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Income Distribution, Informal Safety Nets, and Social Expenditures in Uganda

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Abstract

Inequality in Uganda rose during 1989–95, although this rise moderated in 1993–95. In 1993–95, real food consumption became more equal. Regional and urban–rural disparities in income and variations in income accruing to individuals with different educational levels principally explain "between group inequality." While informal safety nets appear to work for Ugandan middle-class families, a lack of mutual insurance among poor production workers and farmers accentuates the inequality trends. An expansion of formal safety nets would help this segment of the population. The intrasectoral allocation and benefit incidence of expenditures on education and health can be improved to reduce inequality.

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I. INTRODUCTION

Uganda has a long track record of implementing structural adjustment policies. Since 1987, the implementation of policies has been largely uninterrupted, and the country's performance is regarded as a success. Not only has macroeconomic stability been restored, but important structural reforms have been implemented.

This paper does three things. First, it investigates the trends in inequality in Uganda during the period of structural adjustment through 1995 and provides a decomposition of the major determinants of inequality. The paper does not attempt to quantitatively associate the major determinants of inequality with particular aspects of structural adjustment. Second, because structural adjustment can have an adverse effect on poor groups, which may accentuate the inequality trends, this paper provides a simple model of informal safety nets, estimates the extent to which they may be available to poor Ugandans, and discusses whether there is a need for more formal safety nets. Finally, in addition to the provision of short-term safety nets to protect the consumption of the poor and vulnerable, this paper assesses the quality of education and health care expenditures, which has implications for building human capital and promoting a more equal distribution of income over time. This paper hopes to make a useful contribution to the debate on inequality trends during periods of adjustment in Uganda and to help determine whether changes are required in existing policies to address equity concerns.

Structural adjustment aims to ensure that the economy is put on a more sustainable and balanced path of economic growth and adjustment. Structural adjustment has two dimensions: implementing macroeconomic policies aimed at the restoration of internal and external balance in the economy and addressing the structural reforms required to remove constraints and distortions from the resource allocation and growth process and thus reinforce the macroeconomic policies being pursued. Both dimensions of structural adjustment are likely to impact on inequality.

Data on inequality in Uganda is sketchy. Although Gini measures of inequality are available from different sources, detailed household expenditure surveys are more limited. The analyses in this paper relies significantly on an expenditure survey carried out in 1989–90, the 1992/93 integrated household survey (IHS), and two subsequent monitoring surveys (the First Monitoring Survey (FMS) in 1993/94, and the Second Monitoring Survey (SMS) in 1994/95.[2]

In general, the impact of macroeconomic policies on income distribution is of growing interest. However, despite limited empirical work in this area, available cross-sectional analysis does provide some framework for assessing the likely impact of various

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[2]See Appendix 2 for a detailed description of the household expenditure data that were used in this study. Most data in Uganda is reported on a fiscal year basis (July-June).

macroeconomic factors on inequality.[3] Some studies on the distributional effects of adjustment programs have been quite negative in their conclusions.[4] In general, these studies have argued that at least in the short run, structural adjustment programs may worsen income distribution. For example, real expenditure reductions in pursuit of balanced budgets may be achieved by contractions in social expenditures which can worsen income distribution. Gupta, Clements, and Tiongson (1998) find that this is not necessarily true. In a sample of countries with IMF-supported structural adjustment programs, social spending actually increased. Also, to the extent that the adjustment is contractionary, slower growth can lead to rising unemployment, which may worsen inequality.

This paper is organized as follows. Section II reviews the major elements of structural adjustment in Uganda since 1987. Section III provides an analysis and description of trends in income inequalities in Uganda between 1989 and 1995, with available international comparisons. Section IV estimates the availability of informal safety nets in Uganda, and Section V assesses social expenditures, focusing on education and health expenditures. Section VI concludes with an assessment and policy implications.

II. Structural Adjustment Policies in Uganda, 1987–97

Uganda has had a satisfactory track record of adjustment under successive IMF arrangements, including two annual arrangements under the structural adjustment facility (SAF) during 1987–88 and seven annual arrangements under the enhanced structural adjustment facility (ESAF) during 1989–97.[5] Macroeconomic stability has essentially been restored in Uganda. Inflation fell from an average of over 250 percent in 1986/87 to about 8 percent in 1996/97, while real GDP growth averaged 6.5 percent per annum.

In addition to rehabilitating essential infrastructure, important structural reforms were carried out in several areas. The trade and payments system was liberalized; the exchange rate is now market-determined; domestic prices were liberalized, and the monopoly of marketing boards abolished; the financial sector was substantially restructured, and interest rates liberalized; the civil service was cut in half; several state enterprises were privatized or are being reformed; and there was substantial army demobilization. Although the adjustment period under review seems long (10 years), many of these reforms were implemented or strengthened in more recent adjustment programs. For example, the goals of economic stabilization were largely achieved in the more recent adjustment programs starting in 1994/95. Since that time, inflation

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[3]See, e.g., Sarel (1997). Although several studies have considered the relationship between macroeconomic variables and growth, and the link between growth and income distribution, few studies have considered the direct link between macroeconomic factors and income inequality.

[4]For a brief review, see Handa and King (1997).

[5]For a detailed discussion of structural adjustment policies in Uganda, see Sharer, De Zoysa, and McDonald (1995); and Sharer, Schiller, and Ahmad (1994).

fell from an average of 26 percent in 1989/90–1993/94 to 6 percent in 1994/95–1996/97. In addition, several critical reform components in the structural areas occurred in the early 1990s (such as the liberalization of the coffee sector and the adoption of a market-determined exchange rate) or gathered momentum after 1994/95 (such as financial sector reforms and privatization). Therefore, in considering income distribution trends, it should be recognized that there is an inherent difficulty in associating these trends with the particular evolution of various reforms.

III. Income Distribution

Reasonably reliable data on inequality in Uganda are available for 1989/90, 1992/93, 1993/94, and 1994/95. The 1989/90 household expenditure survey was carried out mainly to revise the consumer price index. In 1992/93, the first nationally representative household survey was undertaken to evaluate inequality, poverty, and basic needs. That survey contains much more than just household expenditure data: for example, it covers small-scale establishments and household enterprises. However, the survey suffers from systematic underreporting of expenditures as the design "switched from a detailed list of prompting consumption items bought during the thirty days immediately prior to the interview to an open format expenditure questionnaire with minimum prompting."[6] In 1993/94 and 1994/95, the FMS and SMS were carried out; they provide significantly more details about the characteristics of households, and allow for an analytic decomposition of the determinants of inequality.

A. The Evolution of Inequality, 1989–95

Although the available data on inequality trends represents a subset of the period of structural adjustment (1987–97) under consideration, it nevertheless covers a core period during which many of the adjustment policies were implemented. Table 1 presents Gini coefficients for Uganda in a comparative context for the 1980s and 1990s.[7] In general, higher-income countries have lower levels of inequality; the notable exception is the middle-income countries of Latin America and the Caribbean, which have the highest estimated levels of inequality in the world. Based on this sample of countries, inequality increased in sub-Saharan Africa between the 1980s and the 1990s, where average Gini coefficients rose from 43.5 to 47. Uganda, therefore, compares favorably with this sample of African countries as its average Gini coefficient for the 1990s is estimated at 43.3. In particular, Uganda's distribution of income compares favorably with the available data for eastern and southern

[6]See World Bank (1996a, p. 88).

[7]From Deininger and Squire (1996).

Table 1. Decadal Average of Gini Coefficients by Region and Country Groups: 1980s and 1990s 1/

	1980s	1990s
Eastern Europe	25.1	28.9
Industrial and High-Income Developing Countries	33.2	33.8
East Asia/Pacific	38.7	38.1
South Asia	35.0	31.9
Middle East/North Africa	40.5	38.0
Latin America and the Caribbean	43.5	47.0
Sub-Saharan Africa	49.8	49.3
Uganda	33.0	43.3

Source: Deininger and Squire (1996).
1/ Gini coefficients multiplied by 100.

African countries. For example, in 1992, the Gini coefficient for Kenya was estimated at 54.4; in 1990, for Zimbabwe, it was estimated at 56.8.[8]

The published Gini coefficients for Uganda indicate that income inequality increased between 1989/90 and 1994/95,[9] when the Gini coefficient increased from 33.0 to 44.0 (Table 2). On the basis of consistent income and expenditure measures, inequality rose fastest between 1989/90 and 1992/93. Using the expenditure measures, the Gini coefficient rose from 33.0 to 40.8 for this period, whereas between 1992/93 and 1994/95, the Gini coefficient rose from

[8]Ibid.

[9]It should be noted that for 1989/90, the Gini coefficient is based on an expenditure survey, whereas for the more recent years, the data is based on income surveys. Typically, capital assets or savings are accumulated to smooth consumption or expenditures. Thus, there is likely to be more variability in measured income than in expenditures, which may be reinforced by underreporting. It is also more likely that the distribution of capital assets would be more skewed as higher-income groups have greater access to financial and other markets. As a result, expenditure surveys will tend to underestimate the accumulation and distribution of capital assets, resulting in lower Gini coefficients. In addition, because expenditure is a function of disposable income, then assuming a progressive tax system, inequality will tend to be higher when gross incomes are used as the measure of inequality. Thus the significant rise in inequality in the data between 1989/90 and 1992/93 is partly due to the shift from expenditure to income surveys. Irrespective of the methodology used to measure inequality, there is a clear trend of rising inequality between 1989 and 1995.

Table 2. Uganda: Distribution of Income, 1989–95

Year	Gini Coefficient 1/	Share of Bottom 20 Percent	Share of Top 20 Percent
1989/90 2/	33.0	8.5	41.9
1992/93 2/	40.8	6.7	48.1
1992/93 3/	43.0	6.3	46.3
1993/94 3/	43.0	6.2	48.9
1994/95 3/	44.0	6.4	49.3

Sources: Chen, Shaohua, Datt, and Ravallion (1994); World Bank (1996b); and Uganda (1997).
1/ Gini coefficient times 100.
2/ Based on distribution of expenditure by person.
3/ Based on household income.

43.0 to 44.0, using the income estimates. The trend in the earlier period is supported by an observation of income shares. In 1989/90, the bottom 20 percent accounted for 8.5 percent of total income, whereas the top 20 percent accounted for 41.9 percent of total income. By 1992/93, the respective shares of the bottom and top 20 percent were 6.7 percent and 48.1 percent. Between 1992/93 and 1994/95, the share of the bottom 20 percent rose marginally (based on the income estimates), while the share of the top 20 percent rose from 46.3 percent to 49.3 percent.

Tables 3 and 4 present inequality measures for urban and rural areas. Again, it is evident that the distribution of income worsened dramatically in urban areas in the period 1989/90–1992/93, with the Gini coefficient increasing from 37.3 to 43.9, based on expenditure estimates. Between 1992/93 and 1994/95, inequality actually declined from 48.0 to 46.0 using a consistent measure of incomes. These aggregate Gini coefficients, however, mask changes in income shares, where, during the same period, that of the bottom 20 percent fell from 6.4 percent to 5.5 percent, and that of the top 20 percent rose from 44.3 percent to 46.8 percent. Inequality in rural areas tell a somewhat different story. Inequality fell between 1989/90–1992/93, and then again between 1992/93–1993/94, before increasing between 1993/94–1994/95. The income shares of both the bottom 20 percent and top 20 percent increased between 1992/93 and 1994/95.An interesting issue to analyze is whether income distribution *between* rural and urban areas worsened over the period.

Table 3. Uganda: Distribution of Income in Urban Areas, 1989–95

Year	Gini Coefficient 1/	Share of Bottom 20 Percent	Share of Top 20 Percent
1989/90 2/	37.3	...	...
1992/93 2/	43.9	...	...
1992/93 3/	48.0	6.4	44.3
1993/94 3/	45.0	5.9	47.7
1994/95 3/	46.0	5.5	46.8

Sources: Deininger and Squire (1996); Uganda (1997).
1/ Gini coefficient times 100.
2/ Based on distribution of expenditure by person.
3/ Based on household income distribution.

Table 4. Uganda: Distribution of Income in Rural Areas, 1989–95

Year	Gini Coefficient 1/	Share of Bottom 20 Percent	Share of Top 20 Percent
1989/90 2/	36.4	...	...
1992/93 2/	34.4	7.2	...
1992/93 3/	39.0	7.6	41.7
1993/94 3/	36.0	7.7	41.2
1994/95 3/	39.0	5.5	42.9

Sources: Deininger and Squire (1996); Uganda (1997).
1/ Gini coefficient times 100.
2/ Based on distribution of expenditure by person.
3/ Based on household income distribution.

Overall, rural incomes deteriorated as a percentage of urban incomes between 1992/93 and 1994/95.[10] In 1992/93, average incomes in rural areas were approximately 45 percent of urban incomes, but by 1994/95, this ratio worsened to 39 percent. The picture is even more dramatic with respect to the top 20 percent of income earners in both rural and urban areas. The ratio of average rural incomes of the top 20 percent of income earners to the average incomes of the top 20 percent of income earners in urban areas decreased from 47 percent in 1992/93 to 27 percent in 1994/95. However, in the bottom 20 percent of income groups, there has been some narrowing of incomes between rural and urban areas, as evidenced by the increase in the ratio of average rural incomes to average urban incomes from 47 percent in 1992/93 to 49 percent in 1994/95. This suggests that there has been some decline in relative hard-core poverty between rural and urban areas, and is supported by movements in poverty indexes over the period. It is estimated that in 1992/93, 42 percent of the rural population lived below the poverty line; by 1994/95, this ratio had dropped to 34 percent. In urban areas, the respective ratios were 8 percent in 1992/93 and 7 percent in 1994/95.[11] Although this seems a convincing argument in favor of the rural poor, this information also suggests that lower income groups in urban areas may have disproportionately borne the costs of structural adjustment.[12]

B. Decomposition of Inequality Measures

The decomposition of inequality measures is important so as to identify the possible sources or "causes" of inequality. For policymakers, the "causes" of inequality should serve as a guide for the future focus and nature of policy initiatives. The explanation of inequality is, however, limited by the household characteristics provided in the household surveys. The monitoring surveys of 1993/94 and 1994/95 provide sufficient information to allow for a more rigorous analysis of inequality in Uganda. Not only do the surveys provide a large number of observations, they also provide information on important household characteristics such as education, occupation, and regional and urban/rural location. From this data, the Gini coefficients and alternative measures of inequality are constructed for real food consumption and real income. These measures are then decomposed, based on available household characteristics.

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[10]Author's calculations from Uganda (1997).

[11]The poverty line is drawn at two-thirds of mean per capita expenditure using adult equivalence scales. Mean per capita expenditure from the household survey of 1992/93 is used to obtain poverty lines for the monitoring surveys in 1993/94 and 1994/95, but these were adjusted for price changes between these periods.

[12]Yet another approach could be used to indicate the possible widening of the gap between urban and rural incomes. According to the 1991 census in Uganda, approximately 89 percent of the population lived in rural areas. If the Gini coefficients in rural and urban areas are weighted by the relative population sizes, and a weighted average of these two values are taken, then the difference between urban and rural incomes is evidenced by the smaller value of this average compared to the national Gini coefficient. Between 1989 and 1995, the difference between the weighted average of rural and urban Gini coefficients and the national coefficient widened from 14.8 percentage points to 23.7 percentage points.

Let y_i, $i = 1 \cdots n$, be the income or consumption of individual i and μ be the mean of the observations. The Gini Coefficient is defined by,

$$G = \frac{1}{2n^2\mu}\sum_{i=1}^{n}\sum_{j=1}^{n}\left|y_i - y_j\right| .$$

Note that the Gini takes differences over **all** pairs of incomes, i and j and therefore avoids the total concentration on differences vis-à-vis the mean of the distribution.

The Gini belongs to the generalized entropy (probabilistic) class of inequality indices defined by,

$$E(\alpha) = \frac{1}{\alpha^2 - \alpha}\left[\frac{1}{n}\sum_{i=1}^{n}\left(\frac{y_i}{\mu}\right)^{\alpha} - 1\right]$$

where, $\alpha \geq 0$.

This general formula for the parametric class of inequality indices satisfies a number of desirable properties, such as symmetry, population replication, income scale invariance, and decomposability. Three other measures of this class that provide useful comparisons because of their varying sensitivities to different parts of a distribution are as follows:[13] E(0) is the mean log deviation, and can be expressed as,

$$E(0) = \frac{1}{n}\sum_{i=1}^{n}\log\left(\frac{\mu(y)}{y_i}\right).$$

E(1) is called the Theil index, and is defined as,

$$E(1) = \frac{1}{n}\sum_{i=1}^{n}\frac{y_i}{\mu(y)}\log\left(\frac{y_i}{\mu(y)}\right)$$

and $E(2)$ is half of the square of the coefficient of variation,

$$E(2) = \frac{1}{2n\mu(y)^2}\sum_{i=1}^{n}\left[y_i - \mu(y)\right]^2.$$

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[13]For a discussion of the desirable properties of these measures and their derivation, see Cowell (1995).

The Gini coefficient is sensitive to consumption (income) around the mean, in that transferring income between individuals close to the center of the distribution has a larger effect on G than making such transfers at the extreme ends of the distribution. On the other hand, E(0) considers only the level of log difference of consumption or income from the mean, and is sensitive to consumption (income) at the bottom of the distribution. E(2) takes into account the variability of these differences, and is sensitive to higher consumption or income, whereas the Theil index is constructed for constant responsiveness across all ranges of the distribution. The inequality measures can be decomposed into two components: one that captures the inequality between groups into which the population is partitioned and one that captures within-group inequality. The share of total inequality accounted for by the between-group components can be interpreted as the share of inequality "explained" by the particular attributes that defines the partitions.

Cowell (1995) shows that overall inequality, E, can be written as the sum of the within-group components, E_W, and the between-group components, E_B:

$$E = E_W + E_B \ .$$

Let f_j be the population share of the subgroup, $j = 1,....k$, and v_j be the income share of subgroup j. Define the within-group population weights as $w_j = v_j^{\alpha} f_j^{1-\alpha}$, then the within-group component E_W can be written as

$$E_W = \sum_{j=1}^{k} w_j E_j \ .$$

The between-group component E_B is defined as

$$E_B = \frac{1}{\alpha^2 - \alpha}\left[f_j \left(\frac{\mu_j}{\mu} \right)^{\alpha} - 1 \right] .$$

The share of inequality explained by a partition is calculated as

$$R = \frac{E_B}{E} \ .$$

In the decomposition exercise that follows, the focus is on between-group inequality. The partitions are defined by education, occupation, region and urban/rural distinctions. For the three measures—E(0), E(1) and E(2)—Table 5 shows the fraction of inequality that can be "explained" by the given characteristics or partitions in the available household data for 1993/94 and 1994/95. Although the Gini coefficient as measured by real food consumption shows a 4.1 percent improvement in inequality in 1994/95 over 1993/94, the Gini coefficient as measured by real income exhibits a 6.5 percent rise in inequality, which is consistent with the trend in the previously reported Gini coefficients. All the entropy class of measures, based on real food consumption as well as real income, show a rise or no change in inequality, except E(0) based on real food consumption.

An interesting and more consistent technique of monitoring welfare changes over time is stochastic dominance analysis.[14] It is carried out by plotting the cumulative distribution functions of income or expenditure. In the analysis, first-order stochastic dominance and Lorenz dominance (mean-normalized second-order stochastic dominance) are applied. Distribution function A is said to display first-order stochastic dominance over distribution B, if A lies nowhere above and somewhere below B. In this case, any social welfare function that is individualistic and increasing in income will record an unambiguously higher level of social welfare in A than in B, regardless of its particular distributional judgements. On the other hand, distribution function A dominates distribution function B, if the Lorenz curve for A lies nowhere below and somewhere above that for B. In this case, inequality is lower in distribution A than in distribution B for any inequality measure that satisfies the transfer principle, which requires an increase/decrease in inequality in response to a transfer in income from a poorer/richer to a richer/poorer person.

Table 6 provides results of the stochastic dominance analysis as measured by real food consumption and real income for 1993/94 and 1994/95. As shown, 1994/95 Lorenz dominates that of 1993/94 using real food consumption, indicating that in 1994/95, there was a general improvement in the equality of food consumption.

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[14]See Cowell (1995), for a discussion and the proofs of the theorems of stochastic dominance.

Table 5. Inequality Indices and Decomposition

	Real Food Consumption				Real Income			
	Gini	E (0)	E (1)	E (2)	Gini	E (0)	E (1)	E (2)
1993/94								
Total	0.419	0.301	0.330	0.616	0.403	0.278	0.343	0.776
Decomposition								
Education	n.a.	0.090	0.094	0.045	n.a.	0.188	0.203	0.073
Occupation	n.a.	0.081	0.082	0.038	n.a.	0.104	0.103	0.034
Region	n.a.	0.292	0.312	0.168	n.a.	0.174	0.184	0.071
Urban/rural	n.a.	0.100	0.100	0.050	n.a.	0.101	0.101	0.037
1994/95								
Total	0.402	0.272	0.343	0.776	0.429	0.315	0.440	0.776
Decomposition								
Education	n.a.	0.136	0.143	0.095	n.a.	0.235	0.255	0.554
Occupation	n.a.	0.073	0.072	0.044	n.a.	0.105	0.105	0.021
Region	n.a.	0.222	0.231	0.160	n.a.	0.176	0.184	0.042
Urban/rural	n.a.	0.124	0.125	0.082	n.a.	0.119	0.119	0.026

Sources: Authors' calculation from household survey data.

Figure 1 displays the Lorenz curves on which these statistically significant dominance results are based. The figure indicates that the improvement in inequality comes from the middle 20–75 percentile of the population, as represented by a relatively wider gap between the curves of the two distributions over this range. This could have been inferred from the E(0) measure for real food consumption, which is more sensitive to the lower part of the distribution. However, there is minimal improvement at the lowest and highest/uppermost ends of the distribution. In terms of real income, 1993/94 Lorenz dominates 1994/95 (Figure 2). However, despite this rise in inequality of incomes, 1994/95 displays first-order stochastic dominance over 1993/94, showing an increase in social welfare in 1994/95 (Figure 3). This improvement in welfare can probably be explained by Uganda's high growth rate.

Table 6. Stochastic Dominance Analysis

	1993/94		1994/95	
	Food	Income	Food	Income
1993/94				
Real food				LD
Real income				
1994/95				
Real food	LD			
Real income		FSD		

Sources: Authors' calculation from household survey data.
Note: LD is Lorenz dominance; FSD is first-order stochastic dominance.

As is shown in Table 5, in 1993/94, the explanatory power of the various characteristics (or partitions) added together is highest for E(1), accounting for 58.8 percent with respect to real food consumption and 59.1 percent with respect to real income, and lowest for E(2), accounting for 30.1 percent based on real food consumption and 21.5 percent based on real income. For both E(0) and E(1), the explanatory power of the characteristics increases in 1994/95 with respect to real income.

Looking at individual characteristics, region is the most important source of inequality followed by education and urban/rural location. Occupation, however, explains little of the inequality in 1993/94 or in 1994/95. For E(0), region explains 29.2 percent of the inequality based on real food consumption and 17.4 percent based on real income in 1993/94, and education explains 9 percent using real food consumption and 18.8 percent using real income in 1994/95. The explanatory power of region and education for E(0) increases in 1994/95, with the exception of the estimate based on real food consumption. The explanatory power of the various partitions is similar for E(1). For both E(0) and E(1), the explanatory power of urban/rural location is in the range of 10 percent to 12.5 percent for both years. In conclusion, spatial disparities across regions and urban/rural locations and the dispersion in returns accruing to different education levels are found to be the most important variables in explaining the observed income inequality in Uganda for the period under analysis. A key implication of these findings for public policy is that government expenditure policy should aim to positively influence these variables if a reduction in inequality trends in Uganda is to be

Figure 1. Real Food Consumption Lorenz Curves, 1993/94 and 1994/95

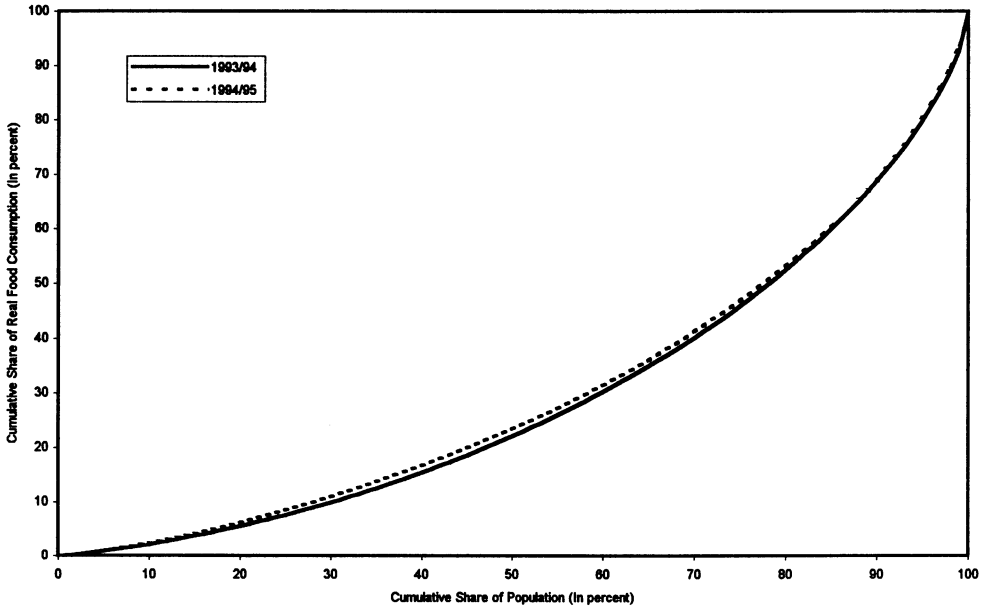


Figure 2. Real Income Lorenz Curves, 1993/94 and 1994/95

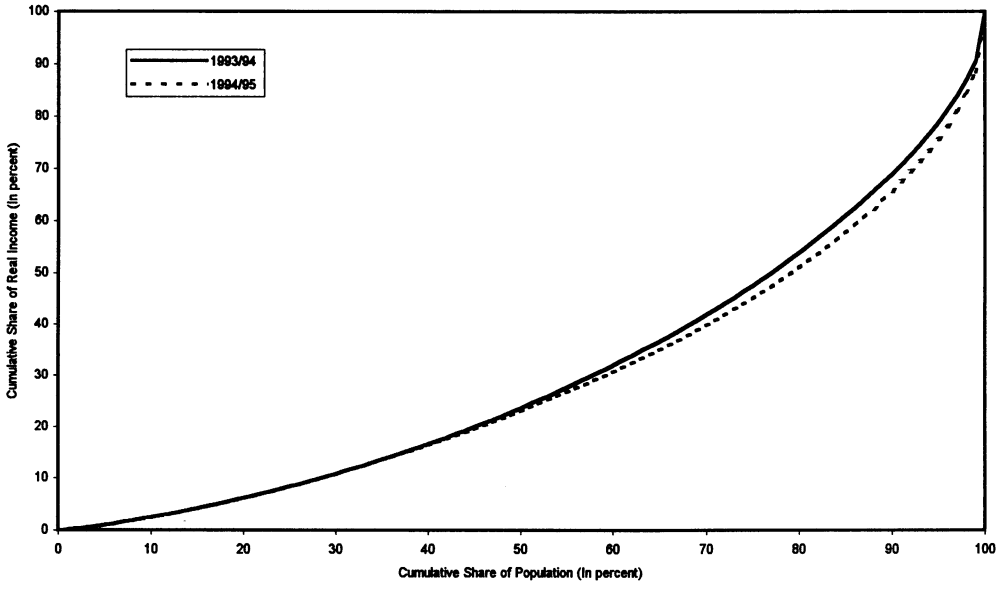
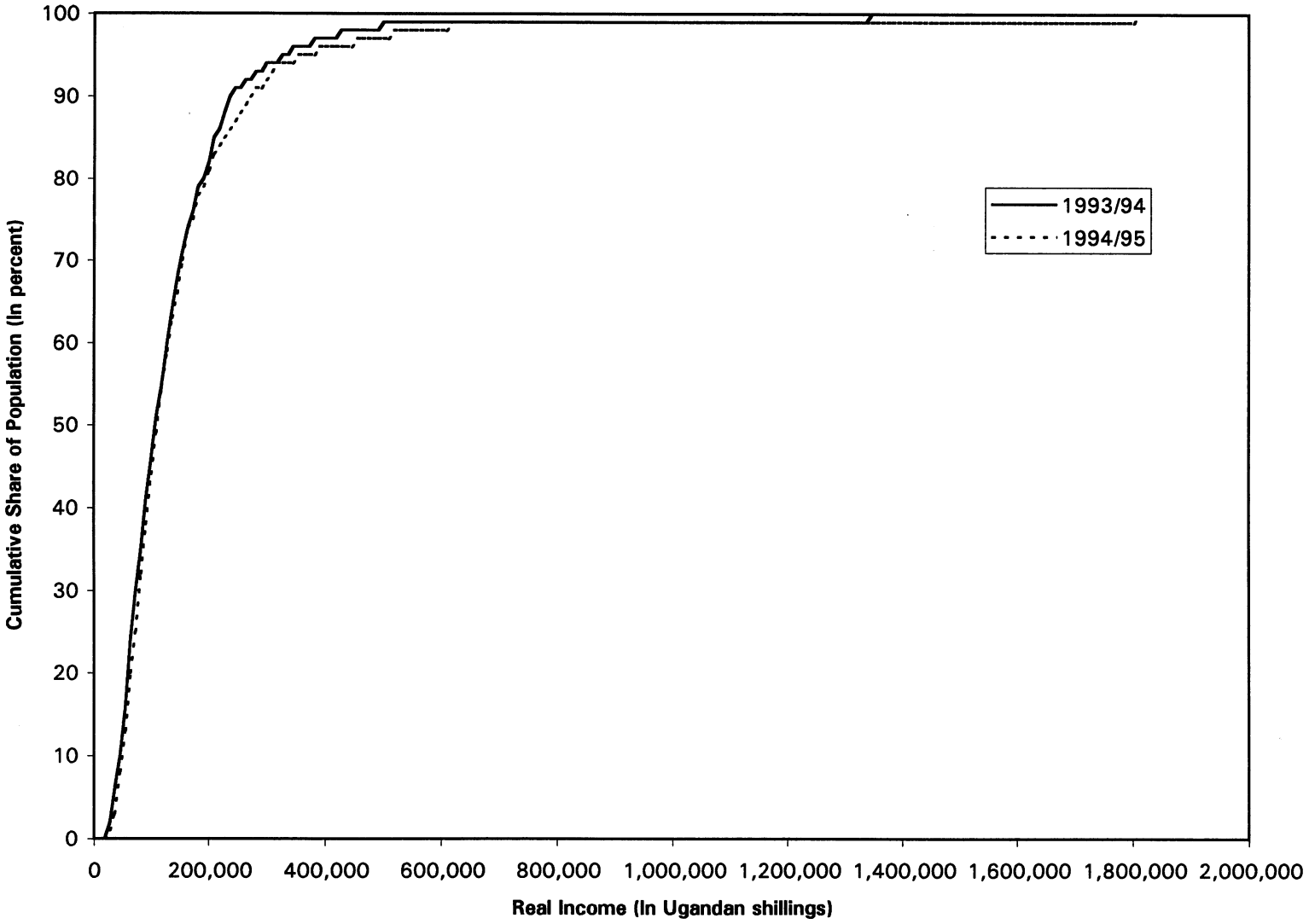


Figure 3. Cumulative Distribution Functions, 1993/94 and 1994/95



achieved. The impact of spacial disparities and urban/rural location on inequality may be due, for example, to insufficient investments in basic infrastructure, such as roads, education facilities, and public health. The links between the provision of basic infrastructure and poverty and equity are well documented (see, e.g., World Bank, 1994). Public expenditures on infrastructure should, therefore, aim to minimize these geographical disparities. Given the importance of educational levels in determining inequality, government expenditure policy should also focus on increasing the efficiency of these expenditures (see Section V).

An obvious question arises: What are the effects of various structural adjustment reforms on the identified sources of inequality—namely, region, educational levels, and urban/rural location? A rigorous quantitative analysis of this issue is outside the scope of this paper, however; and, in any event, such an analysis would require significantly more data than are presently available. This could be a subject of future research.

IV. Informal Safety Nets

In this section, the existence of informal mutual insurance in Uganda is assessed. This issue is considered in light of the possible adverse effects that structural adjustment policies can have on the poor and vulnerable. If vulnerable groups are unable to protect their real consumption as a result of these adverse effects or because of temporary shocks, inequality trends may be accentuated. If informal social safety nets are insufficient, then governments may want to consider complementing these informal mechanisms with formal safety nets, paying due attention to preventing distortions or the introduction of disincentives to the operation of labor markets. The objective of this section is to determine whether such a case can be made for strengthened government intervention to protect the incomes and consumption of specific groups in the society during a period of structural adjustment, thus preventing a worsening of inequality.

The formal safety nets and social insurance in Uganda during the adjustment period can be described as follows. The Ministry of Labor and Social Welfare is responsible for assisting the vulnerable, the Ministry of Local Government for general community development, disabled people, and foreign refugees. The government, however, allocates little money for this purpose, hence the ministries cannot deliver the help to the needy (World Bank, 1993). Consequently, a large number of nongovernment organizations (NGOs) operate in Uganda to provide social safety net services to such groups. NGOs, however, tend to concentrate on selected vulnerable groups and certain localities: for example, 90 percent of Uganda's disabled receive no assistance (World Bank, 1993).

As part of the civil service reform program that began in 1988/89, the government, with the help of donors, provide some safety nets in the form of retrenchment packages, which include counseling, retraining, and an entrepreneurship reemployment program. In 1992/93 and 1993/94, Uganda demobilized a total of 33,000 soldiers. With donor support, the

demobilization program included a social safety net package, that provided all demobilized soldiers with a financial package to assist in their rehabilitation and reintegration into society.

The government provides pension services for retired civil servants and the army. Public spending for pension purpose ranged from 0.3 percent to 2.8 percent of the recurrent public expenditures for the period 1989/90 to 1993/94, averaging 0.9 percent for the entire period (Uganda, 1997). However, the country's pension system covers only a small portion of the population: civil servants numbered 156,694 in 1995 and 159,517 in 1997—less than 1 percent of the population. There is also a small provident fund called the National Social Security Fund (NSSF), which covers qualified private sector employees.

Uganda, like many developing countries, lacks an extensive formal social security system. However, in developing countries, informal and traditional social security arrangements are widely recognized, and can play an important role in protecting the vulnerable.[15] [16] Uganda might not need to establish more formal social safety nets if the informal ones provided sufficient insurance to the population. A government with a severe budget constraint like Uganda's, should provide the formal social security system as a complement to the existing traditional arrangements.[17]

A. Evaluation of the Existing Informal Social Safety Net

The common approach to evaluating an existing informal social safety net is to compare its performance to the perfect insurance system. In an ideal situation, the shocks specific to a household would be insured perfectly; consumption would be uninsured only if a whole village or region were struck by unavoidable shocks, such as bad weather or a collapse in crop prices. Under a mutual insurance system, the consumption of each household would be insensitive to own income; it would depend only on the aggregate consumption level of the

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[15]See Fafchamps (1992); and Platteau (1989).

[16]Townsend (1995) found that people in rural villages in Thailand tend to smooth their consumption more than those in urban areas. The evidence of a well-functioning informal financial system is also documented for Indian villages (Townsend, 1994). Similar tests conducted by Mace (1991) and Cochrane (1991) show that this is not the case for the United States. See Udry (1994), for the study on Nigeria.

[17]See the discussion in Chu and Gupta (1998).

village. Townsend (1994) shows that the degree of such a mutual insurance system can be evaluated by the following regression analysis,[18]

$$c_i - C = \alpha_i + \beta y_i + \gamma A_i + u_i, \quad (1)$$

where subscript i denotes each household, c_i is the consumption of each household, C is the average of c_i in the community, y_i is the income of each household, A_i is the demographic term, and u_i is the disturbance term.

If the informal risk-sharing system is working well, consumption of a household would depend only on aggregate consumption but not on its own income. In equation (1), this implies the coefficient of own income would be zero,[19]

$$\beta = 0. \quad (2)$$

The economy would have a perfect insurance system, if (2) were true.

B. Estimation Results

The cross-sectional data of the FMS are used after several considerations.[20] The FMS collected data from around 5,000 households in fiscal year 1993/94. Table 7 shows the regression results over all households in Uganda and in four regions. The full risk-sharing hypothesis is rejected in all regions. The existing informal safety net is not perfect in any region or in Uganda as a whole, yet only 4.6 percent of the deviation of the consumption from the community average is explained by the fluctuation of own income as a whole. It is 5.7 percent in the central region, where the capital is located and the greatest urbanization exists.

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[18]Townsend (1994) shows that the test for risk-sharing among households is the test for the Pareto optimality of the allocation of consumption. In the decentralized economy, the welfare theorems suggest that the Pareto optimal allocation coincides with the allocation in the competitive equilibrium with complete security markets. Because Uganda lacks formal complete security markets, the test actually examines how the informal risk-sharing system works.

[19]Equation (2) is the null hypothesis.

[20]See the detailed discussion in Appendix 2.

Table 7. Estimated Coefficient of Income, by Region

Total	Central	Eastern	Western	Northern
0.0459	0.0564	0.0229	0.0334	0.0438
(0.0091)	(0.0088)	(0.0096)	(0.0082)	(0.0108)

Note: All numbers are significantly different from zero.

Next, the regression is conducted using the distinct data from each decile of consumption.[21] This provides information on who—rich or poor—suffers from the lack of mutual insurance. The results are shown in Table 8 and Figure 4. The results suggest that the middle classes enjoy perfect mutual insurance, whereas the poor are isolated from the informal social safety net. The rich are likely to prefer independence. In particular, the coefficients of the income of the households in the fourth, fifth, and sixth deciles support the null hypothesis, that is, their consumption does not depend on their own income at all and the insurance system is perfect

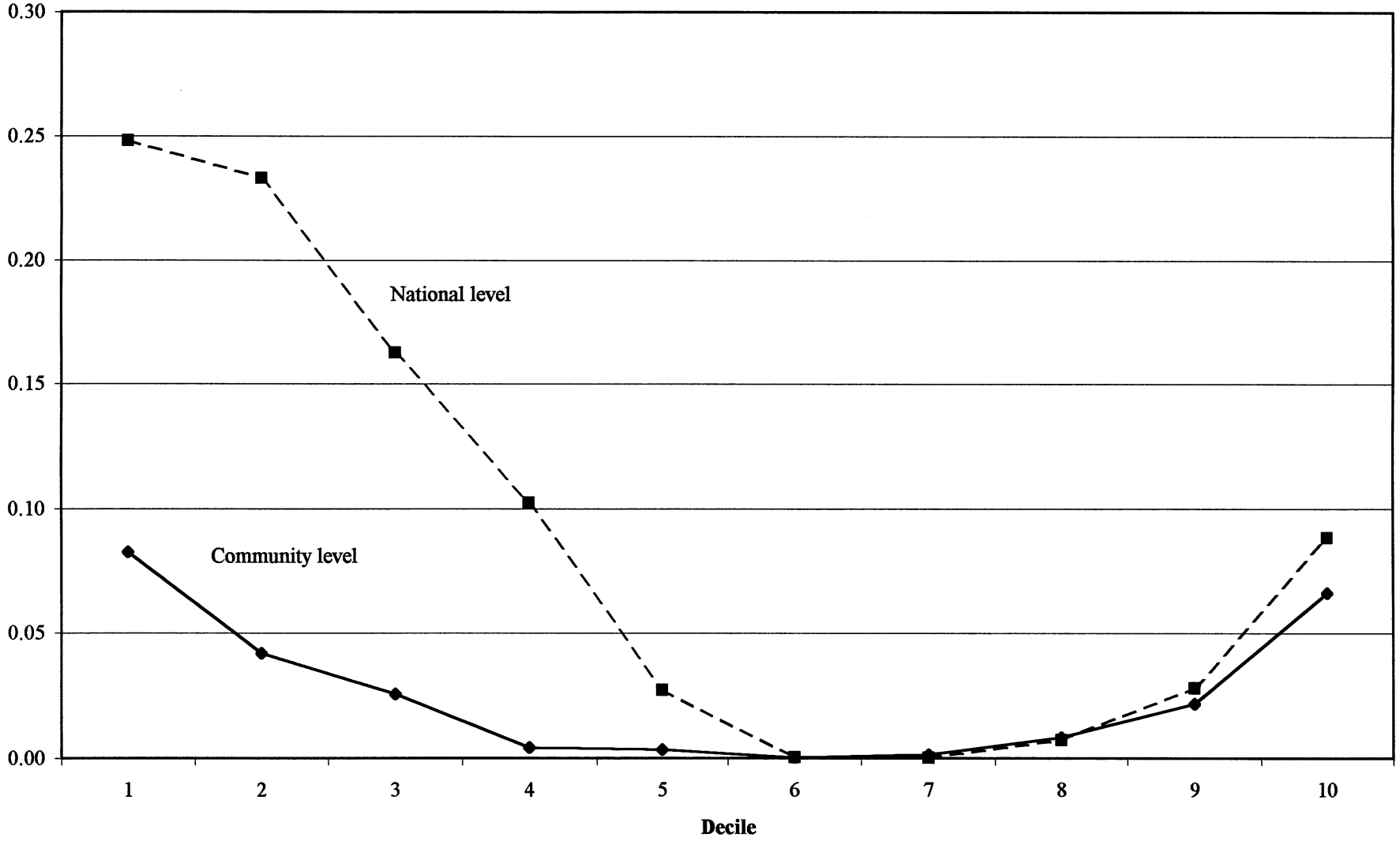
Table 8. Estimated Coefficient of Income by Decile at the Community Level

Subgroup	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10
Total	0.0826	0.0419	0.0257	0.0043	0.0034	0.0002	0.0013	0.0083	0.0218	0.661
	(0.0285)	(0.0091)	(0.0059)	(0.0041)	(0.0025)	(0.0007)	(0.0003)	(0.0016)	(0.0026)	(0.0117)
Memorandum items:										
Urban	0.0792	0.0349	0.0141	0.0012	0.0015	-0.0005	0.0010	0.0042	0.0166	0.0650
	(0.0284)	(0.0094)	(0.0063)	(0.0028)	(0.0030)	(0.0007)	(0.0002)	(0.0021)	(0.0025)	(0.0118)
Rural	0.1879	0.0918	0.0552	0.0337	0.0062	0.0029	0.0039	0.0172	0.0399	0.0728
	(0.0289)	(0.0190)	(0.0134)	(0.0087)	(0.0045)	(0.0019)	(0.0014)	(0.0037)	(0.0074)	(0.0208)

Note: Deciles are based on the community-differenced consumption.

[21]After solving the problem associated with the social weights, the remaining problem is the assumption of the constant absolute risk-aversion among households (see the detailed discussion in Appendices 1 and 2). The parameter can be allowed to vary by exploiting the information from a large number of communities.

Figure 4. Coefficient of Income by Decile at Community and National Levels



for them. Moreover, the coefficients in the seventh and eighth deciles are very small, although they are significantly different from zero, which indicates that their consumption is almost independent of their own income.[22]

This result supports the casual observation reported in Chu and Gupta (1998): in Africa, being poor is often synonymous with having no family or friends. Table 9 is the result of the regressions using the data from occupation subgroups. Production workers suffer most from the lack of mutual insurance. In particular, poor production workers are highly sensitive to their own risk. Poor farmers seem to follow them. The lower and middle classes of professionals and service workers benefit the most from the informal mutual insurance system.

Table 9. Estimated Coefficient of Income by Occupation and Decile

Subgroup	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10
Professional	0.0546	0.0351	0.0169	0.0141	0.0064	0.0021	-0.0005	0.0068	0.0196	0.0564
	(0.0331)	(0.0124)	(0.0088)	(0.0049)	(0.0045)	(0.0016)	(0.0017)	(0.0030)	(0.0042)	(0.0094)
Service worker	0.1101	0.0273	0.0214	-0.0019	0.0045	-0.0018	0.0024	0.0072	0.0229	0.1041
	(0.0209)	(0.0138)	(0.0109)	(0.0011)	(0.0054)	(0.0011)	(0.0007)	(0.0017)	(0.0037)	(0.0205)
Agriculture	0.1670	0.1060	0.0480	0.0345	0.0058	0.0042	0.0037	0.0153	0.0226	0.0308
	(0.0174)	(0.0322)	(0.0131)	(0.0106)	(0.0050)	(0.0023)	(0.0017)	(0.0049)	(0.0136)	(0.0204)
Production worker	0.1934	0.0630	0.0321	0.0545	-0.0057	-0.0021	0.0010	0.0126	0.0309	0.2222
	(0.0402)	(0.0312)	(0.0185)	(0.0082)	(0.0041)	(0.0010)	(0.0001)	(0.0057)	(0.0100)	(0.0762)

Note: Deciles are based on community-differenced consumption.

[22]Note that the sensitivity of consumption to own income in lower deciles may be a result of measurement errors of the population of crops (see the discussion in Appendix 2). These problems can be seen in the regression results in subgroups of occupations. The consumption levels of the lower-middle and the lower classes of farmers depend significantly on their own income. This result is not quite believable because even the richest farmers participate in the mutual insurance system in their communities. This biased estimation probably comes from measurement errors of crop production. It may explain why the lower-income classes in rural areas are less likely to be insured than those in urban areas.

The across-community insurance system is considered in Table 10 (and shown in Figure 4). So far, it is assumed that the communities are the risk-sharing units. If Uganda as a whole is treated as a risk-sharing unit, the difference between the performance under the mutual insurance system and under the former assumption can be checked. The estimation using the variables of deviation from the community mean and the estimation using the variables of deviation from the national mean can be compared. The difference of consumption sensitivity to own income indicates the across-community performance of mutual insurance. The results indicate that the national-level coefficients of consumption to own income are higher than those of the community level in almost all deciles. This implies that communities are not well linked. And, the poor suffer most from this missing link.

Table 10. Estimated Coefficients of Income at the Community and National Levels

Subgroup	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10
Community deviation	0.0826	0.0419	0.0257	0.0043	0.0034	0.0002	0.00135	0.0083	0.0218	0.0661
	(0.0285)	(0.0091)	(0.0059)	(0.0041)	(0.0025)	(0.0007)	(0.0003)	(0.0016)	(0.0026)	(0.0117)
National deviation	0.2483	0.2330	0.1627	0.1024	0.0272	-0.0004	0.0002	0.0073	0.0281	0.0883
	(0.0147)	(0.0263)	(0.0107)	(0.0071)	(0.0032)	(0.0016)	(0.0003)	(0.0022)	(0.0043)	(0.0128)

From the above analysis, it can be concluded that informal mutual insurance at the community level is working well in Ugandan middle-class families. An apparent lack of informal mutual insurance is observed among poor production workers and poor farmers. The rich tend to be independent. The existing informal social safety net is not at the first best level if the across-community allocation of risk is considered. Communities seem isolated from each other. And the poor suffer most from this isolation.

These results imply that the government should take into account the existing informal safety nets when establishing broad formal social safety nets. In this regard, it is more critical to target the poor production workers and poor agricultural workers in each community. At the same time, the government should consider policies to strengthen the links among communities. As an example, public investment in basic infrastructure, such as roads, can reduce the isolation of communities.

V. Social Expenditures

In the previous sections, the authors analyzed inequality trends in Uganda, provided a decomposition of the major determinants of inequality, and estimated the availability of informal safety nets to various segments of the population. In the decomposition exercise of the inequality measures, it was concluded that education was one of the critical determinants of inequality. Although social safety nets can protect the incomes and consumption of vulnerable groups in the short run during an adjustment phase, long-run inequality trends may be more influenced by social expenditures. It is for this reason that the authors now focus on trends in spending on education and health care in Uganda.

Aggregate public expenditure in Uganda which averages 17 percent of GDP for the period 1989/90–1996/97 is low compared to sub-Saharan Africa's standard (Table 11). The relatively low level of aggregate public expenditure in Uganda has been partly attributed to a weak domestic revenue effort (Sharer, de Zoysa, and McDonald, 1995). Budgetary allocations to social sectors have been relatively small but efforts have been made in recent years to allow for higher social spending. Uganda's public expenditure on education and health was less than 1½ percent of GDP until 1993/94, but increased considerably in the following two years.

A. Education

Government expenditure on education averaged 1.5 percent of GDP during the period 1989/90–1996/97.[23] It increased rapidly in the last three years under review, reaching 2.5 percent of GDP in 1996/97.[24]

Public spending on the education sector in Uganda is inefficiently allocated and targeted. There is room for the government to use its resources in more efficient and equitable ways to minimize poverty and income inequality. Government spending per student is skewed toward beneficiaries at the upper levels of the education system (Table 12). The ratio of public spending per student allocated to university and teacher training to primary education was 184:42:1, on average, for 1989/90–91/92, which compares unfavorably to the average in sub-Saharan Africa. Moreover, the poorest (bottom quintile) benefit less from public spending than the richest, and the disparity worsens with increasing level of the education

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[23]Includes recurrent spending only. The limited data coverage is partly due to difficulties in separating donor-financed capital spending by function.

[24]In both primary and secondary schools, government funding for education has been supplemented by contributions from parents through parent–teacher associations, and through tuition payments. Private sector contribution has been significant though has declined over time. Since 1997, the government has been implementing a universal primary education program (UPE), whereby the government will bear all the tuition costs and some of the material costs for up to four children per family.

Table 11. Social Spending in Uganda, 1989/90–1996/97 1/
(Current spending only; in units as indicated)

	1989/90	1990/91	1991/92	1992/93	1993/94	1994/95	1995/96	1996/97
				(In percent of GDP)				
Uganda								
Education	1.1	1.2	0.5	1.2	1.1	2.1	1.9	2.5
Health	0.3	0.4	0.2	0.4	0.4	0.8	0.9	0.7
				(In percent of total spending)				
Education	8.3	7.5	2.2	6.9	7.0	12.4	11.5	14.6
Health	2.6	2.4	0.8	2.5	2.8	4.8	5.7	4.2
Memorandum items:								
Sub-Saharan Africa 2/				(In percent of GDP)				
Education	3.2	3.1	3.0	3.3	3.3	4.0	3.3	3.2
Health	1.1	1.0	1.0	1.1	1.1	1.5	1.1	0.8
				(In percent of total spending)				
Education	13.7	14.0	13.2	12.5	12.4	16.0	12.6	13.8
Health	4.8	4.7	4.4	4.2	4.2	5.3	4.0	3.9
				(In percent of GDP)				
Total government expenditures	12.1	15.1	21.2	18.6	19.3	16.7	16.2	17.2
Other social expenditures	0.4	0.3	2.5	0.2	0.3	0.3	0.2	0.2

Sources: Ugandan authorities; and IMF staff estimates.

1/ All data in Table 11 refer to current expenditures, except for "total government expenditures" which comprise both current and capital expenditures. The limited data coverage of social spending in Uganda is partly due to difficulties in separating donor-financed capital spending by function.

2/ Includes nine countries. The sample size varies slightly over time, subject to availability of data. It includes both calendar and fiscal year data.

system. For example, 19 percent of the poorest and 18 percent of the richest, 4 percent of the poorest and 49 percent of the richest, and 6 percent of the poorest and 47 percent of the richest benefit from public spending on primary, secondary, and tertiary education, respectively (Bogetić and Matovu, 1998). Children in the bottom expenditure quartile join disproportionately government financed and/or managed schools, whereas both nonprofit and commercially run primary schools have their students from better-off families (World Bank, 1996b).

Table 12. Central Government Current Expenditure Per Student, by Education Level

	1989/90	1990/91	1991/92
Ratio (to primary)			
Primary	1	1	1
Secondary	5	6	3
Teacher education	65	59	25
University	215	225	157

Sources: World Bank, 1993.

B. Health

Government expenditure on health averaged 0.5 percent of GDP during the period 1989/90–1996/97.[25] Government health facilities at all levels have increasingly resorted to informal charges for drugs, meals, consultations, treatments, and operations, and since 1989, districts have been officially allowed to set user fees for their health services (Ablo and Reinikka, 1998).

Public spending on health is also beset with inefficiencies and imperfect targeting. It is skewed toward curative services, with preventive and public health measures absorbing a relatively small proportion of the budget. For example, the share for curative health care in the total health care recurrent budget averaged between 60 percent and 65 percent between 1994/95 and 1996/97 (see Table 13). Meanwhile, the share for preventive health was in the range of 1–2 percent. The analysis of the incidence of public spending based on the 1992/93 IHS indicates that the bottom expenditure quartile (the poor) make about as much use of public outpatient facilities as the top expenditure quartile (the rich), implying that benefits from government subsidies to these facilities is enjoyed as much by the rich as the poor (World Bank, 1996b).

[25]Data refers to current expenditures only.

Table 13. Intrasectoral Allocation of Central Government Spending in Health
(In percent)

	1994/95	1995/96	1996/97
Recurrent expenditure	100	100	100
Of which: wage by sector	12	13	16
Preventive 1/	1	2	2
Curative 2/	61	65	60
Others 3/	38	34	38

Sources: Background to the budget (1998).
1/ Comprises district primary health care and district health training schools.
2/ Comprises Mulago Hospital, Butabika Hospital, district hospitals, and district medical services.
3/ Comprises Ministry of Health and district lunch allowance.

C. Social Indicators

Developments in Uganda's education and health indicators, relative to other countries, have been mixed (Table 14). The illiteracy rate, for example, fell by an average of 2.6 percent a year, compared with an average drop of 3.5 percent in 49 countries with IMF-supported programs and 2.4 percent in 15 sub-Saharan countries with IMF-supported programs. Life expectancy at birth has deteriorated in the latter part of the 1990s. The under-five infant mortality rate has also fallen in this period, but at a lower rate than in other sub-Saharan countries with IMF programs.

These only modest improvements in social indicators, relative to other countries, have to be seen against the background of rather large increases in social spending in Uganda in the second half of the 1990s. Government spending on education, on average, has increased by 12.1 percent in real per capita terms in these years. This exceeds the growth rates in all countries with an IMF program as well as in Sub-Saharan countries with an IMF program by a large margin (Table 15). The same picture emerges with regard to health spending.

Although social indicators are influenced by a host of factors other than government expenditures, substantial increases in public spending on education and health care in Uganda have coincided with improvements in education and health indicators that in many areas lag those experienced in other countries. This reinforces the point made earlier that more attention needs to be paid to the efficiency and targeting of spending on education and health.

Table 14. Improvement in Social Indicators Under IMF-Supported Programs, 1985–97

(Average annual percent improvement since the start of the program; number of countries in parentheses)

		All Program Countries					
	Uganda 1/	All		Sub-Saharan Africa		ESAF	
Education							
Illiteracy rate 2/	2.6	3.5	(49)	2.4	(15)	2.2	(21)
Female	2.4	3.5	(49)	2.3	(15)	2.1	(21)
Gross primary school enrollment rate	0.1	0.8	(55)	0.6	(15)	1.0	(25)
Female	0.1	0.8	(52)	1.1	(14)	1.1	(24)
Male	–0.1	0.7	(52)	1.0	(14)	0.9	(24)
Gross secondary school enrollment rate	1.8	1.1	(53)	1.2	(14)	0.8	(24)
Female	2.1	1.9	(49)	3.1	(14)	2.3	(23)
Male	1.7	0.6	(49)	0.3	(14)	0.2	(23)
Net primary school enrollment rate	. . .	0.7	(31)	0.1	(10)	0.6	(17)
Persistence to Grade 5	. . .	1.7	(23)	2.3	(9)	2.0	(11)
Health care							
Life expectancy (in years)	–1.3	0.2	(45)	–0.1	(13)	0.2	(25)
Infant mortality rate 2/	1.5	2.5	(48)	1.0	(14)	1.5	(25)
Under-5 mortality rate 2/	0.3	3.7	(29)	0.8	(8)	2.9	(14)
Births attended by skilled staff	0.0	1.8	(37)	1.7	(9)	3.2	(18)
Contraceptive prevalence	16.8	3.1	(14)	6.9	(3)	5.6	(5)
Access to health care	. . .	3.7	(13)	6.6	(5)	11.2	(3)
Percent immunized under age 12 months							
DPT	12.6	4.8	(61)	5.7	(15)	6.9	(29)
Measles	11.1	4.4	(60)	4.3	(14)	6.1	(28)
Other basic services							
Access to safe water	12.8	2.9	(41)	4.2	(12)	4.2	(19)
Access to sanitation	22.7	4.4	(37)	2.7	(10)	6.7	(17)

Sources: Gupta and others (forthcoming); and World Bank, World Development Indicators 1998 and 1999 database.

1/ Compares the earliest available data with the most recent data between 1985 and 1997.

2/ The annual percent improvement in illiteracy, infant mortality, and under-5 mortality rates refers to a decline in these rates. An annual percent improvement of 3.4 in illiteracy, for example, means that illiteracy rates fell by 3.5 percent per year.

Table 15. Government Spending on Education and Health Under IMF-Supported Programs 1/

	Number of Countries	Mean Changes Between Preprogram Year and Latest Year (Median changes in parentheses)					
		Annual Percent Growth in Real Per Capita Spending		In Percent of GDP		In Percent of Total Government Expenditure	
Education							
Uganda 1/		12.1		1.6		6.5	
All program countries	65	2.4	(1.6)	0.3	(0.1)	2.2	(1.9)
Of which:							
Sub-Saharan Africa	18	1.0	(1.1)	0.4	(0.3)	1.8	(2.0)
ESAF countries	31	4.0	(3.7)	0.5	(0.5)	2.8	(2.3)
Health							
Uganda 1/		11.8		0.4		1.6	
All program countries	65	2.5	(1.0)	0.3	(0.0)	1.4	(1.1)
Of which:							
Sub-Saharan Africa	18	4.4	(2.1)	0.8	(0.2)	2.5	(1.5)
ESAF countries	31	4.9	(2.3)	0.5	(0.2)	2.1	(1.4)

Sources: Gupta and others (forthcoming); Ugandan authorities; and IMF staff estimates.

1/ Includes current spending only. Because of insufficient data, the analysis compares the earliest available data (1989/90), instead of preprogram data, with the latest available data (1997/98).

VI. Conclusion and Policy Implications

In this paper, the trends and sources of income inequality in Uganda were analyzed against the background of structural adjustment. The paper also assessed the extent to which informal safety nets adequately protect the consumption of various income groups. Finally, the paper assessed social expenditures. Although inequality, as measured by Gini coefficients, compares favorably with other sub-Saharan African countries in the region, it has risen over the adjustment period 1989–95. However, this increase moderated in the 1993–95 period, and by the authors' estimates, real food consumption actually became more equal in this period.

Regional and rural/urban disparities in income and variations in income accruing to different educational levels are found to be the most important variables in explaining the between-group inequality, accounting for more than half of the variations. The estimation of informal mutual insurance from available household data suggests that informal safety nets appear to be working well in Ugandan middle-class families; however, poor production workers and poor farmers lack informal mutual insurance. Across communities, there appears to be little informal mutual insurance, and the poor suffer most from this isolation.

Although public social spending in Uganda has risen considerably in recent years, the improvements in education and health indicators in many areas lag behind those experienced in other countries. Public spending on education is inefficiently allocated and imperfectly targeted. It is skewed toward beneficiaries at the upper level of the education system. Health care is also characterized by inefficiencies and imperfect targeting, and a disproportionate allocation of public funds to preventive as against primary health care.

Policy implications

To reduce poverty and income inequality and hence enhance the welfare of Ugandans, the following policy proposals could be considered:

- Increase basic public infrastructural expenditures, such as on roads, sanitation, education, and health facilities, in underdeveloped regions and in rural areas to reduce spacial disparities. The provision of basic infrastructure, such as roads, can also increase linkages among communities, which would thus increase the effectiveness of informal social safety nets in allocating across-community risks.

- Increase the provision of formal social safety nets to protect the most vulnerable groups of the population, particularly agricultural and production workers who have insufficient informal mutual insurance. In this regard, the government should also focus on providing policy guidance and on coordinating and monitoring NGO activities, to ensure delivery of standardized services, and avoid duplication and unequal provision of these services.

- Augment public allocation of funds to basic social services (e.g., education and health), with special emphasis on those areas where the private sector cannot be primarily involved.

- Improve the efficiency and targeting of the system for channeling public funds to schools, health care facilities, and hence to the ultimate beneficiaries. Pay particular attention to the development of local government capacities, given that increasing levels of social expenditure are taking place at this level of government.

- Restructure the allocation of funds in favor of primary education, and introduce cost-sharing programs and student loans for higher education. The government has recognized the importance of primary education and included it as a priority area in its poverty alleviation strategy; accordingly, it has already increased public spending on primary education through the UPE program. However, the government should take appropriate steps to improve participation of females in education.

- Restructure public expenditures in favor of preventive and primary health care, and introduce cost-recovery for curative health services.

- Direct more resources to the poorest regions, as this is the best way to target the poorest and reduce inequality.

THEORY AND THE TEST EQUATION FOR INFORMAL SAFETY NETS

In this appendix, the authors follow Townsend (1994) to derive the test equation for informal safety nets.

Let $U^i(C^{i,k}_{j,t}, A^{i,k}_{j,t})$ denote the instantaneous utility function of person k in household i in community j at period t, where A denotes an age/sex index. Let h_t denote the history of state or shock at period t. Given the discount factor δ, the expected utility of each individual at the initial date can be written as

$$\sum_{t=1}^{\infty} \delta^t \sum_{h_t} prob(h_t) U^i(C^{i,k}_{j,t}(h_t), A^{i,k}_{j,t}) . \tag{1}$$

Let λ_k denote the social weight for individual k, and assume the same weight for each member in the same household. The social planning problem within community j is the maximization of the sum of the weighted average of utilities in community j:

$$\sum_{k=1}^{N} \lambda_k \sum_{t=1}^{\infty} \delta^t \sum_{h_t} prob(h_t) U^i(C^{i,k}_{j,t}(h_t), A^{i,k}_{j,t}) \tag{2}$$

subject to the resource constraint for the community j and for each history h_t

$$\sum_{k=1}^{N} C^{i,k}_{j,t}(h_t) \le \overline{C}_t(h_t) . \tag{3}$$

By construction, this gives us the Pareto optimal allocation of consumption in each possible state h_t. Moreover, the welfare theorems assure that the solution of the social planning problem gives the same allocation as in the competitive equilibrium in the decentralized economy.

The first-order conditions imply that the weighted marginal utility of consumption in each state of each person is equated to the common Lagrange multiplier associated with the common resource constraint (3). That is, at each date and in each possible state, the weighted marginal utilities are equal across all persons.

$$\lambda_k U^i_C(C^{i,k}_{j,t}(h_t), A^{i,k}_{j,t}) = \mu(h_t) . \tag{4}$$

Note that consumption of each individual becomes independent of individual shocks. It depends only on the aggregate shock to the community.

For simplicity, the authors take the specific utility function:

$$U^i(C_{j,t}^{i,k}, A_{j,t}^{i,k}) = -\frac{1}{\sigma_i}\exp\left[-\sigma_i \frac{C_{j,t}^{i,k}}{A_{j,t}^{i,k}}\right]. \tag{5}$$

The same amount of food is assumed to give different utilities to people if their ages and sex are different. This is based on the fact that children and women need fewer calories to survive than adult males. Note that the utility function exhibits constant absolute risk-aversion with the parameter σ. Absolute risk-aversion is not usually considered as a constant over consumption level, and the authors take this into account in the estimation.

Suppose σ is constant over households in the same community. By adding the first-order conditions over individuals in community *j* in any period *t*, the authors get

$$\hat{c}_i - \hat{C} = \alpha_i + \gamma \hat{A}_i + u_i \tag{6}$$

where

$$\hat{c}_i = \frac{\sum_{k=1}^{Ni} C^{i,k}}{\sum_{k=1}^{Ni} A^{i,k}} \tag{7}$$

$$\hat{C} = \frac{1}{N}\sum_{l=1}^{N} \hat{c}_i \tag{8}$$

$$\alpha_i = \frac{1}{\sigma}\left[\log(\lambda_i) - \frac{1}{N}\sum_{l=1}^{N}\log(\lambda_l)\right] \tag{9}$$

$$\gamma = -\frac{1}{\sigma} \tag{10}$$

$$\hat{A}_i = \left[\frac{\sum_{k=1}^{Ni} A^{i,k} \log(A^{i,k})}{\sum_{k=1}^{N_i} A^{i,k}} - \frac{1}{N} \sum_{l=1}^{N} \frac{\sum_{k=1}^{Ni} A^{i,k} \log(A^{i,k})}{\sum_{k=1}^{N_i} A^{i,k}} \right]. \tag{11}$$

Note that if current income, X, is included, then equation (6) becomes the test equation in Section IV. If the risk-aversion parameter varies over household, then both the constant and slope in the test equation varies. These coefficients can be estimated if good panel data are available. Unfortunately, this is not the case for Uganda.

PROBLEMS AND ESTIMATION STRATEGIES ASSOCIATED WITH THE DATA

The 1992/93 integrated household survey represented the first complete household survey. Nonetheless, this survey lacked key information on household characteristics because of collection mishandling or data storage. Moreover, some questions in that survey differ from those in more recent surveys, so some variables cannot be easily compared.[26] The authors therefore focus on the FMS of 1993/94 and the SMS of 1994/95.[27]

The FMS and the SMS together contain around 5,000 observations averaging about 10 observations in each community. Households in these surveys are partially overlapped to form the panel data. However, only 710 observations in total are available and thus cannot be used for the community-level investigation. The authors conducted only cross-sectional estimations using the 1993/94 survey.

Consumption is reported for each item such as bananas and potatoes. For each item, sources are also reported; that is, whether purchased, from household stock, or received as gifts. Ideally, the authors need the quantity of items consumed. However, the measurements of quantity are rarely reported in objective units (such as grams or pounds) but rather in vague terms (such as "bunches of bananas" or "some potatoes"). Fortunately, field workers recorded the monetary value of these items. The authors used this value.

Because values are reported in terms of money, the authors had to adjust the regional price differences. And because the visiting date to each household varied over several months, it was necessary to adjust the seasonal price fluctuation. Moreover, the value of self-consumption is recorded using the farm gate price, which is different from the market price, thus, this had to be adjusted too. The authors followed Appleton (1998) to adjust these price differences.

Adult/male indices are also taken from Appleton (1998), which originally came from the joint paper of FAO/WHO/UNU (1985). This index is needed to calculate the variables in the test equation (1). Income data consist of wage, entrepreneurial income, income from capital and transfers. For the paper's purposes, transfers should not be included as household income. Instead, the income before any transfers was used.

Although consumption data included those from household stocks, the income data included only monetary profit from agricultural activities. Ideally, the gross production output from each household's plots is needed, but such data are not available. Consumption from

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[26]See Appleton (1998), for a discussion of these issues.

[27]A 1995/96 survey has recently been completed but because of the need to complete the processing of the data, it cannot as yet be used for econometric work.

household stocks as a proxy is included for output from each farm. Income from own production should contribute quite a large portion of the income of the middle- and lower-class households in the rural area. Hence the main variability of income is eliminated by taking the consumption from the household stock as a proxy for output from its plots. It is expected that the sensitivity of consumption to income from these households will be over-biased.

Because only cross-sectional data are available, the household-specific fixed effect term α_i, which is really the log deviation of the social weight λ_i in the community, cannot be estimated. Here, the authors took a different approach from that of Townsend (1994). Theory suggests that the social weights are the initial endowment points. Income from capital is taken as a proxy for the physical capital endowment. Many households, however, did not report any income from capital. In such an economy, the human capital is more important than the physical capital. The authors computed the shadow value of education by a simple regression over total households and created the proxy for human capital. The proxy of the initial endowment of each household is obtained by adding both the physical and human capital. Normalization within each community gave the proxy for the social weight λ_i.

Now the test equation is as follows

$$c_i - C = \alpha z_i + \beta y_i + u_i \tag{1}$$

where

$$z_i = \left[\log(\lambda_i) - \frac{1}{N} \sum_{l=1}^{N} \log(\lambda_l) \right] - \hat{A}_i \tag{2}$$

$$\alpha = \frac{1}{\sigma} . \tag{3}$$

As in equation (2) in Section IV, $\beta = 0$ is the null hypothesis. Note that the theory suggests that any variables in the test equation other than those specified in equation (8) in Appendix I should not be included.

The authors might have conducted the test in each community. However, only 10 observations in each community are available;[28] 457 communities are available. Note that both the right-hand-side and the left-hand-side variables are deviations from the community average. This allows the formulation of panel-like data across communities, because the fixed effect of each community is removed.

[28]Some communities in large towns contain 30 observations.

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