the quantitative magnitudes involved, the qualitative conclusion is plain:

poverty and undernutrition in Indonesia continued to decline during the difficult 1980s.

We have investigated the "proximate causes" of Indonesia's success using two methods of decomposition, one based on sectors, the other based on distributional parameters. The sectoral decomposition of the change in aggregate poverty indicates that gains to the rural sector were very important, particularly for the poorest of the poor. Gains to the urban sector and population shifts between sectors (from rural to urban) contributed to poverty alleviation, but were quantitatively less important than the direct gains to the rural poor. In terms of the parameters of the aggregate consumption distributions, we found that both increases in average real consumption (holding relative inequalities constant), and a modest improvement in overall equity, contributed to poverty alleviation during the period. The former factor was quantitatively more important, though less so for the preferred (distributionally sensitive) poverty measure.

A task for future research is to understand more deeply how this success was achieved. Some possible clues have been identified here. The gains to the rural farm sector were crucial and so policy adjustments aimed at protecting that sector probably had an important role. Certain ingredients of the macroeconomic policy response probably helped here, such as the devaluations. Indonesia's recent economic history had a role too; by the mid 1980s, past growth at relatively low inequality had created a situation whereby relatively large effects on aggregate poverty could be generated by seemingly small shifts in the distribution of consumption. Thus, Indonesia's recent economic history had created initial conditions for the adjustment which were quite favorable to maintaining the country's momentum in poverty alleviation, provided that at least modest growth in private consumption per capita could be maintained.

Appendix 1: The Distributions

The Household Consumption and Caloric Intake Data

Past poverty assessments for Indonesia have generally been based on the distributions of household consumption per person from the SUSENAS expenditure surveys done by the Central Bureau of Statistics. We follow this method, though noting that it has both advantages and disadvantages. The following points should be particularly noted:

- (i) The SUSENAS is widely recognized as a household consumption survey of relatively high quality which has used sound and consistent survey methods over many years. The 1984 and 1987 surveys appear to be fully comparable in terms of the questions asked, and the methods of sampling and interviewing. The estimates obtained will depend in part on the date of interview, particularly in rural areas where past work has found evidence of seasonality in consumption (as well as incomes).¹⁹ The 1984 and 1987 SUSENAS surveys used here were done at approximately the same time of year (February and January respectively) in comparable agricultural years,²⁰ and so this is unlikely to be a problem for comparisons between those years.
- (ii) The SUSENAS has the advantage over expenditure surveys for a number of developing countries that it is a consumption based survey i.e., it does not just ask how much was spent on various goods and services, but also asks how much was actually consumed from various sources, including of course, market expenditure but also including consumption from own production and transfers (van de Walle, 1988).

- (iii) Normalizing household consumption by the number of persons makes no allowance for the likely variation in consumption needs between different persons, according to (for example) age or gender. There is a large literature on the construction of equivalence scales which allow the normalization to take account of such differences in household composition, though it remains that there is no single ideal method of dealing with this issue.²¹ Future work on measuring poverty in Indonesia might fruitfully address this issue, but for present purposes we shall follow past practice.
- (iv) The use of consumption rather than income is generally desirable in this setting, since incomes fluctuate more and households can save. It can be argued that consumption expenditures for a single date will provide a better measure of a household's standard of living than current income. However, it is also of interest to examine the effects on incomes, as this is where many of the immediate consequences of macroeconomic adjustment are felt.²²
- (v) The SUSENAS aims to provide a random sample of the entire population. However, it is probably difficult to survey certain types of households, and a disproportionate number of these may be poor; individuals without fixed abode are an obvious example. Though we do not have any evidence to support the view, it is not implausible that the itinerant urban poor in large cities such as Jakarta are not well represented in the SUSENAS. If there has been an increase in the numbers of such persons during the adjustment period then this will bias downward our

assessment of poverty in 1987, relative to 1984. The sample was stratified spatially. All our calculation have used the local expansion factors (inverse sampling rates) in aggregation.

- (vi) The SUSENAS is the only available source of data on household consumption and income in Indonesia which provides national coverage. It is thus essential for constructing consumption or income distributions such as required for convincingly measuring inequality, poverty or undernutrition. There is another important data source for the national aggregates, such as consumption, notably the national accounts. However, the two sources do not generally agree on the aggregates; the SUSENAS typically yields lower estimates of mean consumption than the national accounts (see, for example, Dapice, 1980). The reason for this is unclear. It is thought to be plausible that the SUSENAS underreports consumption, though it can also be argued that this is more likely to be so for the rich than the poor, in which case poverty assessments may still be reasonably accurate.²³ Also of concern here is that the SUSENAS implies a higher growth rate of mean consumption per person over the period 1984-87 than do the national accounts; the former source suggests a three year growth rate (at constant prices) of about 15 percent, while the latter implies a much lower figure of about 5 percent. There is no obvious explanation for this disparity. In view of this, it is also important to test how sensitive results are to possible overestimation of aggregate consumption growth rates (see Section 5).

- (vii) Income or expenditure based poverty assessments typically ignore publicly provided goods, as these cannot be easily valued in terms of money. Though there is little hard evidence, there have been numerous casual observations that the mid and late 1980s witnessed a deterioration in the availability and quality of some publicly provided goods for which the poor are amongst the beneficiaries, such as piped water supply, health services, nutrition programs and schooling. Public services to the poor are clearly relevant to poverty assessments, but they are unlikely to be reflected in the consumption expenditure distributions used in the present study.
- (viii) The SUSENAS estimates household caloric intake by applying fixed caloric food values to observed consumptions of about 170 categories of food and beverage for each household, based on 7 day recall by the respondent. Caloric intakes are almost certainly underestimated, mainly because consumption of food in street-side stalls and restaurants is underestimated (such expenditures being classified elsewhere in the survey where physical consumptions are not asked; see van de Walle, 1988). This is more likely to bias the urban caloric distributions than those for rural areas. However, there is no obvious reason why the problem should bias our comparisons over time.

The Price Deflator

An important problem in comparing consumption levels across space and time is that prices are not constant. For Indonesia the interregional

differences in prices at one point in time may be just as important as the usual intertemporal differences associated with inflation (though the former have generally been ignored in past work.) The consumer price index (CPI) for Indonesia monitors price changes over time for bundles of goods which are predetermined in composition for each of a number of cities (spanning the archipelago), but are not, however, strictly comparable between cities.²⁴ Nor can it be convincingly argued that the differences in goods composition across regions solely reflect consumer substitution effects. It is quite likely that the bundle of goods is more "generous" in richer cities; the implicit reference utility level cannot be assumed to be constant.²⁵

Without an ideal price deflator, we have based all distributional comparisons on two alternatives: i) the Ordinary CPI which ignores spatial price variability in the base period, and simply adjusts prices for January 1987 in each province to the corresponding February 1984 prices using the price index for its capital city (although with higher weights on food expenditure; see below), and ii) the Spatial CPI which uses the expenditure data by city underlying the CPI to construct an index which allows all 1987 consumptions to be expressed in 1984 Jakarta prices. The first index is likely to lead us to overestimate the regional disparities in living standards (since it ignores spatial price variability, which is likely to be positively correlated with nominal expenditures), while the second index is likely to underestimate those disparities (because of the aforementioned problem that the implicit bundle of goods is not spatially constant, and is likely to yield a higher standard of living in provinces with higher average living standards). It turns out, however, that the choice between these deflators has a negligible effect on our assessments of aggregate poverty.²⁶ Results are only reported here based on the ordinary CPI.

There are two possible problems with the CPI:

- (i) The goods composition of the index is not ideal for measuring the standard of living of the poor; the weight on food (particularly rice) is undoubtedly too low (see, for example, Mulijanto, 1988). This does not, of course, mean that the CPI will underestimate inflation for the poor; that also depends on how relative prices changed. On disaggregating the CPI by commodity group we have found that the rate of inflation between February 1984 and January 1987 was slightly higher for the food group than the non-food group in most provinces, though the difference is small. There is, however, no reason why one need be confined to the expenditure weights implicit in the CPI. For the purposes of this study we have recalculated the price index using a higher food share, given by the average expenditure share for the poorest 30 percent of urban households in 1984 which Bank staff have calculated to be 0.68 (certainly a good deal higher than the CPI weight of about 0.45). Since the relative price of food changed little during the study period we do not, however, expect that this re-weighting will have much effect.
- (ii) Questions have also been raised about the methods used for compiling rice prices in the CPI. Average market prices are used. Though there does not appear to be any hard evidence, it is thought by some observers that average rice quality has declined in Jakarta markets over recent years. Thus the use of average market prices tends to put a downward bias on estimates of the cost of a given quality of rice. Bank staff have

compared monthly rice prices implied by the CPI with those for a specific grade of rice over recent years. The results suggest that the recent rates of rice price increase for an approximately uniform quality of rice are higher than those implicit in the CPI. However the divergence has mainly occurred since mid-1987, seemingly associated (for some unknown reason) with high rates of rice price increase as a result of that year's poor harvest. The implicit rice price in the CPI tracks well the monthly market price of a uniform quality of rice over the period of the present study.

Prices also vary between urban and rural areas. Past practice has been to make some assumption about the urban/rural cost-of-living differential, reflecting the fact that the prices for most goods (particularly food and housing) tend to be higher in urban areas. For example, on Indonesia's most populous island, Java, it has been estimated that average dwelling rents in 1981 were six times greater in urban areas than rural areas, while the price of the main food staple, rice, was on average 10 percent higher in urban areas (van de Walle, 1989a). Observations of this sort have often led some past investigators to use substantially different poverty lines for urban and rural areas of Indonesia. This practice has important implications for sectoral rankings in terms of the headcount index of poverty (given by the proportion of the population below the poverty line). For example, the 66 percent differential in poverty lines between urban and rural areas for 1981 assumed by a past CBS study is sufficient to reverse the poverty ranking of sectors in terms of the headcount index (over that obtained at a zero differential).²⁷

A proper treatment of these issues would require a demand system analysis to construct a true spatial cost-of-living index. This is beyond the resources of the present enquiry. Nonetheless we can still learn something from recent research along these lines. One of the potentially most important lessons is that past work appears to have considerably overestimated the urban-rural cost-of-living differential for Indonesia.²⁸ A differential of about 10 percent appears to be plausible for the poor.²⁹ This is assumed. We also assume that the urban-rural cost-of-living differential did not change over the period. This is consistent with the only price index constructed on a comparable basis for both urban and rural areas, namely the CBS Nine Essential Commodities (NEC) index. This also gives a very similar rate of inflation to the CPI, namely about 20-25 percent over this period.³⁰ Huppi and Ravallion (1989) discuss the sensitivity of regional and sectoral poverty profiles to alternative assumptions on spatial cost-of-living differentials.

Appendix 2: Lorenz Curve Parameterizations

The decomposition of poverty alleviation gains into "growth and equity" components in Section 4 uses the following parameterization of the 1984 Lorenz curve (following Kakwani, 1989b):

$$L(p) = p - ap^{\alpha}(1-p)^{\beta}e^{\nu} \quad (A1)$$

where $L(p)$ is the proportion of total expenditure by the poorest p proportion of the population and a , α and β are positive parameters to be estimated (with convexity of the Lorenz curve requiring that neither α nor β exceed unity) and ν is a random error process. The P_{α}^{87*} poverty measures in equation (2) are then calculated from the parameterized 1984 Lorenz curve and the 1987 mean, using the formulae given in Datt and Ravallion (1989). Similarly, P_{α}^{87**} is estimated using the parameterized 1987 Lorenz curve and the 1984 mean. The density at any point can also be retrieved from the parameterized Lorenz curve and the mean of the distribution, noting that $f(x) = 1/(\mu L''(p))$ where $p = F(x)$ is the cumulative distribution function and μ is the mean. This allows estimation of the growth elasticity η_0 (equation 3). The parameters of the Lorenz curve are estimated from the following linear regression implied by (A1):

$$\log[p-L(p)] = \log a + \alpha \log p + \beta \log(1-p) + \nu \quad (A2)$$

The accuracy of these methods depends on the precision in estimating the underlying Lorenz curve. Table 5 gives the estimated parameters of Indonesia's Lorenz curves in Table 4 for each sector in 1984. Table 6 gives the corresponding estimates of the national Lorenz curve. The overall fit is excellent; the standard deviation of the errors in estimation is 0.082

percentage points, equivalent to about 0.3 percent of the consumption share of the poorest half of the population. We experimented with two alternative parameterizations, namely the Kakwani-Podder Lorenz curve and the elliptical Lorenz curve (Villasenor and Arnold, 1989). The corresponding estimates are given in Table 6. The Kakwani Lorenz curve is clearly superior in fit to the Kakwani Podder specification (though that is unsurprising since the latter uses one less parameter). The ranking of the Kakwani and elliptical models is less clear; the latter gives a slightly better overall fit (the standard deviation of the error drops to 0.070). However, the gain is largely due to the elliptical model's better fit in some higher deciles, particularly the eight; Kakwani's model generally fits better at the lower end (for example, standard deviations of the errors for the poorest 50 percent are 0.047 and 0.065 for Kakwani and elliptical models respectively), and so it will generally be more accurate for simulating the poverty measures. In calculating the elasticity of the headcount index to the mean, we also tried a non-parametric density estimator based on the Gaussian kernel. Table 7 gives results for both methods. They agree fairly closely on the elasticities.

Notes

1. Though little convincing evidence has been presented, concerns about adverse effects on the poor have often been expressed in casual discussions and in recent literature; see, for example. Jayasuriya and Manning (1988), Sundrum (1988), Booth and Sundrum (1988) and Papanek (1988). The latter paper gives evidence that real wage rates in rural Java declined during the 1980s (as discussed further below), while national income per capita was increasing. Papanek infers from this that the overall distribution of income worsened, though that inference is clearly rather hazardous, as it ignores the numerous other variables which influence income distribution. More direct evidence is called for.
2. There have been recent signs of a slight downward trend in inequality. CBS (1988, Table 10.2.7) reports Gini coefficients for per capita expenditures of .33 for 1984, .33 for 1981, .34 for 1980, .38 for 1978 and .34 for 1976. However, Lorenz dominance does not hold, so other inequality measures may give different results. (The conditions necessary for lower inequality to reduce poverty are discussed further later in this paper). Inequality seems to have been on a rising trend through most of the 1970s; see Fields (1989).
3. See Demery and Addison (1987), and Keuning and Thorbecke (1989).
4. Agriculture accounted for over half of the rise in non-oil exports between 1986 and 1987; see Bank Indonesia (1988).
5. Papanek (1988) presents evidence that real agricultural wage rates were declining at about 1.7 percent per year in Central and East Java between 1982 and 1987. The apparent inclusion of the last half of 1987 as the

end date of Papanek's series tends to exaggerate the downward trend (as it coincided with a severe drought and unusually high rice prices). Nonetheless, his data do suggest declining real wages over the adjustment period. Collier et al. (1988) do not confirm this result in their study of 13 villages in the same provinces over a similar period, though the two studies have used different price deflators. It may also be noted that labor market adjustment will probably mitigate adverse effects on poor net consumers of tradeable goods, though that adjustment can be slow; for evidence in a possibly not dissimilar setting see Ravallion (1989a).

6. For evidence on the performance of voluntary redistributive or social insurance arrangements (the so-called "moral economy") in this setting see Ravallion and Dearden (1988).
7. For an excellent survey see Foster (1984).
8. More, formally, for a population of size n , split into m subgroups with population shares n_i ($i=1, \dots, m$), the FGT class of poverty measures takes the general form

$$P_\alpha = \sum_{i=1}^m P_{\alpha i} n_i$$

which is simply the population weighted mean of the subgroup poverty index ($P_{\alpha i}$), given by:

$$P_{\alpha i} = \sum_{j=1}^{q_i} g_j^\alpha / n_i \text{ for } \alpha \geq 0$$

where $g_j = (z - y_j)/z$ denotes the proportionate poverty gap of the j th person in subgroup i when y_j is the expenditure per capita of that person's household (ranked in ascending order) and for which q_i persons in subgroup i are found to have a value of y_j below the poverty line,

9. Important contributions are Atkinson (1987) and Foster and Shorrocks (1988).
10. Though a suitable demand model does not exist to allow us to estimate true cost-of-living indices, we have considered some of the implications of consumer substitution possibilities in response to temporal and spatial differences in relative prices. There is mounting empirical evidence to suggest that those responses are far from negligible for the poor, and substantial errors can arise in using fixed weight price indices when relative prices vary. See Appendix 1 for further discussion and references.
11. Sundrum (1987, Ch.6), Ravallion (1988a), Kakwani (1989b). In principle, a distributional change around a given mean may alter measured poverty in a way which one would not identify as a change in "inequality". In practice a two parameter characterization is often adequate.
12. More precisely, this will hold for any inequality measure which satisfies the Pigou-Dalton "transfer principle", namely that a transfer of income (or expenditure) from person A to person B will increase inequality whenever A has lower income than B. See Atkinson (1970).
13. Allowing for regional price differentials will probably give lower overall inequality; for example, the Lorenz curve for 1984 based on our estimates of real expenditures using a spatial CPI (see Appendix 1) lies entirely above the Lorenz curve based on nominal expenditures for that year. It appears that regional price levels tend to be positively correlated with average consumptions. A similar conclusion was reached by van de Walle (1989).
14. For computational convenience we have calculated the Lorenz curves and Gini indices from frequency distributions rather than the unit record

data. The distributions were, however, detailed (51 groups) so the approximations should be quite good. In calculating the Gini indices we have used Gastwirth's formulae for the upper and lower bounds and then used the weighted mean of the two, with two-thirds weight to the upper bound; see Cowell (1977).

15. The $P_{\hat{g}}^{87*}$ and $P_{\hat{g}}^{87**}$ measures are simulated from the parametrized 1984 and 1987 Lorenz curves for urban and rural areas, as discussed in Appendix 2, which also outlines our estimation method for η_0 .

16. This interpretation isn't only strictly valid if the Lorenz curve shifts such that $L^{87}(p) = L^{84}(p) - \lambda[p - L^{84}(p)]$, where $L^t(p)$ denotes the Lorenz curve for date t ; then a decrease in the Gini coefficient will decrease poverty (for a broad class of additive measures) if and only if the poverty line is less than the mean (Kakwani, 1989b). Noting that λ is equal to the proportionate change in the Gini index, the above assumption implies the following national Lorenz curve for 1987 (where $\hat{\lambda} = -.0302$):

p	10	20	30	40	50	60	70	80	90
$L^{\hat{87}}(p)$	3.60	8.50	14.31	21.01	28.64	37.33	47.28	59.05	73.81

Clearly this is quite a good approximation to the actual Lorenz curve for that year (given in the last column of Table 3; the standard error of estimate is 0.23 percentage points), but it is still an approximation.

17. Thus we are considering the second-order effects of changes in distributional parameters on poverty: such effects are often of

interest, though they have received little attention. For related discussion see Ravallion (1988c) and Datt and Ravallion (1989).

18. This assumes that the changes in G are such that the new Lorenz curve is given by $L(p) - \lambda[p - L(p)]$. As noted, this assumption fits the data in Table 4 well (footnote 16). Then $\epsilon_0 = \eta_0(z - \mu)/z$ and $\epsilon_\alpha = \eta_\alpha + \alpha\mu P_{\alpha-1}/(zP_\alpha)$ for $\alpha \geq 1$, and it is readily verified from the following formulae that $\partial\eta_\alpha/\partial G > 0$ (all α) for these data.
19. This was found by Ravallion (1988a) in a study of poverty in East Java based on the 1981 SUSENAS which (unlike 1984 and 1987) spanned an entire year.
20. Though harvests in 1987 were depleted, this occurred after the SUSENAS interviews.
21. For a recent discussion and some evidence for Indonesia see Deaton and Muellbauer (1986).
22. Noting that the distribution of consumption will also depend on how households adjust in their intertemporal behavior.
23. There is some evidence of a systematic bias, whereby the "poor" tend to overestimate food expenditure over a 7 day recall, while the "rich" underestimate it. The turning point (at which there is neither under- or overestimation on average) is such that standard poverty measures for Indonesia will tend to be underestimated, though the magnitude of the error is probably fairly small. For detailed results and an interpretation see (Ravallion 1989b).
24. The index tracks changes in the cost of an average consumption bundle in each of 17 Provincial capital cities; for other capital cities they have used shares for the city amongst the 17 which is considered to be most similar in this respect (usually the closest).

25. Nicholas Prescott pointed this problem out to us in his comments on an earlier version. We considered an alternative deflation method, using the Department of Manpower's "Minimum Physical Requirements Index" (KFM) which is intended to be a cost-of-living index for working households, and is derived independently of the CPI. We studied this index closely, including a discussion with the Department of Manpower officers responsible for the index. For a number of reasons we decided that the index is quite unsuitable for our purposes. Details are available from the authors.
26. For the lower poverty line, the headcount index obtained using the spatial CPI drops from 34.70 percent in 1984 to 23.47 percent in 1987, while for the higher poverty line, the corresponding figures are 58.96 and 47.62. As for the ordinary CPI, first-order dominance holds over the entire range.
27. The study referred to is CBS (1984). For further discussion see Ravallion and van de Walle (1989).
28. Though it may be argued that real consumption "standards" are higher in urban areas, and so a higher real poverty line is called for. This is, in our view, difficult to defend on ethical grounds; we take it as axiomatic here that poverty comparisons should be symmetric, in the sense that the poverty line in terms of real living standards (leaving aside the problems in measuring the latter) should be constant over time and space.
29. See Ravallion and van de Walle (1989). An urban and rural price differential of 10% is also in close accord with Rao's (1984) estimated poverty line differential.

30 Anne Booth has pointed out to us in correspondence that the consumption component of the "Farmers' Terms of Trade Index" (FTT) for Java does suggest a higher inflation rate for rural areas than the CPI or NEC. However, we have found that this is largely due to the very high price increases recorded for vegetables in the FTT for Central and East Java over 1985-86 (see, for example, CBS, 1987 Table 9.4.9). Substitution possibilities in consumption are thought to be relatively high for vegetables (Deaton's, 1989, estimates for Java in 1981 indicate a compensated own price elasticity of about unity), so fixed weight price indices can considerably overstate the welfare effect of such a change in relative prices. It should also be noted that most farmers in Java are (or can readily become) net producers of vegetables, and so they are unlikely to be worse off after such a change in relative prices.

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Table 1: Aggregate Poverty Measures for Alternative Poverty Lines, 1984-87

Poverty measure	Poverty line	Sector	1984	1984 st. error	1987	1987 st. error	Significant difference?* t=	Percentage decline (1984-87)
Headcount index (Z) ($\alpha=0$)	11000	Urban	12.08	0.26	7.32	0.21	14.35	39.40
		Rural	39.43	0.26	26.80	0.23	35.77	32.03
		Total	33.02	0.21	21.65	0.18	40.86	34.39
	15000	Urban	28.04	0.36	21.17	0.33	14.21	24.50
		Rural	64.46	0.26	54.31	0.26	27.50	15.75
		Total	55.91	0.22	45.55	0.22	33.16	18.53
Poverty gap ratio ($\alpha=1$) (Z)	11000	Urban	2.68	0.07	1.25	0.05	17.70	53.36
		Rural	10.32	0.09	5.29	0.06	46.37	48.74
		Total	8.52	0.07	4.22	0.05	51.63	50.47
	15000	Urban	7.31	0.12	4.67	0.09	14.21	36.11
		Rural	21.63	0.12	14.84	0.10	44.30	31.39
		Total	18.27	0.10	12.15	0.08	49.91	33.50
Preferred measure ($\alpha=2$) (x100)	11000	Urban	0.92	0.03	0.33	0.02	15.61	64.13
		Rural	3.86	0.05	1.57	0.02	44.50	59.33
		Total	3.17	0.03	1.24	0.02	49.38	60.88
	15000	Urban	2.78	0.06	1.50	0.04	17.84	46.04
		Rural	9.57	0.07	5.51	0.05	47.20	42.42
		Total	7.97	0.06	4.45	0.04	52.79	44.17

Note: i) Ordinary CPI deflator for the poor used throughout; spatial deflator gives very similar results.

ii) $*t = (P_{\alpha}(1987) - P_{\alpha}(1984)) / \text{se}(P_{\alpha}(1987) - P_{\alpha}(1984))$. All differences between the poverty measures over the two years are statistically significant at the one percent level. (Calculations based on Kakwani's (1989a) standard errors.)

Table 2: Sectoral Decomposition of Aggregate Poverty Alleviation

	Poverty Line	Sectoral Urban	Poverty alleviation due to (%)		
			Gain: Rural	Population Shift	Interaction Effect
Headcount index ($\alpha = 0$)	11000	9.83	84.99	7.05	-2.02
	15000	15.58	74.96	10.30	-0.93
Poverty gap ($\alpha = 1$)	11000	7.81	89.50	5.21	-2.45
	15000	10.13	84.89	6.86	-1.99
Preferred measure ($\alpha = 2$)	11000	7.18	90.78	4.46	-2.58
	15000	8.54	88.25	5.65	-2.31

Note: Urban population shares were .235 in 1984 and .264 in 1987.

Table 3: Lorenz Curves and Gini Coefficients

Poorest p% of pop. p=	<u>Cumulative percentage of total expenditure</u>					
	Urban 1984	Urban 1987	Rural 1984	Rural 1987	Total 1984	Total 1987
10	3.23	3.46	3.77	4.26	3.40	3.78
20	7.88	8.15	8.99	9.81	8.14	8.77
30	13.54	13.84	15.18	16.21	13.82	14.59
40	20.15	20.54	22.25	23.42	20.42	21.20
50	27.76	28.05	30.28	31.46	27.97	28.73
60	36.46	36.74	39.35	40.44	36.62	37.27
70	46.51	46.81	49.65	50.59	46.57	47.10
80	58.38	58.69	61.50	62.25	58.40	58.76
90	73.47	73.58	76.06	76.42	73.31	73.48
Gini	0.333	0.329	0.293	0.277	0.331	0.321

Table 4: Growth, Equity and Poverty Alleviation

Poverty measure	Poverty line	Sector	Poverty alleviation due to:			Elasticity w.r.t. mean consumption 1984 (η_α)
			higher mean* (%)	lower inequality** (%)	residual (%)	
Headcount Index ($\alpha = 0$)	11000	Urban	78.25	18.29	3.46	-3.27
		Rural	82.97	7.72	9.31	-2.00
		Total	86.12	6.43	7.44	-2.05
	15000	Urban	92.95	3.64	3.41	-2.19
		Rural	103.85	-10.65	6.80	-1.18
		Total	100.93	-5.73	4.80	-1.27
Poverty gap ($\alpha = 1$)	11000	Urban	65.81	38.43	-4.24	-3.51
		Rural	69.82	30.23	-0.05	-2.82
		Total	72.82	26.93	0.25	-2.88
	15000	Urban	78.83	20.38	0.79	-2.84
		Rural	80.65	15.40	3.95	-1.98
		Total	83.02	13.85	3.13	-2.06
Preferred measure ($\alpha = 2$)	11000	Urban	56.07	53.63	-9.71	-3.83
		Rural	64.11	43.14	-7.25	-3.35
		Total	66.81	39.93	-6.74	-3.38
	15000	Urban	69.65	33.17	-2.82	-3.26
		Rural	72.35	27.98	-0.33	-2.52
		Total	75.19	25.23	-0.42	-2.58

* $(P_\alpha^{87*} - P_\alpha^{84}) / (P_\alpha^{87} - P_\alpha^{84})$ expressed as a percentage.

** $(P_\alpha^{87**} - P_\alpha^{84}) / (P_\alpha^{87} - P_\alpha^{84})$ expressed as a percentage.

Table 5: Parameters of the Lorenz Curves 1984

	Urban	Rural	Total
$\ln a$	-.4906 (.0089)	-.6053 (.0056)	-.5038 (.0081)
α	.9336 (.0052)	.9184 (.0032)	.9397 (.0047)
β	.5230 (.0052)	.5490 (.0033)	.5131 (.0047)
R^2	.9999	.9999	.9999
SEE	.0056	.0035	.0051
Mean dep. var.	-1.7727	-1.8968	-1.7825
St. dev. dep. var.	.4075	.3898	.4147
LM tests:			
Funct. form ($\chi^2(1)$)	2.444	2.2860	3.9873
Normality ($\chi^2(2)$)	0.5208	.9299	.6934
Heteroscedasticity ($\chi^2(1)$)	0.5838	.1722	.4906

Note: Standard errors in parentheses.

Table 6: Alternative Estimators of the 1984 Lorenz Curve

p	Actual	Kakwani	Kakwani Podder	Elliptical
10	3.40	3.42	3.54	3.52
20	8.14	8.12	7.87	8.15
30	13.82	13.77	13.20	13.77
40	20.42	20.35	19.75	20.36
50	27.97	27.93	27.72	27.95
60	36.62	36.64	37.40	36.64
70	46.57	46.70	49.08	46.65
80	58.40	58.55	63.12	58.43
90	73.31	73.21	79.93	73.18

Table 7: Alternative Estimation Methods for the Density Function at the Poverty Line

Poverty line	Sector	Econometric method		Non-parametric method	
		f(z) x10000	η_0	f(z) x10000	η_0
11000	Urban	0.362	-3.27	0.348	-3.17
	Rural	0.718	-2.00	0.735	-2.05
	Total	0.618	-2.05	0.639	-2.13
15000	Urban	0.413	-2.19	0.410	-2.19
	Rural	0.504	-1.18	0.533	-1.24
	Total	0.472	-1.27	0.501	-1.34

Figure 1

Consumption Distributions

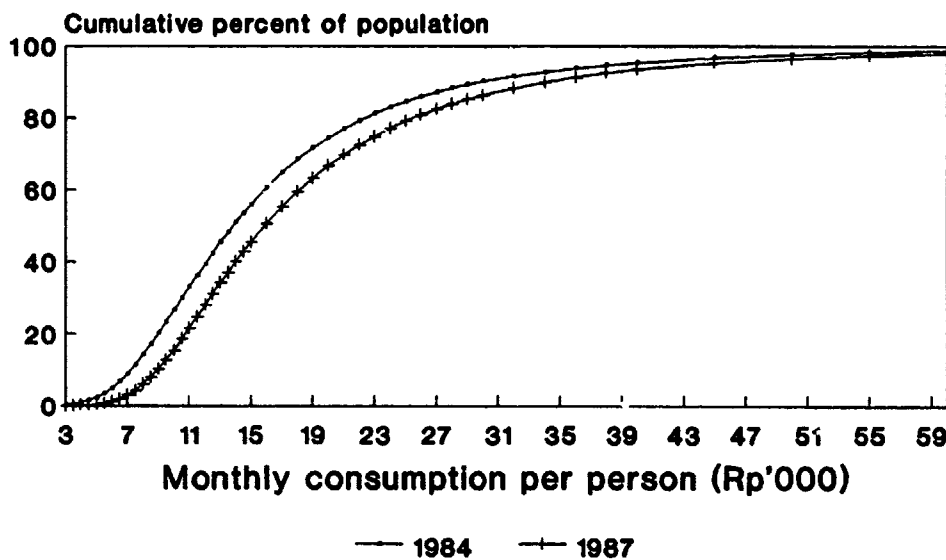


Figure 2

Consumption Densities

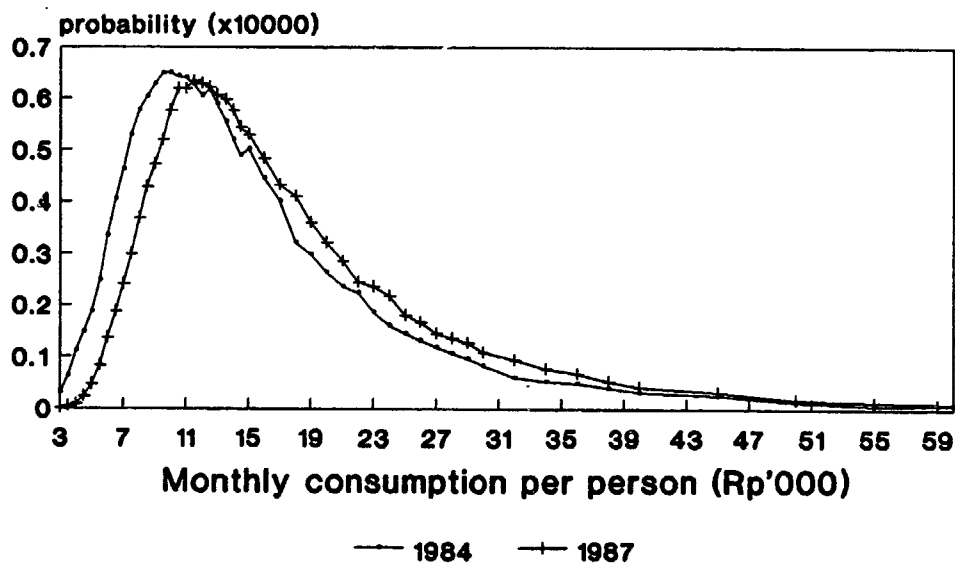


Figure 3 Income Distributions

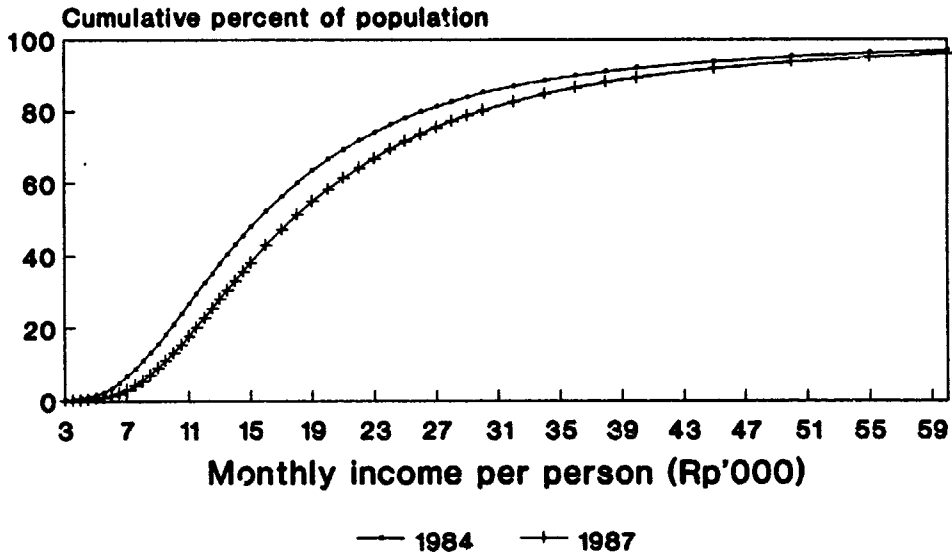


Figure 4 Non-Food Consumption Shares

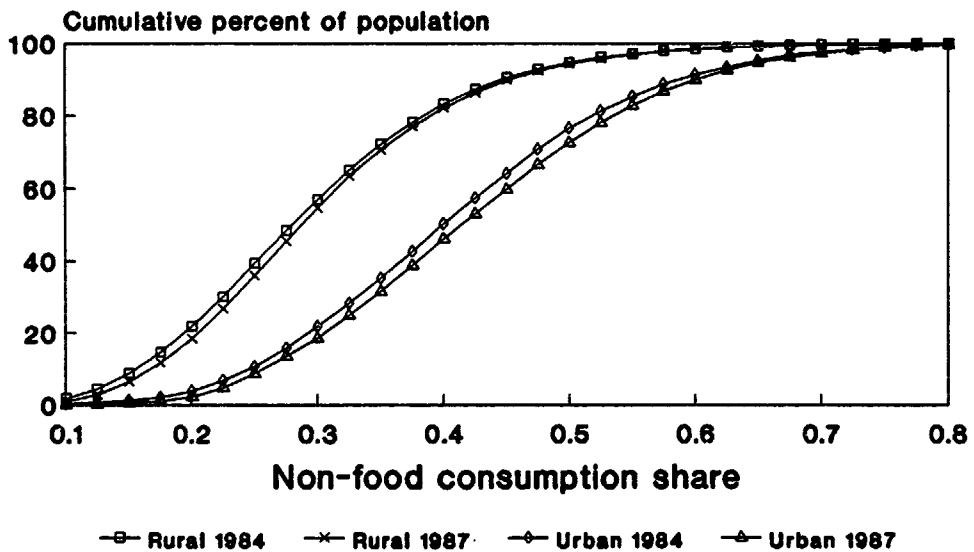
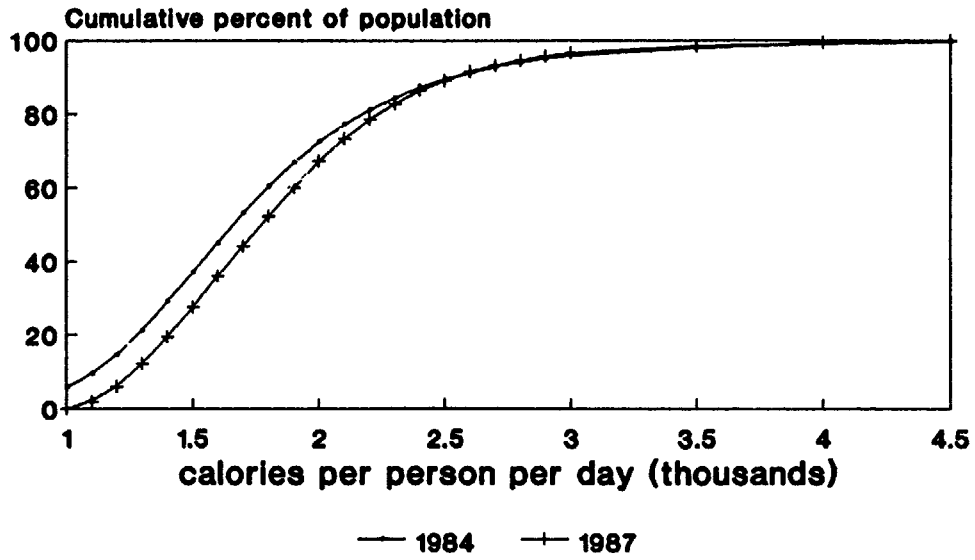


Figure 5

Caloric Intake Distributions



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