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Poverty and Inequality During Structural Adjustment in Rural Tanzania

M. Luisa Ferreira

Growth attributed to structural adjustment has benefited the population generally, shifting a significant portion of the population from below the poverty line to above it. Only that smaller fraction of the population with extremely low incomes was unable to benefit from the economy's improved performance — probably because the liberalization process that encouraged growth rewarded those with education, excluding from benefits those with little education.

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Summary findings

Ferreira measures structural adjustment's impact on growth and on the poor in Tanzania. Adjustment reforms have contributed to robust growth. The rural average per capita income in 1991 was, in real terms, significantly higher than in 1983. The Economic Recovery Program, launched in 1986, has positively affected income, although the increase is not yet reflected in such basic social indicators as infant mortality rates or levels of primary schooling.

Structural adjustment appears to have benefited many poor households. The population living in poverty declined from 65 percent in 1983 to 51 percent in 1991. The population near the poverty line benefited the most, while those with extremely low incomes appear to have become somewhat poorer. Increases in the inequality of income distribution eroded some of the potential for poverty reduction that would have otherwise resulted from growth.

In both years, the stock of human capital was low for the poor, as measured by educational achievement. Possibly the lower incidence but greater severity of poverty is attributable to a liberalization process that rewards those with education, who are better able to respond to new opportunities. This suggests the importance of improving the quantity and quality of education to increase the ability of the poor to benefit from market reforms. Targeting human capital investments to the very poor should be a high priority during adjustment.

This paper — a product of the Transition Economics Division, Policy Research Department — is part of a larger effort in the department to study the social effects of transition. Copies of the paper are available free from the World Bank, 1818 H Street NW, Washington, DC 20433. Please contact Helen Taddese, room J4-200, telephone 202-473-1086, fax 202-473-8299, Internet address htaddese@worldbank.org. August 1996. (50 pages)

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M. Luisa Ferreira

Washington, D.C.

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Executive Summary

Background

1. At the time of independence, in 1961, Tanzania was considered one of the poorest countries in the world. Dependent on subsistence agriculture, the country had only a very incipient industrial basis. Between the mid-1970's and early 1980's, inadequate policies and various external factors contributed to macroeconomic imbalances, economic stagnation, and a sharp decline in per capita income and the standard of living.

2. Possibly the most important cause of the economic decline was inordinate and inflexible state control over the economy which resulted in a stifling of economic activity, widespread deterioration of the country's infrastructure, and a regression to barter trade on parallel markets at the height of the economic crisis in 1982 and 1983. In 1982 high inflation and shortages of goods led the Government to introduce a "homegrown" structural adjustment program. Nevertheless, it was not until 1986 that significant adjustment reforms were undertaken. The First Economic Recovery Program launched by the Government of Tanzania and supported by the IMF and the World Bank, introduced reforms--e.g.,import liberalization, restrictive monetary policy, active exchange policy--which have contributed to sound economic growth in recent years.

3. During the last decade, one of the most important economic debates worldwide has centered around the impact of structural adjustment programs on the poor. The reforms outlined above may have influenced both the amount and structure of poverty in Tanzania. Nevertheless, to date, very few quantitative studies on the effects of the structural adjustment programs on poverty and income distribution have been undertaken. As the literature on the impact of adjustment has often indicated, in-depth empirical research holds the greatest promise for strengthening the understanding of the process by which macro-economic changes are transmitted to the household level.

4. In Tanzania two household budget surveys (1983 and 1991/92)[1] provide an opportunity to evaluate the evolution of living standards during the period in which structural adjustment programs were implemented, albeit the household data available for this study only allow comparison among the rural areas in Tanzania. Although limited to the rural population, an analysis of the data is justified by the fact that the rural population comprises about 70 percent of the population in Mainland Tanzania, and poverty is mainly a rural phenomenon in Tanzania. Given the nature of the available data, the study focuses on **what** happened during adjustment, rather than **why** it happened.

Temporal Evolution of Poverty in Rural Tanzania

5. Households were ranked by their level of income--estimated to be the sum of the remuneration of all productive assets owned by the household, i.e., labor, land, and capital, plus transfer income from other households--deflated by the number of adult equivalents in the household. This approach considers that families of different size and composition have different needs. People were classified as **poor** if they lived in households earning less than Tsh 3,053 per year per adult equivalent in 1983, or less than Tsh 15,030 per adult equivalent in 1991. This poverty line is defined in Purchasing Power Parity terms and corresponds to a line of one dollar per day. People were classified as very poor if they live in households earning less than Tsh 2,269 per year per adult equivalent in 1983, or less than Tsh 11,171 per adult equivalent in 1991. This poverty line, also defined in Purchasing Power Parity, corresponds to a poverty line of 75 cents a day.

Table 1: Evolution of Poverty: 1983 and 1991

	1983	1991
Head Count (Incidence)	64.6	50.5
Poverty Gap Index (Depth)	35.8	34.2
Average Shortfall Income (at current prices)*	5,389	5,143
Total Poverty Gap in 1991 Tsh (billions of Tsh)	55.2	63.2
Total Poverty Gap in billions of US dollars**	1.21	0.314

Head Count = Percent of the population falling below the poverty line.
Poverty Gap Index = Percent of poverty line income required to bring everyone below it up to the poverty line.
* Average shortfall income is the poverty line minus the average income of those below the poverty line
** Using current prices and exchange rates

6. Table 1 shows the extent of poverty--in 1983 and 1991--in the rural areas of Tanzania. Clearly

[1] The **1983 Rural Household Survey**--conducted in September 1983--covered 498 households in the rural areas of Kilimanjaro, Dodoma, Iringa, and Ruvuma. The 1991/92 survey covered 1047 households, of which 477 were in the rural areas of Tanzania.

we are less likely to find a household whose income is below the poverty line in 1991 than in 1983. In 1983, 65 percent of rural Tanzanians lived below the poverty line, versus only 50.5 percent in 1991. This corresponds to a 30 percent reduction in poverty—enough to reduce the population living in poverty from 10.8 million to 9.7 million over the period; and corresponds to approximately 10 percent fewer people living in poverty. Over the same period, the number of better off rose from 5.7 to 9.5 million. This corresponds to approximately 40 percent more people living in households whose incomes are above the poverty line (see Figure 1).

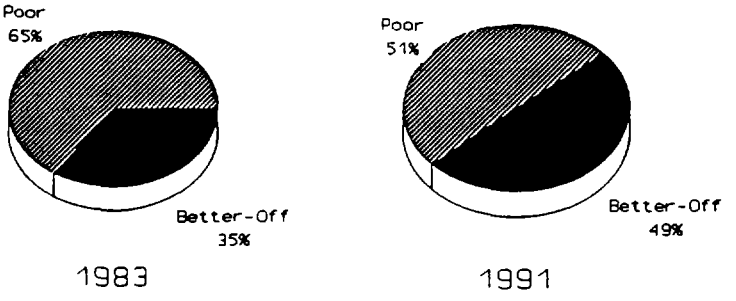

Figure 1: Poverty in 1983 and in 1991

7. Depth of Poverty. If perfect targeting were possible, the minimum amount of transfer payments required to eliminate poverty in 1983 (at 1991 constant prices) would have been about Tsh 5,389 per year per adult equivalent. In 1991, the amount would have been Tsh 5,143. Thus, even those who remained poor in 1991 became significant better off from 1983 to 1991. However, given the increase in the rural population over the period, in 1983, the rural poverty gap is estimated to have been Tsh 55.5 billion (in 1991 prices), lower than the corresponding value in 1991 of Tsh 63.2 billions. Yet, given successive devaluation of the Tanzanian shilling, these amounts when estimated in dollars correspond to approximately US$1.21 billion and

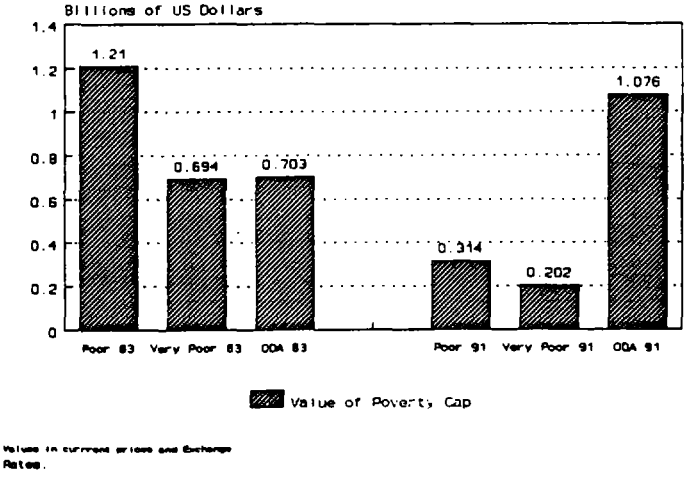

Figure 2: Minimum Amount of Payments Necessary to Eradicate Poverty in Rural Tanzania (in current US Dollars)

US$0.694 billion, respectively in 1983 and 1991. It is interesting to compare these figures to the Official Development Assistance (ODA) from all donors, which amounted to about US$0.703 billion in 1983 and US$1.1 billion in 1991. Thus, in 1991, ODA transfers were enough to eliminate poverty in rural Tanzania--assuming that perfect targeting were possible and that the money were used as recurrent transfers rather than capital investment.

8. Thus, growth has benefitted the population in general and has shifted a significant proportion of the population from below the poverty line to above it. However, if we look at lower poverty lines--e.g. 75 cents per day--we see that those who remained extremely poor (53.8 percent in 1983 *vis-à-vis* 41.8 percent in 1991) were not able to benefit from this better economic performance.

The Size and Distribution of Income

9. Comparing both average per capita and adult equivalent income estimates in 1983 and 1991, it appears that rural incomes have improved substantially since 1983. Rural adult equivalent incomes are estimated to have been Tsh 17,986 Tsh in 1983 (1991 prices) and Tsh 56,969 in 1991, and per capita incomes were Tsh 12,181, and Tsh 36,252, respectively. This change is equivalent to a staggering average annual growth rate of 14.6 percent. While this is higher than is credible, it nonetheless indicates an improvement in the economy. Yet the average income among the poor (and the very poor) was lower in 1991 than in 1983. However, it must be recalled that we are comparing two intrinsically different groups of people, because a portion of the population that was poor in 1983 was no longer poor in 1991.

10. Inequality in 1991 (Gini of 72 percent) was higher than in 1983 (Gini of 52 percent), for all population groups but was higher among the overall population than among the poor. However, in relative terms, the increase of inequality among the lowest income groups was higher than for the entire population. During this period there were major reforms in the agricultural price policy. Yet, not all farmers have benefitted equally from increases in producer prices. As prices rose, inequalities within the agricultural sector increased, and poor, less efficient farmers were left behind. This increase in inequality is consistent with Kuznet's hypothesis that income inequality tends to first increase and then decrease during the process of economic development. However, there are some caveats--use of income data, small sample size, etc--which require us to view these results with caution. The rural inequality as measured by different indices increased, as did the average income in real terms. Thus, one cannot conclude which distribution is superior in terms of well being.

11. Income inequality can be decomposed into inequality between poor and non-poor and inequality within the poor and the non-poor. The data indicate that in 1983 and 1991 the most important source of inequality between poor and non-poor was the within group inequality. Further, the increase in overall rural inequality between 1983 and 1991 was due more to an increase of the inequality within groups than between groups.

Poverty: Growth and Inequality

12. As discussed above, the rich and the poor have benefitted from Tanzania's recent growth. This section addresses the extent to which each group captured the benefits of the reform. The change in the head count index of poverty can be written as the sum of a growth component, a redistribution component, and a residual term. The growth component captures the effect on the head count index measure of poverty of the change in mean income between 1983 and 1991, while holding constant the income distribution in 1983 (our reference period). The redistribution component captures the effect of the changes in the distribution of income between 1983 and 1991, while holding income constant at the 1983 level. The residual component reflects the interaction between changes in the mean and in the other moments of the income distribution.

13. The changes in poverty which occurred in Tanzania between 1983 and 1991 were the result of an increase in the mean level of adult equivalent income. Further, these changes would have been much higher if the increase in the inequality of the income distribution would not have been as biased against the poor. As previously seen, for the selected poverty line, the incidence of poverty decreased 14.1 percentage points. If income distribution had not changed, the reduction that occurred in poverty would have been much higher and equal to 38.5 percentage points. Thus, while the poor benefitted from growth over the period, the rich captured a much greater share of the economic improvement. In fact, not only did the changes in the distribution have the effect of attenuating the growth effect, but also the observed decrease in poverty was entirely due to the positive growth in income.

14. The redistribution effect is stronger the higher the weight given to those whose incomes are further below the poverty line. If about 20 percent of the increment to the better off had been targeted through income transfers to the poor, then we would have also seen depth of poverty reduced between 1983 and 1991. Thus, a standard strategy to alleviate poverty is for the government to target subsidies for social services to the poor--basic primary education, and basic health care--and, where necessary,

complement these measures with safety nets for those people who are unable to take advantage of growth or those who might be adversely affected by the adjustment process. These findings indicate that significant improvements could be financed from general economic improvement.

Characteristics of the Rural Poor in Tanzania

15. An interesting policy question is how the poor differ from the rest of the population, and whether these differences have changed between 1983 and 1991. An analysis of the demographic characteristics of these different populations reveals no major changes in the country's socio-demographic structure. However, differences in socio-economic activity emerge over the study period. For example, the percentage of households hiring labor to help with the agricultural activities almost doubled over the period from 12 to 22 percent. Among the better off, this value jumped from 16 percent to 27 percent. This reflects the fact that the use of hired labor was strongly discouraged before liberalization. Also, whilst the proportion of households using either fertilizer or pesticides did not change significantly between 1983 and 1991 for the rural population, it slightly increased among the better off and decreased among the poor. Finally, we observe an increase in the use of ploughs and carts for all income groups. This, together with the fact that dependency ratio slightly increased, may mean that farmers tried to overcome the household labor constraint by using more intensive techniques: hiring labor and using machinery.

16. Given that a large majority of the rural population engage in agricultural activities, a full understanding of the trend on poverty and income distribution requires the simultaneous consideration of crop production and crop sales patterns. Among the better off, twice as many households were producing more than one cash crop in 1991 than in 1983, and the proportion of revenues from the sale of cash crops increased significantly between 1983 and 1991, mainly among the more affluent. This is the result of a decline in the prices of food crops--whether in the parallel or in the official market--relative to export crops that began in the late 1980's. During the height of the crisis, given that the return on cash crops decreased in relative terms, the percentage of sales from cash crops declined as income increased. The policy of high taxation of the producer prices of cash crops had been carried to the point at which it was regressive among the farming community.

Holdings of Assets

17. We also looked at the ownership of three assets of the poor: human capital (as proxied by

ownership of formal education), land, and livestock. There are hardly any differences between the poor and the rural population, in general, in terms of ownership of important productive assets, such as land and livestock. The results point towards the fact that in Tanzania, unlike in countries like Pakistan and India, access to land and livestock is not a major determinant of poverty status and income distribution. In fact, the proportion of households that own some small or large stock is about the same in 1983 and in 1991 and is not related to income status. Among the poor, the average values owned are significantly lower than among the better off, but similar between the two years considered. Thus, while it is true that the poor are slightly disadvantaged in terms of the quantities of productive assets--land and livestock--that they own, the differences in quantities are not per se sufficient to explain the existent differentials of income. However, **there is striking difference in human capital ownership between the poor and the better off in the rural areas of Tanzania.** Therefore, more important than increasing access of poor to productive assets is to raise the return on those assets.

Education

18. About 40 percent of the population older than 14 was illiterate in both years. However among the better off, the literacy rates increased about 7 percentage points from 1983 to 1991, while among the poor they deteriorated.

19. When compared with other sub-Saharan African countries, Tanzania is performing relatively well in terms of illiteracy rate. However, in 1983 only 1.5 percent of the population had attended any secondary school. By 1991, this figure had increased to almost 4 percent. While this constituted an improvement, Tanzania still ranked worst in the world according to this indicator.

20. Very few of those who go beyond primary education live in households that were classified as poor. In 1991, among the better off, 6 percent had been to secondary school, while among the poor this value was about 1 percent. As expected, no one with a university degree was reported to live in a poor family. The question that remains is whether the under-representation of people from poor households among more highly educated respondents indicates that the educational system is biased against poor people, or that higher education is the route out of poverty.

21. If education is a way out of poverty, then Tanzania's falling enrollment rates and decreasing expenditures on education are very worrying. In 1983, only 31 percent of children ages 7-9 were in

school. In 1991, this value was 27 percent. Among children ages 10-13, 78 percent were in school in 1983, *versus* 65 percent in 1991. Furthermore, the fraction of children enrolled in school--while higher among the better off--decreased both for the poor and the better off.

22. From 1983 to 1991, both in real terms and nominal terms, the per capita government expenditure on education decreased. The private sector did not compensate for this decline, and total expenditures declined in real terms over the period. If average expenditures per pupil reflect the willingness to pay for education, then between 1983 and 1991 this willingness to pay declined sharply; and in absolute terms, the decline was stronger among the poor than among the better off. This fact, together with falling enrollment rates, presents an alarming picture for the upcoming years in Tanzania.

Conclusions

23. This study addressed the question of structural adjustment's impact on growth and on the poor. The structural adjustment reforms have clearly contributed to robust growth. The average income in 1991 was, in real terms, significantly higher than for 1983. Whereas the overall per capita income is estimated at Tsh 12,197 per annum for 1983 (in 1991 prices), in 1991 this figure was Tsh 36,252. Apparently the launching of the Economic Recovery Program in 1986 is showing positive income effects, although this development is not yet reflected in basic social indicators, like infant mortality or primary education.

24. In addition, structural adjustment appears to have benefitted many poor households. This study indicates that the population living in poverty declined from 65 percent in 1983 to 50.5 percent in 1991. Furthermore, those who were poor, but in the neighborhood of the poverty line, got better off. However, the probability of finding people with extremely low incomes is higher in 1991 than in 1983. It seems that growth has benefitted the population in general, and has shifted a significant proportion of the population from below the poverty line to above it. However, that smaller fraction of the population who had extremely low incomes was not able to benefit from the economy's improved performance. Moreover, significant increases in the inequality of the income distribution eroded some of the potential gains of economic growth in reducing poverty. This increase in inequality is consistent with Kuznet's hypothesis that income inequality tends to first increase and then decrease during the process of economic development.

25. That the poor, in both years, are characterized by a low stock of human capital, as measured by

formal educational achievement, is clear. This study is consistent with the hypothesis that the principal explanation for a distinct reduction in the incidence but increase in severity of poverty was a liberalization process that encouraged growth through rewarding those with education, excluding those with low education from benefitting. This implies that improvements in the income distribution require improving the quantity and quality of education in the regions most adversely affected by reforms. Yet, the low and declining enrollment rates, among not only the poor but also among the better off, indicate that major improvements in educational attainment are not to be expected in the next decade.

1

Background and Justification

1. At the time of independence, in 1961, Tanzania was considered one of the poorest countries in the world. Dependent on subsistence agriculture, the country had only a very incipient industrial basis. Thirty years have passed, and Tanzania has gone through several changes in policy, but this situation is unchanged. According to the 1995 *World Development Report*, Tanzania ranked second poorest among all countries in the world in terms of per capita income.[1]

2. Between the mid-1970's and the early 1980's, inadequate domestic policies and various external factors contributed to macroeconomic imbalances, economic stagnation, and a sharp decline in per capita income and the standard of living. Among the causes contributing to this situation were a severe drought in 1973-74 associated with increases in food imports prices, the decline of international prices for the traditional export commodities, and two major oil crises. The first of these crises, in 1973, caused prices to quadruple; the second one, in 1978, caused prices to double. In 1977 the collapse of the East African Community provoked a disruption in trade with Kenya, and the 1979 war with Uganda placed a further strain on the country's resources. However, the most significant cause of economic decline was the failure of domestic policies to generate sustained growth in per capita income. Inordinate and inflexible state control over the economy resulted in a stifling of economic activity, widespread deterioration of the country's infrastructure, and a regression to barter trade on parallel markets in 1982 and 1983 at the height of the economic crisis.

3. The macroeconomics imbalances in 1980 were severe. From 1981 to 1983, the real GDP decreased, while the population grew at an average rate of 3.1 percent annually. Infrastructure

[1] The situation is not as severe as it may look. In the most recent years, because of successive devaluations, the value of GNP expressed in dollars should be considered with caution. Using an integrated poverty index, among a set of 114 developing countries, Tanzania ranked 35 in 1988 (Gauzier *et al.* 1993). In the same year, when ranked by per capita income, Tanzania was the 5th poorest country in the world.

deteriorated, and foreign aid was reduced. In 1982 high inflation and shortages of goods led the Government to introduce a "homegrown" structural adjustment program. Nevertheless, it was not until 1986 that some significant adjustment reforms, sought as indispensable, were undertaken. This corresponds to the launching of the first Economic Recovery Program (ERP I) by the government of Tanzania. Supported by the IMF with an 18-month stand-by arrangement and by the World Bank with a Multi-Sector Rehabilitation Credit, the ERP I fundamentally redefined the role of the government in the economy. For example, imports were liberalized, a restrictive monetary policy was introduced, and an active exchange rate policy ended with the overvaluation of the shilling. These reforms have contributed to sound economic growth in recent years. Between 1986 and 1991, the average annual GDP growth rate was approximately 4 percent in real terms. However, a high population growth rate of 2.8 percent per year during this period limited the per capita growth rate to almost zero.

4. During the last decade, one of the most important economic debates worldwide has centered around the impact of structural adjustment programs on the poor. The reforms outlined above may have influenced both the amount and structure of poverty in Tanzania. Various socio-economic groups are likely to have been affected differently. The income distribution may have changed. As the literature on the impact of adjustment has often indicated, in-depth empirical research holds the greatest promise for strengthening the understanding of the process by which macro-economic changes are transmitted to the household level. Nevertheless, very few quantitative studies of the effects of the structural adjustment programs on poverty and income distribution have been undertaken. This is partly because few countries in the world implementing structural adjustment programs possess both pre- and post-adjustment household surveys. In Tanzania two household budget surveys (1983 and 1991/92) provide an opportunity to evaluate the evolution of living standards during the period in which structural adjustment programs were implemented, albeit the household data available for this study only allow comparison among the rural areas in Tanzania.[2] Given the nature of the available data--small sample size, not all variables of interest can be compared--the study will focus on **what** happened during adjustment, rather than **why** it happened.

[2] Some studies use macroeconomic figures of income to study the impact of structural adjustment programs. In Tanzania this may not be the best avenue to forming some conclusions. The official figures of GDP have been questioned--so the effects of structural adjustment on incomes may be better determined using microeconomic/household level data.

5. This paper analyzes the impact of Tanzania's structural adjustment program on poverty and the income distribution among the rural population of Tanzania during the period between 1983 and 1991. Thus, the study covers two distinct periods of economic policy: the "crisis" period of 1983-85, and the ongoing period of economic and social adjustment that began in 1986. It will help determine whether the Structural Adjustment Program in Tanzania, which may have caused shifts in the income distribution, was associated with an improvement or deterioration of the standards of living of the poor during a period of overall economic expansion. Ideally the comparison would be between the situations with and without the program. It should also be kept in mind that other factors (e.g. in rain-fed agriculture, the weather during a particular crop season plays a vital role) influenced what happened with regard to incomes and poverty during this period.

6. The paper is organized as follows: Section 2 presents a brief overview of Tanzania's Agricultural Sector performance from 1976 through 1991. Section 3 presents a temporal evolution of poverty between 1983 and 1991, and Section 4 studies what happened with regard to the inequality of income distribution during this same period. Section 5 presents a comparison of characteristics of the poor in 1983 and in 1991. Annex A presents the methodological background and additional results (e.g. poverty measures using per capita income).

2

An Overview of Tanzania's Agricultural Sector During Crisis and Adjustment

Background

1. The agricultural sector in Tanzania has consistently been the predominant sector in terms of its contribution to GDP (61 percent, average 1989-91) and the number of people employed (84 percent, average 1989-91). Therefore the performance of the economy is closely related to the performance of the agricultural sector (see Figure 2.1). During the 1970's and early 1980's, domestic policies led to a deterioration of the agricultural sector. These policies included the villagization program, price and marketing controls (in 1976 the agricultural sector was heavily regulated), breaking up of peasants' cooperatives, restrictions in labor hiring, and minimum acreage regulations on some small subsistence crops.

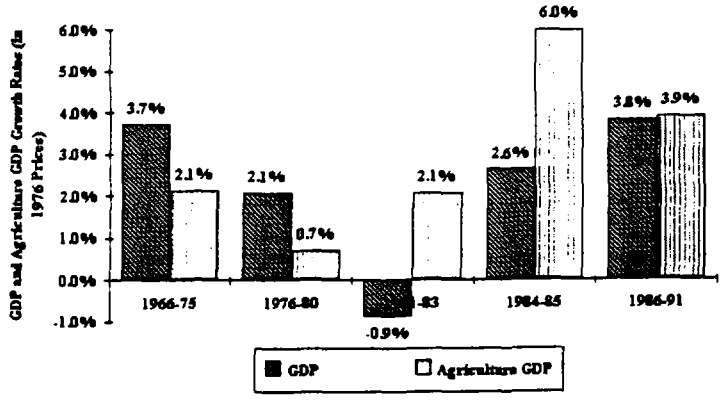

Figure 2.1: Real Growth in GDP and Agriculture GDP (1976 prices)

2. The poor performance of the agricultural sector, caused partially by heavy government intervention in both the output and input markets, led to food shortages and a decrease in export earnings. External debt arrears increased. Inflation jumped from 10 percent in 1978 to 30 percent in 1984 and remained at this level throughout the 1980's. The fiscal situation deteriorated sharply, with deficits in some years exceeding 16 percent of the GDP. Both imports and exports declined significantly. However, reduced import costs were insufficient to offset reduced export revenues; the trade deficit increased throughout the decade. Early gains in providing basic education and primary health coverage

were reversed.

3. It is the general consensus that there was a sharp decrease in the standard of living of the majority of the population (Bevan *et al.* 1989, Collier *et al.* 1986). No economy can function well in the long run with high inflation rates, an overvalued currency, overtaxation of farmers, shortages of foreign currency such that vital imported consumption goods and inputs are in short supply, basic social services in disrepair, deteriorating agricultural and infrastructural services, decaying rural roads, and a lack of basic financial services.

4. The household data available for this study only allow comparisons among the rural areas in Tanzania.[1] Though limited to the rural population, such a study is justified on the grounds of the importance of the rural population, which comprises about 70 percent of the population in Mainland Tanzania. Moreover, the major source of income in the agricultural areas is the agricultural sector, which provides 65 percent of both the GDP and merchandise exports and comprises 84 percent of the workforce. Evidence from the Cornell/ERB 1991 survey (World Bank 1993b, Tinios *et al.* 1993), as well as from other previous studies (e.g., ILO 1982), indicates that poverty is mainly a rural phenomenon. Accordingly, in 1991, the rural poor accounted for 85 percent of the total number of poor people in Tanzania (World Bank 1993b). Furthermore, reform in the agricultural sector has been underway since the Economic Recovery Program was initiated in 1986. Structural adjustment, by removal of the distortions in the exchange rate and other prices, was expected to contribute to growth in the agricultural sector.

Table 2.1: The Agricultural Sector in Tanzania

	1983	1991
Total Agricultural GDP (constant Tsh millions of 1996)	10,065	15,198
Share of Agricultural GDP on total GDP (%)	44	63
Labor Force in the Agricultural Sector (%)	85.6*	84
Agricultural Exports (Million of $US)	258.5	241.5
Share of Agricultural Exports on Total Exports (%)	68	56

* Value in 1980.

[1] See Chapter 3 for more on the comparability problems of the household-level data sets. For more information on the surveys and data sets, see Bevan *et al.* (for the 1983 rural household survey), and Tinios *et al.* (1993) for the 1991 Cornell/ERB household survey.

An Overview of the Performance of the Agricultural Sector[2]

5. During the 1980's Tanzania's agricultural GDP (see Table 2.1) grew more rapidly than the non-agricultural GDP. This atypical behavior of the agricultural sector during the development process caused the agricultural GDP as a percentage of total GDP to increase from 44 percent of total GDP in 1983 to 63 percent in 1991 (Tanzania, 1993c).

6. The significant growth in the agricultural sector during this period was due to increases in food crops rather than in export crops (See Figure 2.2).[3,4] Food crop production, which accounts for 55 percent of agricultural GDP maintained a steady growth rate since 1982/83, following a 5-year period characterized by stagnation in per capita food production; and the traditional export crops--coffee, tea, sisal, cotton, cashewnuts, sugar, pyrethrum, and tobacco--which account for only 8 percent (World Bank 1993c), performed poorly throughout the decade, despite the devaluation of the Tanzanian shilling. Inefficient official marketing institutions and/or export processing industries, which remained monopolies in the hands of cooperative unions or export marketing boards, absorbed all the potential gains from devaluation otherwise transmitted to the producer level. Adjustment in the markets for coffee and cotton --the two most important traditional export crops--had been slower than in the market for food crops. The government withdrawal had been slow and incomplete. Consequently, marketing for those crops was still monopolized by large and insolvent cooperative unions (World Bank 1993c).

7. One of the traditional export crops that is of particular interest for this paper, given the characteristic of the regions included in the 1983 household survey, is the coffee crop. The remainder of this section will analyze two "crops": the food crops, and the coffee crop.

8. <u>The Food Crops.</u> From 1979/80 through 1983/84, official prices fell in real terms, while parallel

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[2] This overview relies heavily on World Bank (1993c) and van den Brink (1992). Figures 2.1, 2.6, and 2.7 are from World Bank (1993c) and figures 2.2, 2.3, 2.4, and 2.5 are from van den Brink (1992).

[3] This discussion should be considered with caution. For the export crops, the available information is restricted to purchases of official marketing institutions. Surveys of area and/or total production are non-existent. In the case of a crop like coffee, where there is anecdotal evidence of smuggling to Kenya and Uganda, the picture presented here may not be accurate. Van den Brink (1992) discusses how the estimates of food crop production are calculated and how they should be considered with caution.

[4] Van den Brink (1992) claims that the official statistics which claim large increases in food crop production are inconsistent with other sources of information (e.g. open market price data or grain import figures) that seem to indicate stagnation, rather than growth.

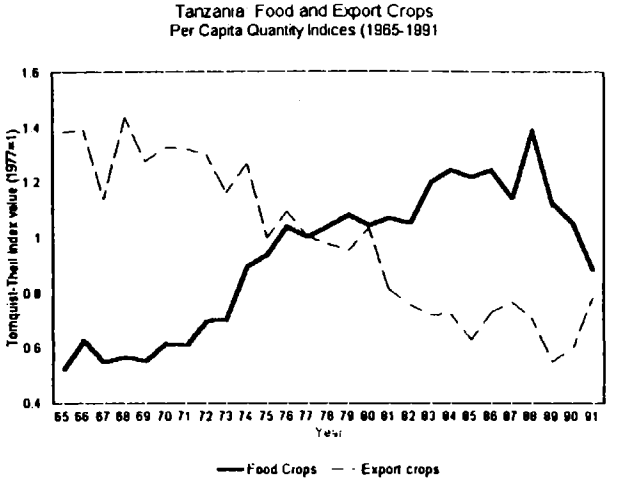

Figure 2.2: Per Capita Production of Food Crops and Purchases of Export Crops

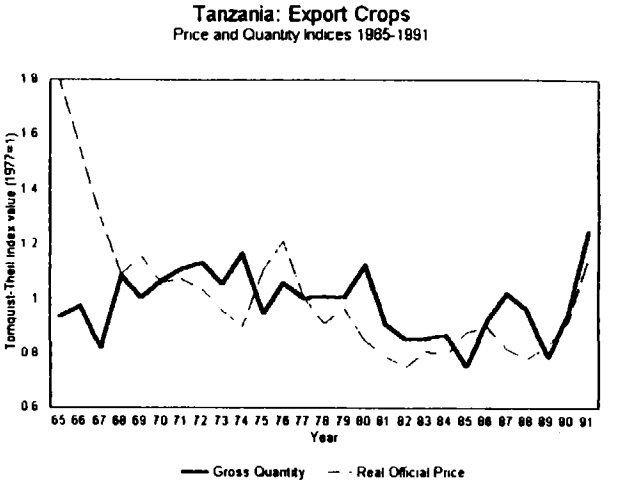

Figure 2.3: Export Crops: Price and Quantity Index

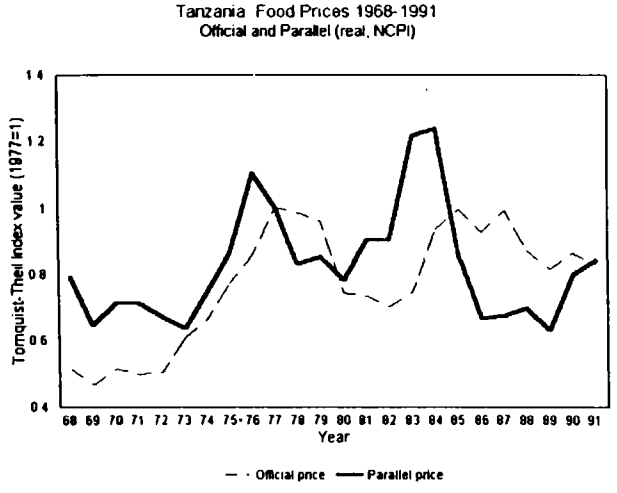

Figure 2.4: Food Crops: Official and Parallel Market Prices

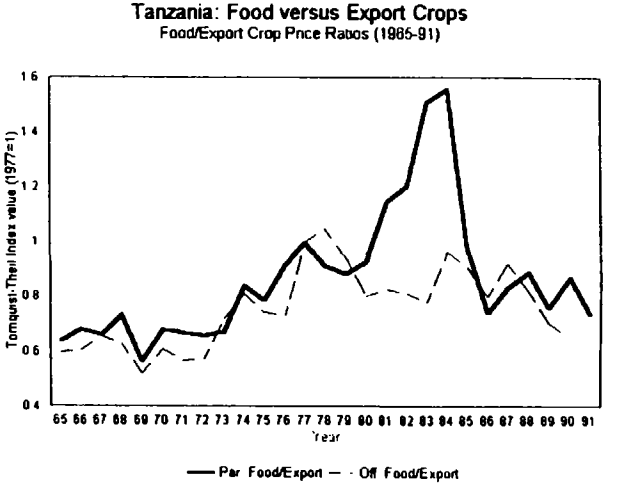

Figure 2.5: Ratio of Food Crops (Official and Parallel Market) Prices to Export Crops Producer Prices

"market prices rose steeply in this period, exposing the inefficiencies of the official marketing system." (see Figure 2.4). After 1984, with *de facto* liberalization of private grain marketing, parallel market prices responded immediately by declining dramatically. Nonetheless, a positive supply response was recorded in the official series for the 1983/84 production year. An important feature of the reform program, initiated in 1984, was to increase the availability of consumer goods, especially the so-called incentive goods--sugar, roofing sheets, soap, clothing, cooking oil--for rural dwellers. Bevan *et al.*'s (1989) analysis shows that for Tanzania, "[...] the supply responses are indeed a function of the severity of rationing, rather than merely movements in real producer prices." The increase in supplies of consumer goods caused a rapid increase in the production of cash crops and in the marketing of food crops during the late 1980's, despite an unfavorable trend in the prices, which remained stable or even declined. This is a "one shot" phenomenon, and farmers started responding to the movements of relative prices.

9. The Coffee Crop. Tanzania relies on traditional export markets for 45 to 50 percent of export revenues. Even though coffee's share of the total export revenues declined, it still plays an important role. With the exception of the coffee boom years--1975/76 and 1976/77--the real official price for coffee (in Tsh) (see Figure 2.6) had steadily declined to its lowest real level in the past 25 years. In 1991, the world market price for coffee was less than 50 percent of what it was in 1980, in real terms. From 1985/86 to 1989/90, most of the windfall profits from devaluation were apparently captured by the monopsonies of the official marketing institutions. In 1990/91 and 1991/92, however, coffee producer prices increased significantly, due to increasing concern of the government with the falling share of producer prices in world market prices (van den Brink 1992). Despite the declining real price, coffee export volumes remained stable. This is due to compensating domestic policy, which included numerous devaluations (see Figure 2.7).

10. It is likely that the inclusion of estimates for the parallel markets of coffee would greatly affect the recorded quantity trends. First, coffee is the most important cash crop in Tanzania. Second, the villagization program did not affect the coffee growing areas because these areas were already characterized by high population density. In fact, there is anedoctal evidence of smuggling of coffee from Arusha and Kilimanjaro (and less so from Kagera or the Southern Highlands), which used these markets to compensate for the crisis of the official economy in Tanzania.

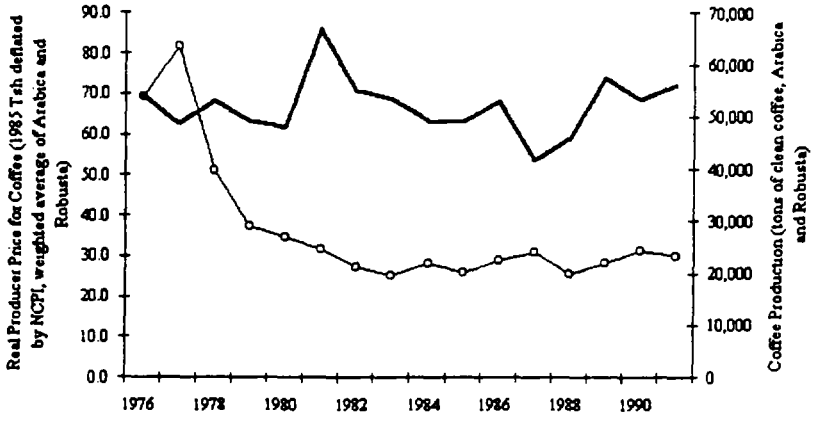

Figure 2.6: Coffee Crop: Official Producer Prices and Production

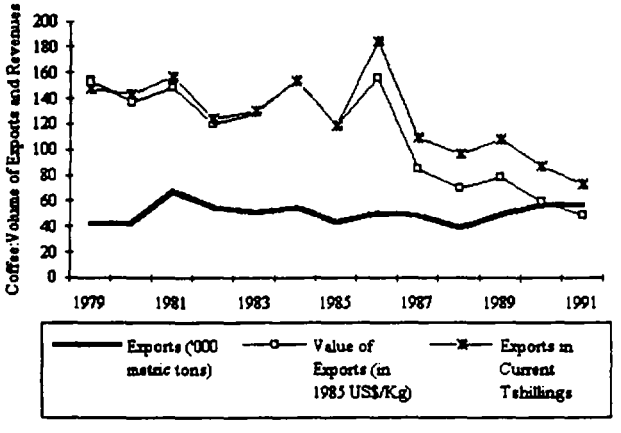

Figure 2.7: Coffee: Volume of Exports and Revenues

3

Structural Adjustment and Poverty in Tanzania

Structural Adjustment

1. A review of the performance of a group of developing countries (in Corbo and Fisher, 1992; World Bank 1993a) shows that countries which implemented adjustment programs present better macroeconomic indicators than "non-adjusting" countries. A quick digression through some of these indicators reveals that the macroeconomic performance of Tanzania has steadily improved during the last decade (see Mans, 1994, for a comprehensive overview of Tanzania's structural adjustment program), as demonstrated by the following:

   a. Between 1986 and 1992, the average annual growth rate in the agricultural sector has been higher than the annual population growth rate, resulting in increasing per capita income;

   b. Between 1986 and 1991 the average annual growth of the industrial sector was 5 percent, compared to a negative annual growth of 5 percent from 1979 to 1985;

   c. The exchange policy, aimed at eliminating the overvaluation of the shilling, narrowed the gap between the official exchange rate and parallel market exchange rates. To this end, the Tsh exchange rate to the dollar was moved in a series of adjustments, from Tsh 11 in 1989 to Tsh 219 in 1991, to about Tsh 500 in the first quarter of 1994.

2. Tanzania has steadily improved its macroeconomic performance as a result of the adjustment program, and it is among those countries in which substantial improvements are reported. The question is whether those gains had a substantial impact on poverty. The remainder of this paper analyzes what happened with regard to poverty and income distribution during the adjustment process. The determination of effects on household welfare, poverty, and the fulfillment of basic needs under conditions of structural change is largely an empirical matter. To quantify what happened with regard to poverty and inequality during the period that the economy was undergoing structural adjustment, this

study uses two household surveys: the 1983 household budget survey, and the 1991 Cornell/ERB household survey. The next paragraphs discuss the two household surveys.

Measuring and Determining Poverty

The Sources of Data

3. **The 1983 Rural Household Survey.** In the mid 1970's (1976-78), during the coffee boom, Tanzania benefitted from a significant improvement in its terms of trade. To study the "consequences for peasants of this [...] temporary shock and of the way it was handled by the [Tanzanian] government" (p. 1), Bevan *et al.* launched a rural household survey in Tanzania. The **1983 Rural Household Survey** was conducted during September, 1983, on a subsample of the households interviewed in 1976/77 by the Tanzania Bureau of Statistics. This survey covered 498 households in the rural areas of Kilimanjaro, Dodoma, Iringa, and Ruvuma. As the 1983 Rural Household Survey was conducted in 4 of the 19 rural regions of Tanzania, it is important to identify the consequences for this study's conclusions. The following paragraphs briefly characterize these four regions.

4. The Regional Focus of the 1983 Data. Based on agro-ecological similarities, cultivation intensity, levels of technology, and linkages to the cash economy, it is possible to define six major farming systems. An analysis of the surveyed regions shows that not only coffee growing areas were sampled. The sample clearly encompasses different farming systems, quite diverse regarding regularity and abundance of rainfall, agricultural potential, scarcity of land, and dominant type of crop production. For example, the northern part of Iringa (Semi Arid Lands) and most of Dodoma region (Arid lands) are pastoral or agro-pastoral. **No significant coffee production is reported in this farming system.**

5. Despite the fact that the survey aimed at studying the impact of improved terms of trade for coffee, clearly not only coffee-growing regions were sampled. In addition, the income levels of the sampled regions are quite diverse. According to the National Accounts of Tanzania (1976-1992) Kilimanjaro and Dodoma are the poorest regions in terms of GDP per capita, while Iringa and Ruvuma are the wealthiest regions (excluding Dar es Salaam). This may explain why the comparison of the results from the four regions with a national sample led Bevan and his co-authors to conclude that the 1983 survey is representative of the rural regions of Tanzania. Bevan argues, "using the 1976/77 survey [it is possible] to demonstrate that our own survey, although it is regionally selective, it is in most respects [e.g., levels and composition of income] adequately representative of the national peasant

economy. [... In fact] the traced households were in 1977 representative both of the four regions in which the survey was conducted and of peasants households nationally" (Bevan *et al.* 1989:43). This justifies the use of this household survey in this study.

6. **The 1991 Cornell/ERB Household Survey** was undertaken in August and September, 1991, by the Cornell Food and Nutrition Policy Program and the Economic Research Bureau of the University of Dar-es-Salaam. It was a nationally representative survey based on the National Master Sample of the Bureau of Statistics. This **Cornell/ERB** survey used a stratified sub-sample of the National Master Sample (NMS), covering 1,046 households, of which 477 households were in the rural areas of Tanzania. The sample included 30 units from the 100 NMS rural villages, 20 units out of the 70 NMS urban areas outside Dar es Salaam, and all 52 NMS clusters for Dar-es-Salaam.

7. Table 3.1 demonstrates that, for 1991, variables such as poverty and income level vary, depending on whether only the four regions or all the rural population is included. If the 1983 survey better reflects the population of the four regions than that of the rural areas, we are comparing somewhat richer regions in 1983 with the whole rural population in 1991/92, which is somewhat poorer. Thereby, a decrease in poverty over the period would be understated. Nevertheless the 1991 survey was not designed to yield estimates at the regional level, while the 1983 survey was. Moreover, according to the NMS sampling framework, the rural clusters (villages) were stratified to represent the following categories: villages surrounding large towns, villages in low density districts, and normal villages. However, no "low density" (and, perhaps, low income) cluster is included in the subset of the four regions. This may explain why incomes are higher when using the households in the four rural regions, rather than all rural households. For the sake of comparability, it would have been preferable to subset four regions for the 1991 survey, but the sample size was insufficient; and the sampling scheme, inappropriate.

Table 3.1: Means for Selected Variables

Variable	1991/92	
	4 Regions	Rural
Per Capita Income at current prices (Tsh)	35,375	36,252
Soft core Poverty % (households criterion = Per Capita Income)	54%	62%
Hard core Poverty % (households criterion = Per Capita)	46%	53%
Total income (Tsh)	243,600	213,413

8. A temporal comparison of poverty and the income distribution in Tanzania is hampered by

conceptual and practical problems. At the practical level there are comparability problems between the two surveys, particularly with regard to:

a. Slightly different definition of household membership. The 1983 survey considered to be household members any guests who, at the time of the interview, had been staying with the household for at least two weeks, while the 1991 survey did not.

b. Differences in the coverage. The 1983 survey was based on a sample which only covered 4 regions of rural mainland Tanzania, while the 1991 survey covered the rural areas of all 19 regions. However, as stated previously, if the results were influenced by this fact, it is likely they were influenced in a conservative direction (to show less reduction in poverty rather than more reduction over the period).

c. Small sample size in both years may lead us into "small cell" problems. Some of the erratic variations in the tables to be presented may be attributed to this.

d. Incompatibility between the two surveys precludes us from performing some very important analysis. For example, the 1983 survey does not provide individual labor usage data on agricultural self-employment activities.

9. An additional problem surfaces due to the reliability of the published statistics. Since this analysis involves comparisons over time, we need information on price increases between these two years to perform an analysis in real terms.[1] Since we are using income, this was done on the basis of the deflator implicit in the GDP.[2] However, the published values are of questionable reliability.

10. At the conceptual level, three major decisions have to be made to measure poverty.[3] First, one must choose a criterion to rank households. Second, one must chose a poverty line to distinguish poor from better off households. There is a vast amount of economic literature suggesting that ranking

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[1] The Purchasing Power Parity (PPP) exchange rate implicit in the GDP is 6.14 for 1980 at current prices, 8.8 for 1985 at 1980 prices, 22.24 for 1988 at 1985 prices, and 40.6 for 1991 at current prices. This gives an increase in the GDP deflator between 1983 and 1991 that is likely to be an underestimation of the official implicit GDP deflator Index.

[2] With regard to the price evolution of two important commodities--maize and beans--the market price increased 5.23 and 5.74 times, respectively, between 1983 and 1991. The increases in the official prices were much higher: 13.63 and 7, respectively. Given that a non-negligible amount of market transactions were already occurring, it is likely that the increase in unit revenue for the farmers did not correspond to the official quotations.

[3] A recent paper by Ravallion (1992) presents an overview of the conceptual, methodological, and practical difficulties associated with poverty measurement.

households' welfare by level of consumption of goods and services, as proxied by expenditures, is preferable to income. For example, if a family can dissave or borrow, then its present standards of living are not constrained by current income. Glewwe and van der Gaag (1990) present a set of alternative indicators to measure poverty, and they argue that the best indicator is household consumption per adult equivalent. Comparing income to expenditure as a ranking criterion, they conclude that, for income, the overlap in the ranking of households is less than 18%, suggesting that households adjust to transitory income fluctuations through savings and dissavings. Other studies also reach the same conclusions, indicating that cross-sectional annual income is an inaccurate measure of permanent income. However, there are no expenditure data in the 1983 household survey.

11. A third issue is the measurement of individual welfare. Both surveys collected income data at the household level, and some adjustment is required for the household-level figures to reflect the well-being of the individual members of the household. A common approach in the literature is to divide the household variables by the family size. This approach implicitly assigns the same weight to every member of the household, disregarding that, for example, a child will have nutritional needs different from those of adults.

12. In this study, households will be ranked by level of income, deflated by the number of adult equivalents in the household.[4] The deflation by the number of adult equivalents in the household adjusts for the fact that families of different size and composition may have different needs. In the absence of estimated equivalence scales for Tanzania, we follow Collier *et al.*'s (1986) approach in this study. We account for economies of scale and size[5] by using the Engel food scales estimated by Deaton (1980), and we account for differences in family composition--gender and age--by using the caloric requirements by age and gender for East Africa (Latham 1965).[6] This household equivalence scale is then used to deflate household income.

13. Income was estimated to be the sum of the remuneration of all productive assets owned by the

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[4] Since it has been standard practice in empirical work, we will duplicate part of the analysis using per capita expenditure as the criterion to rank households.

[5] For example, to cook a meal for two persons does not require double the amount of energy used in cooking a meal for one person.

[6] For details on how to compute the household specific equivalence scale, see Collier *et al.* (1986).

household--i.e., labor, land, and capital--plus transfer income from other households. The estimate of income does not include the implicit value of income homeowners received from the rent of their house or transfer income from the government, and it is thus an underestimation of actual income.

14. Several households in the samples--both 1983 and 1991--had negative incomes.[7] We assumed that negative incomes represent financial losses on self employment activities (e.g. own farm). Since the corresponding profits are treated symmetrically, households with negative incomes were kept in the sample.[8] Another way to deal with households with negative incomes is to drop them from the sample. This corresponds to the assumption that those observations represent capital losses, i.e., such households have had some positive income but because their capital losses exceeded current income the result is negative. In our case, with the exception of livestock income, we did not include capital gains or losses in the estimation of income. Thus, we can confidently assume that negative incomes do not correspond to capital losses; or if they do, then we should treat symmetrically gains and losses. Lastly, we may assume that negative incomes correspond to data entry errors, or interviewing mistakes, and consequently decide to drop these households altogether; however, positive values may correspond to errors as well.[9] Throughout the paper we will present some results that show how the results would have been impacted had we only considered households with strictly positive incomes.

15. The choice of one specific definition of poverty has major consequences for the population classified as being in poverty. Therefore, we selected two different values for the absolute poverty line which enabled us to perform sensitivity analyses of the extent of the poverty to a given poverty line.[10] People were classified as **poor** (or as being in **soft-core** poverty) if they lived in households with income of less than 3,053 Tsh a year per adult equivalent in 1983, or less than 15,030 Tsh per adult equivalent in 1991 (PPP $370 per year). Households with incomes of less than 2,269 Tsh a year per adult equivalent in 1983, or less than 11,171 Tsh per adult equivalent in 1991, were deemed to be **very poor**

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[7] In 1983, 16 of the 498 households (3.2%) had zero or negative incomes. In 1991, 51 of 477 households had zero or negative incomes (10.7%). This corresponds to 4.4 percent and 12.1 percent of the households in the population, respectively in, 1983 and 1991.

[8] For some of the estimates, the negative values had to be converted to zero. This introduces some bias into such estimates.

[9] As it will be seen later, dropping the households without strictly positive incomes would have made the conclusions in this paper more robust in terms of positive impact of the structural adjustment programs.

[10] Details on the methodological background for this study are reported in Annex A to this document.

(or to be in **hard-core** poverty) (PPP $280 per year). These two poverty lines were defined in Purchasing Power Parity terms and correspond to one dollar per day and 75 cents per day (World Bank 1990).[11] People were classified as being **better off** if they lived in households with income of less than 3,053 Tsh a year per adult equivalent in 1983, or less than 15,030 Tsh per adult equivalent in 1991 (PPP $370 per year). Both lines are held constant in real terms over time for the analysis.[12] In this study we use the GDP implicit deflator. Prices were about five times higher in 1991 than in 1983. This increase in prices is similar to that implicit in the PPP for 1980 (8.8) and PPP for 1991 (40.6)

16. Any poverty index should satisfy three basic axioms: monotonicity, the principle of transfers, and the axiom of decomposability or additivity.[13] This study will compute two poverty indices: the *head count ratio*, and the *poverty gap* index. The two indices measure a different aspect of poverty.

17. The **head count** ratio is the simplest measure of the incidence of poverty. It measures the proportion of people (or households) whose adjusted equivalent income is below the pre-set poverty line. This measure suffers from two shortcomings. First, it ignores gains and losses among the poor. Second, it does not differentiate between those with an income of nearly zero and those with an income close to the poverty line income. The **poverty gap** index measures the distance (gap) between the income of the poor people (or households) and the poverty line. It gives a measure of the average income of those with incomes below the poverty line, or of the depth of poverty. An advantage of the poverty gap index is that it gives a measure of the amount of transfers that would be necessary to end poverty, if perfect targeting were possible.[14] The Poverty Gap Index is given by $PG = \frac{1}{n}\sum_{i=1}^{q}\left(\frac{z-y_i}{y_i}\right)$, where z is the poverty

[11] See Ravallion *et al.* (1991) for further discussion on the defensibility of this "absolute" poverty line. The value of Purchasing Power Parity (PPP) for 1991 equals 40.621 Tsh/USD.

[12] Depending on the sources and the indicator used, the price deflator to be used is different. This is important since some of the results to be presented in this study are very sensitive to the rate of price increase (Summers and Heston 1991).

[13] (1) Monotonicity: A reduction in income of a person below the poverty line should be reflected in an increase in poverty. (2) Principle of Transfers: A transfer of income from a person below the poverty line to someone who is richer must lead to an increase in poverty. (3) Additive Decomposability: The poverty index for a population can be written as a weighted average of the mutually exclusive and collectively exhaustive sub-group poverty indices.

[14] The Poverty Gap Index, however, has the disadvantage of not being sensitive to transfers of income between people below the poverty line.

line, y_i is the income of the *ith* poor, n is the total population, and q is the population with income below the poverty line.

Table 3.2: Two Different Poverty Indices and Two Poverty Lines: 1983 Compared with 1991

	Head Count				Poverty Gap			
	Poor		Very-Poor		Poor		Very-Poor	
	1983	1991	1983	1991	1983	1991	1983	1991
Adult Equivalent Income*	64.6	50.5	53.8	41.8	35.8	34.2	27.6	29.6

Notes: Head Count = Counts the number falling below each poverty line.
Depth = Percent of poverty line income required to bring everyone below it up to the poverty line.

Poor = Poverty line of Tsh 3,052.6 per year in 1983, and Tsh 15,029.8 per year in 1991.
Very Poor = Poverty line of Tsh 2,268.8 per year in 1983, and Tsh 11,170.8 per year in 1991.

18. Table 3.2 [15] shows the extent of poverty--in 1983 and 1991--in the rural areas of Tanzania, when adult equivalent income was used to rank households.[16] The following conclusions emerge:

a. Incidence of Poverty. Clearly we are less likely to find a household whose income is below the poverty line in 1991 than in 1983. In 1983, 65 percent of rural Tanzanians lived in households with adult equivalent income below the soft-core poverty line (Tsh 3,053), and approximately 54 percent of all rural Tanzanians lived in households with adult equivalent income below the hard core poverty line (Tsh 2,269). In 1991 these values were, respectively, 50.5 and 41.8 percent. This corresponds to a 30 percent reduction in poverty--enough to reduce the population living in poverty.

b. The rural population was estimated to be 16.5 million people in 1983, and 19.2 million

[15] When using figures defined in adult equivalent, rather than in per capita terms, the correct estimation of the P_α indices of poverty (for $\alpha \geq 1$) requires one to adapt the formulas to use AES averages and numbers. The poverty gap is now the value of P_1*z (the poverty line), times the number of adult equivalent adults in the economy, rather than the number of people in the economy (This point was made to me by Branko Milanovic). For a complete discussion, see Milanovic, 1994). The use of the standard definition produces an overestimate of the poverty gap (for the higher poverty line) of about 50 percent in 1991. This is approximately the ratio of people to adult equivalents in rural Tanzania in 1991.

[16] When estimating the head count index, negative incomes for families surveyed pose no problem. However, for the other P_α indices, negative values might greatly affect estimates. For calculating these indices we set all negative values equal to zero.

people in 1991.[17] A decrease in the incidence of poverty from 1983 to 1991 was also translated into a decrease in the absolute number of people living in either soft-core or hard-core poverty. Accordingly, in 1983, 10.8 million people were living in soft-core poverty, and 8.9 were living in hard-core poverty. The corresponding estimates for 1991 are 9.7 and 8, respectively. This indicates an approximately 10 percent reduction in the number of people living in poverty. Over the same period, the number of better off rose from 5.7 to 9.5 million. This corresponds to approximately 40 percent more people living in households with incomes above the poverty line (see Figure 3.1).[18]

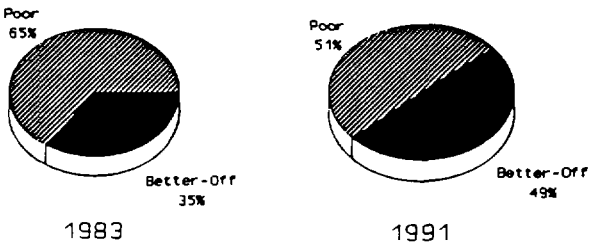

Figure 3.1: Poverty in 1983 and in 1991 Compared

c. Depth of Poverty. If perfect targeting were possible, the minimum amount of transfer payments required to eliminate poverty in 1983 (at 1991 constant prices) would have been about Tsh 5,389 (.358 x 3,053) per year per adult equivalent for the higher poverty line, and Tsh 3,081 per year per adult equivalent for the lower poverty line. For 1991 these values (at current prices) are Tsh

Table 3.3: Average "Shortfall" Income (at current prices)

	1983	1991	Ratio 1991/1983	1983	1991	Ratio 1991/1983
Adult Equivalent*	1,093	5,143	4.7	625	3,307	5.3
Poverty Gap (billions of Tsh)	55.5	63.2	n.a.	31.8	40.6	n.a.
Poverty Gap (billions of US Dollars**)	1.213	.314	n.a.	.694	.202	n.a.

Note: Average shortfall income is the poverty line minus the average income of those below the poverty line.
* The formula uses figures defined in AES rather than per capita terms.
** Using current prices and exchange rates.
n.a. not applicable

[17] These figures were extrapolated from the 1978 population census using a population growth rate of 2.4 percent per annum, and from the 1988 population census, using a population growth rate of 2.8 percent per annum.

[18] A statistical test (t-ratio of 4.4 for the soft core poverty line, and 3.8 for the hard-core poverty line) indicates that the incidence of poverty in 1991 was significantly lower than the incidence of poverty in 1983 at the one percent level of significance.

5,143 and Tsh 3,307 for the higher and the lower poverty lines, respectively. Thus according to our estimates, the poverty gap decreased for the lower poverty line and slightly increased for the higher poverty line. In other words, the poor, though they do not achieve incomes high enough to be classified as non-poor, experienced increases in the average income between 1983 and 1991. Those who were classified as living in hard-core poverty became slightly worse off.

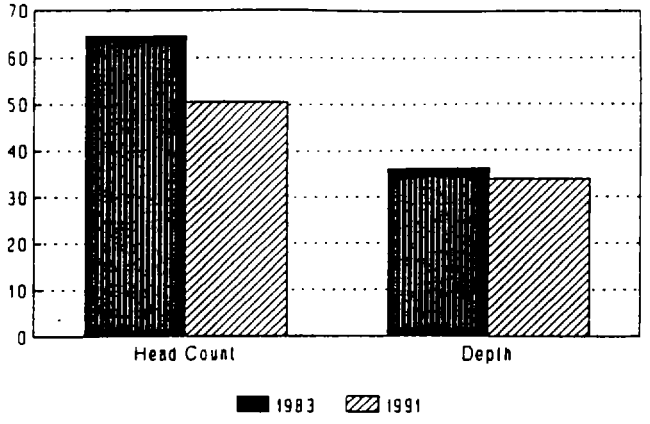

Figure 3.2: Incidence, and Depth of Soft-Core Poverty: A Temporal Comparison

d. Given the significant increase in the rural population over the period, in 1983 the rural poverty gap is estimated to have been Tsh 55.5 billion (1991 prices) at the soft-core poverty line, and Tsh 31.8 billion at the hard-core poverty line (see Table 3.3), lower than the corresponding values in 1991 of Tsh 63.2 billion at the soft-core poverty line and Tsh 40.6 billion at the hard-core poverty line. Yet, given successive devaluations of the Tanzanian shilling, these amounts when estimated in dollars correspond to approximately US$ 1.21 billion and US$ 0.694 billion in 1983, and US$ 0.314 billions and US$ 0.202 billions in 1991, respectively, for the soft- and hard-core poverty lines. It is interesting to compare these figures to the Official Development

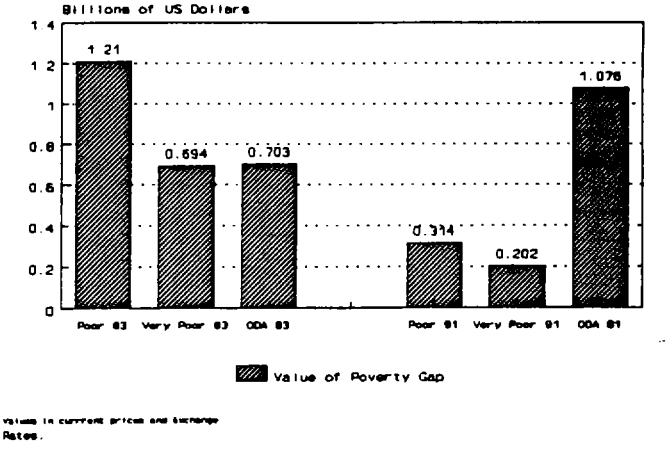

Figure 3.3: Minimum Amount of Payments Necessary to Eradicate Poverty in Rural Tanzania (in current US Dollars)

Assistance (ODA) from all donors, which amounted to about US$0.703 billion in 1983 and US$1.1 billion in 1991. Thus, ODA transfers in 1983 were sufficient to eliminate hard-core poverty. Thus, in 1991, ODA transfers were enough to eliminate both hard-core and soft-core poverty in rural Tanzania--assuming that perfect targeting were possible and that the money were used as recurrent transfers rather than capital investment.

19. Thus, growth has benefitted the population, in general, and has shifted a significant proportion of the population from below the poverty line to above it. However, if we look at the lower poverty line, we see that those who remained extremely poor were not able to benefit from this better performance of the economy.

Sensitivity Tests

20. It is very important to assess the **robustness** of poverty comparisons. Figure 3.4 [19] displays the empirical cumulative distribution of the income per adult equivalent for both 1983 and 1991 (at 1991 prices, considering three possible rates of inflation between 1983 and 1991). Each point in the curve represents the "head count" index of poverty (i.e., the proportion of the population living in households with income below the amount shown in the horizontal axis). Thus the cumulative distribution function can be considered as a poverty incidence curve (Ravallion, 1992). According to first order stochastic dominance criterion (Atkinson, 1987), the most stringent test, it cannot be concluded which year had the higher incidence of poverty. Ranking the years according to income distribution yields ambiguous results since the poverty incidence for one year does not lie entirely above or below the poverty incidence for the other

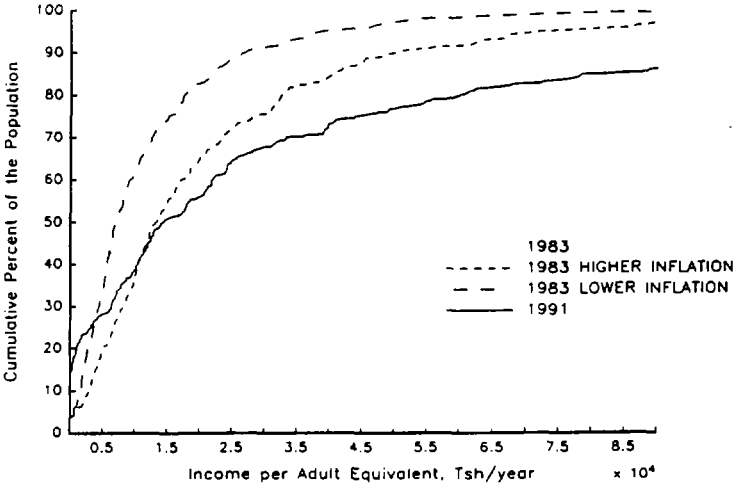

Figure 3.4: Poverty Incidence Curve

[19] The vertical line in Figure 3.4 is a poverty line set at Tsh 6,000.

year. These values depend, however, on the value of the poverty line and poverty index that are chosen. For poverty lines lower than Tsh 6,000, the poverty in 1991 was higher than in 1983; but for poverty lines higher than Tsh 6,000, the incidence of poverty in 1991 was lower than in 1983.

21. The incidence of poverty over the period is robust to a range of inflation rates, that would include almost certainly the true inflation rate. A higher inflation rate for the period between 1983 and 1991 would shift the cumulative distribution function of income down for 1983 (see Fig 3.4, where the line "1983 higher inflation" assumes that the increase in prices between 1983 and 1991 is 6.5 times rather than 4.93). In such a case, the value at which the two lines cross would be below Tsh 6,000--about Tsh 4,000--meaning that there would exist a smaller range of values for which the poverty in 1983 would be lower than in 1991. We also plotted the empirical cumulative distribution function for 1983 considering a lower increase in prices (3.5 times) between 1983 and 1991. The functions for 1983 and 1991, respectively, now intersect for a poverty line of about Tsh 13,000. Thus, for poverty lines lower than Tsh 13,000 per year per adult equivalent, there is less poverty in 1983 than in 1991. For poverty lines higher than Tsh 13,000, poverty is always lower in 1991 than in 1983. Recall that our poverty line was set at Tsh 15,030 (Tsh 11,171 for hard-core). Having in mind that we considered a wide range of inflation rates, and that it is very unlikely that the inflation rate used in this study is an overestimate, we can conclude that the reduction in the incidence of poverty over the period seems to be conservative.

22. The following conclusions emerge from this section:

a. Fewer households had income below the poverty line in 1991 than in 1983.

b. The soft-core poor became less poor. However, the fraction of the population living in households with income below the hard-core poverty line, though much less in 1991 than in 1983, had, on average, slightly lower incomes in 1991 than in 1983.

c. It seems that economic growth has benefitted the population, in general, and has shifted a significant proportion of the population from below the poverty line to above it. However, the smaller fraction (53.8 percent in 1983 *vis-à-vis* 41.8 percent in 1991) who are very poor--8.9 million people in 1983 and 8 million people in 1991--did not benefit from this improved economic performance.

The Impact of Negative Incomes

23. If only the households with strictly positive incomes are considered, the conclusions would have

Table 3.4: Two Different Poverty Indices and Two Poverty Lines: 1983 Compared with 1991--Households with Strictly Positive Incomes

Head Count				Poverty Gap			
Soft		Hard		Soft		Hard	
1983	1991	1983	1991	1983	1991	1983	1991
63.2	43	51.9	33	33.6	24	25.1	19

Notes:
Head Count = Counts the number falling below each poverty line.
Poverty Gap = Percent of poverty line income required to bring everyone below it up to the poverty line.
Soft = Soft core poverty line of Tsh 3,052.6 per year in 1983, and Tsh 15,029.8 per year in 1991.
Hard = Hard core poverty line of Tsh 2,268.8 per year in 1983, and Tsh 11,170.8 per year in 1991.

been stronger in terms of the reduction of the incidence of poverty between 1983 and 1991. Table 3.4 shows to what extent some of the results are sensitive to the decision of excluding the households without strictly positive incomes. According to the first order dominance criterion, for poverty lines higher than Tsh 4,000 (in 1991 prices) the distribution of income in 1991 first-order dominates the distribution of income in 1983, i.e., poverty is always greater in 1983 than in 1991 (see Figure 3.5). Given that Tsh 4,000 corresponds to less than $ 100 in purchasing power dollars (PPP), poverty lines lower than this threshold are clearly not sufficient to meet the most basic needs. Furthermore, we would have also concluded that the depth of poverty was lower in 1991 than in 1983, regardless of which poverty line is chosen.

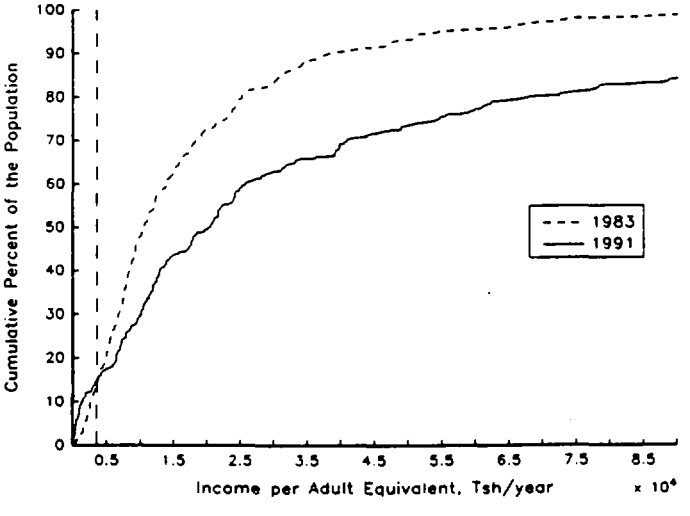

Figure 3.5: Poverty Incidence Curve (Households with strictly positive incomes)

4

The Size and Distribution of Income in Tanzania

Income Levels

Table 4.1: Income Levels in Rural Tanzania: 1983 and 1991 Compared (at 1991 prices)

	Mean Adult Equivalent Income		Mean Per Capita Income		Percent of Population		Actual Population (millions)	
	1983	1991	1983	1991	1983	1991	1983	1991
All	17,986	56,969	12,181	36,252	100.0	100.0	16.5	19.2
Better Off	39,445	110,174	27,100	70,069	35.4	49.5	5.7	9.5
Poor	6,291	5,067	4,053	3,295	64.6	50.5	10.8	9.7
Very Poor	5,147	3,675	3,326	2,366	53.8	41.8	8.9	8

Note: Mean income levels at the household level.

1. Rural incomes have improved substantially since 1983, in terms of both per capita and per adult equivalent. Rural adult equivalent incomes are estimated to be Tsh 17,896 in 1983 (1991 prices) (see Table 4.1), and Tsh 56,969 in 1991, and rural per capita incomes are Tsh 12,181, and Tsh 36,252, respectively, for 1983 and 1991. This change is equivalent to a staggering average annual growth rate of 14.6 percent. While this is higher than is credible, it nonetheless indicates an improvement in the economy.[1] Five factors must be taken into account to explain the difference between this growth rate and the official growth rate estimate. First, the real growth rate is highly dependent on the inflation rate that is chosen. Second, there is ample evidence that the "underground" economy may account for as

[1] Since the Economic Recovery Program was initiated in 1986, the agricultural sector has grown rapidly. The average annual growth rate in the agricultural GDP of approximately 5% between 1985 and 1991 is more than double the annual average for sub-Saharan Africa during the 1980's. Given a rural population growth rate of less than 2.8 percent, this resulted in real gains for the rural sector.

much as 60 percent of the official estimate,[2] and this informal economy is likely to experience greater growth than the rest of the economy. Third, these values should not be compared with the macroeconomic estimates of the per capita GNP. The results in this study concern averages of per capita household income, while the macroeconomic values give the average per capita income (ratio of total income in Tanzania to the total population). For high inequality levels, these values are likely to be very different. Fourth, we are "comparing" four regions in 1983 with all of rural mainland Tanzania in 1991. Fifth, given the small sample size of both surveys, the confidence intervals around the averages are wide, and the confidence interval around the estimate for the annual growth rate are even wider due to the previously mentioned problem with the estimates for the inflation rate.

2. Rural incomes have improved substantially since 1983. Yet the average incomes among the poor and the very poor is lower in 1991. Table 4.1 displays the mean household-level per capita income and the mean household-level adult equivalent income for two subsets of the rural population: the poor and the very poor. The following characteristics become apparent:

a. For the poor, average per capita income was Tsh 4,053 and Tsh 3,295, in 1983 and 1991, respectively (both estimates at 1991 prices). Average adult equivalent income was Tsh 6,291 and Tsh 5,067, in 1983 and 1991 respectively (both in 1991 prices).

b. For the very poor, average per capita income was Tsh 3,326 and Tsh 2,366, in 1983 and 1991 respectively (both in 1991 prices). Average adult equivalent income was Tsh 5,147 and Tsh 3,675, in 1983 and 1991, respectively (both in 1991 prices).

c. Regardless of the inflation rate used, it is most likely that the average income among the poor and the very poor was lower in 1991 than in 1983.

Sources of Income

3. This section analyzes the composition of income for the higher and lower poverty line for the years 1983 and 1991. Total income was separated into income from agricultural production and income from non-agricultural activities. The agricultural income was further disaggregated into three sources: income from crop production, income from livestock production, and other agricultural income. Other agricultural income includes income from wage labor, work at communal shamba, and income from renting agricultural assets. Non-agricultural income is the sum of labor income, business income, and

[2] Sarris and van den Brink (1993) estimated that the shares of the informal economy could be as high as 60 percent for the years 1985-1988. Using a different method, Maliymkono and Bagachwa (1990) estimated this value to be 40 percent.

Table 4.2: Sources of Income

Income in Tsh at 1991 constant prices (mean/year)		All		Better Off		Poor		Very Poor	
		1983	1991	1983	1991	1983	1991	1983	1991
Agricultural Income	all	51,839	208,552	100,217	380,086	25,385	14,717	21,362	8,619
	>0	54,077	244,519	100,217	396,485	27,426	25,284	23,432	18,561
	%	(96.4%)	(80.9%)	(100%)	(95.9%)	(94.7%)	(68.9%)	(95.9%)	(63.6%)
Crop income	all	37,064	188,231	69,143	343,918	19,523	9,829	17,477	6,457
	>0	39,021	252,030	71,623	374,140	20,716	25,623	18,709	21,160
	%	(95.3%)	(75%)	(97.1%)	(92.1%)	(94.5%)	(49.5%)	(95.8%)	(46.2%)
Livestock income	all	11,990	12,883	26,726	24,096	3,929	1,763	2,258	811
	> 0	29,161	27,662	46,475	41,346	13,523	6,646	10,072	4,523
	%	(43.2%)	(50.3%)	(58%)	(61.2%)	(35.5%)	(39.5%)	(31.6%)	(39.9%)
Other Agricultural Income	all	434.8	7,388	4,348	12,072	1,938	3,125	1,627	1,351
	%	(20%)	(21.3%)	(19.2%)	(29.5%)	(20.5%)	(27.7%)	(19.5%)	(26.9%)
Non Agricultural Income	all	18,675	17,017	46,091	31,377	3,688	2,268	2,026	815
	>0	41,590	41,050	75,276	75,513	15,091	15,133	12,857	12,879
	%	(49%)	(44.6%)	(61.2%)	(43.4%)	(42.6%)	(31.8%)	(40%)	(29.7%)
Wage Income	all	4,822	4,437	11,088	7,461	1,395	1,624	1,045	1,132
	%	(10.2%)	(10.5%)	(16.5%)	(13.8%)	(6.8%)	(8.9%)	(6%)	(8.21%)
Business Income	all	10,284	9,439	28,629	20,162	251.4	-1,316	-730	-2,006
	%	(32.5%)	(11.8%)	(37%)	(14.7%)	(30.3%)	(8.9%)	(29.1%)	(8.6%)
Other Income	all	3,841	2,741	6,853	3,754	2,199	1,960	1,883	1,689
	%	(21.4%)	(18.3%)	(28%)	(19.2%)	(18%)	(17.3%)	(17.4%)	(16.9%)
Total Income	all	70,514	225,569	146,308	411,462	29,072	20,504	23,383	13,596
	>0	74,877	244,841	146,308	411,462	33,667	27,025	28,293	19,028
	%	(96.6%)	(87.9%)	(100%)	(100%)	(94.8%)	(75.9%)	(94.1%)	(71.5%)

all = Mean household income for all the households in the sample (Tsh/year).
>0 = Mean household income for households with strictly positive income from the source (Tsh/year).
% = Percentage of households with strictly positive income from the source.
Due to small sample size for some income categories only the percent value is presented.

other income. The major component of "other income" is private transfers to the household.

4. Table 4.2 presents summary data on the average household income from six distinct sources of income over the two surveys. For some sources of income, two lines are displayed. "All" gives the estimate of the average income when all households are considered, regardless of whether income from the source is positive or negative. The line "> 0" displays the estimated average income when only households that have strictly positive income from that source are considered (% gives the percentage of households that have positive income from that source). The data show that in both years, and among both the poor and the better off, crop income is always the most important source of income (see Table 4.3 for a ranking of the relative importance of the six sources of income). The second most

Table 4.3: Ranking the Sources of Income

Source of Income	All		Better Off		Poor		Very Poor	
	1983	1991	1983	1991	1983	1991	1983	1991
Crop	1	1	1	1	1	1	1	1
Livestock	2	2	3	2	2	4	2	5
Other Agricultural	5	4	6	4	4	2	4	3
Non-Agricultural wage	6	5	4	5	5	5	5	4
Business	3	3	2	3	6	6	6	6
Other Non-Agricultural	4	6	5	6	3	3	3	2

important category is either livestock income, or business income, depending on the year and group under consideration. Accordingly, among the better off, the most important category for 1983 is business income, followed by livestock income. For 1991, this ranking is reversed. Among the poor and very poor, business income is the least important source of income for both 1983 and 1991, with reported average losses overall for both years among the very poor.[3]

5. Among the overall population and the better off, the major increase in income is from agricultural activities and is completely attributed to increased income from crop production (see Figure 4.1). Among the poor and the very poor, with the exception of "other agricultural income" and "non-agricultural wage income", all the nominal gains were eroded by the increase in the level of prices, resulting in losses in real terms. Between 1983 and 1991, the relative importance of agricultural income increased, and this increase was due entirely to an increase in the proportion of income from crop production from 71.5 percent of total income in 1983 to 90 percent in 1991.

Income Inequality

6. Any index of inequality is an attempt to summarize, with a single number, the variation found in a given distribution; as such, it is only an approximation of the inequality intrinsic to the distribution. A satisfactory measure of relative inequality should, at least, satisfy the principle of transfers and symmetry, while being mean and population size independent. Since different inequality measures stress

[3] According to our estimates, livestock was the second most important source of income in 1983, followed by business income. According to the published results (Bevan *et al.* 1989) livestock is the least important source of income, among the first and the second lowest quintiles. This reversion in the ranking is due to the use of different methodologies when estimating livestock income (see Annex A for details).

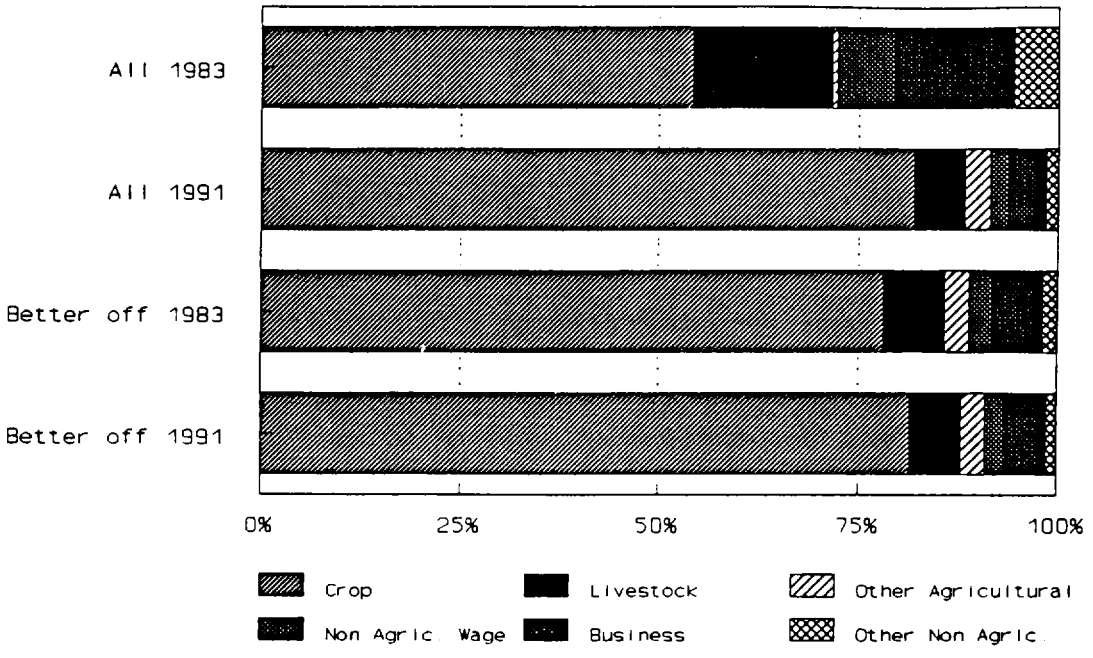

Figure 4.1: Sources of Income

different aspects of the distribution of a given variable (for example income), they may yield different results in their ranking of the inequality of a set of distributions.[4] Thus, different indices of inequality--Gini coefficient, Theil scaled entropy coefficient,[5,6] and coefficient of variation--are estimated in this

[4] For example the Gini coefficient is more sensitive to inequality among the less extreme incomes, while the coefficient of variation or Theil's entropy coefficient is more sensitive to inequality due to extreme poverty. Some other indices stress inequality due to extreme relative wealth.

[5] The Theil's scaled entropy coefficient is an index of relative inequality, and it can be expressed as $(1-\sum_h \frac{y_h}{H} \exp(-\sum_h \frac{y_h}{\sum_h y_h}))$. The coefficient of variation (the ratio of the standard deviation to the mean) is also an index of relative inequality. The Gini coefficient, also an index of relative inequality, measures how far a given distribution lies from perfect equality, i.e. measures the area between a given Lorenz curve and the Lorenz curve for a perfectly equal distribution (45 degree line).

[6] These indices of inequality are zero if there is no inequality present in the distribution, and they assume greater values as the distribution of income becomes more unequal.

paper to assess the inequality of the income distribution in rural Tanzania in 1983 and 1991.[7]

Table 4.4: Some Indicators of Evolution in Inequality in Rural Tanzania between 1983 and 1991

	All		Poor		Very Poor	
	1983	1991	1983	1991	1983	1991
Median	9,909	14,583	6,710	3,278	5,443	1,342
Gini	.53	.75	.35	.55	.34	.61
Gini[a/]	.52	.72	.32	.41	.29	.44
Theil	.39	.73	.2	.44	.19	.5
Coefficient of Variation	1.19	2.99	.61	.99	.58	1.12

Note: The negative values of income were converted to zero to obtain these estimates.
a/ Gini coefficient was estimated considering only households with strictly positive incomes

7. The data in Table 4.4 reveal that inequality in 1991 was greater for all population groups than in 1983. All estimated indices yield the same conclusion. The inequality is also greater for both years among the overall population than among the poor and the very poor. However, the increase in inequality among the lowest income groups was relatively higher than for the entire population. However, it must be recalled that we are comparing two intrinsically different groups of people, because a portion of the population that was poor in 1983 was no longer poor in 1991.

8. Figure 4.2 and Figure 4.3 display the Lorenz curve[8] for the distribution of income for all residents of the rural areas, ranked by their adult equivalent income, and very poor, respectively. Assuming that societal preferences are such that less inequality, *ceteris paribus*, yields higher utility, according to the Lorenz dominance criterion,[9] then rural populations of Tanzania would be worse off in 1991 than in 1983. However, despite the increase in rural inequality, the average income in real terms also increased. If one considers not only the way the pie is distributed (inequality), but also the size of the pie, it cannot be concluded which distribution is superior in terms of well being. Among the

[7] The different inequality indices use the distribution of persons either by adult equivalent income or by per capita income.

[8] The Lorenz curve is a graphic representation of inequality, which displays the cumulative share of total income accruing to each cumulative share of the population, when incomes are ordered from poorest to richest.

[9] According to the Lorenz dominance criterion, income's distribution A dominates distribution B when "the bottom $100p$ [where p is any value between 0 and 1] percent of income recipients in distribution A have a greater share i of total income than do the corresponding group in distribution B, and this is true for every p between zero and unity." (Lambert 1989:34).

very poor, the conclusion is clear. According to Atkinson's Theorem (Atkinson, 1970) the very poor were worse off in 1991 than in 1983, since the increase in inequality was accompanied by a decrease in real average income.

9. The results led us to conclude that rural inequality increased between 1983 and 1991. During this period, there were major reforms in the agricultural price policy. Yet not all farmers have benefitted equally from increases in producer prices. As prices rose, inequalities within the agricultural sector increased, and poor, less-efficient farmers were left behind. In 1985 FAO stated that "measures to implement price policy must be designed and administered so as to ensure that small farmers participate and benefit fully" (p 43). Lugalla (1993) stated: "it seems economic growth in the agricultural sector has been accompanied by uneven distribution of benefits, it has intensified inequalities, and significant groups of the rural population have either experienced little or no improvement in their living standards or have suffered a decline in income and consumption." This is in agreement with the conclusions of the present study. Furthermore, World Bank (1993b) finds that the increase in inequality in rural areas was accompanied by a decrease in inequality in the urban areas.

10. Table 4.5 shows to what extent some of the results may be sensitive to the decision of only including households with strictly positive incomes. If only households with strictly positive incomes had been included, the conclusions in terms on inequality would have been the same, i.e., rural inequality increased between 1983 and 1991, for all population groups but it was higher among the overall population than among the poor. In relative terms, the increase of inequality among the lowest income groups was higher than for the entire population. Comparing average adult equivalent income estimates in 1983 and 1991, we would have concluded that rural incomes improved substantially since 1983. As before, the average income among the poor (and the very poor) was lower in 1983 than in 1991.

Table 4.5: Inequality and Income Levels (Households with Strictly Positive Income Levels)

	Mean Adult Equivalent Income		Gini Coefficient	
	1983	1991	1983	1991
All	18,253	60,551	.52	.72
Better Off	39,445	101,174	.37	.60
Poor	7,411	6,528	.32	.41
Very Poor	6,098	4,748	.29	.44

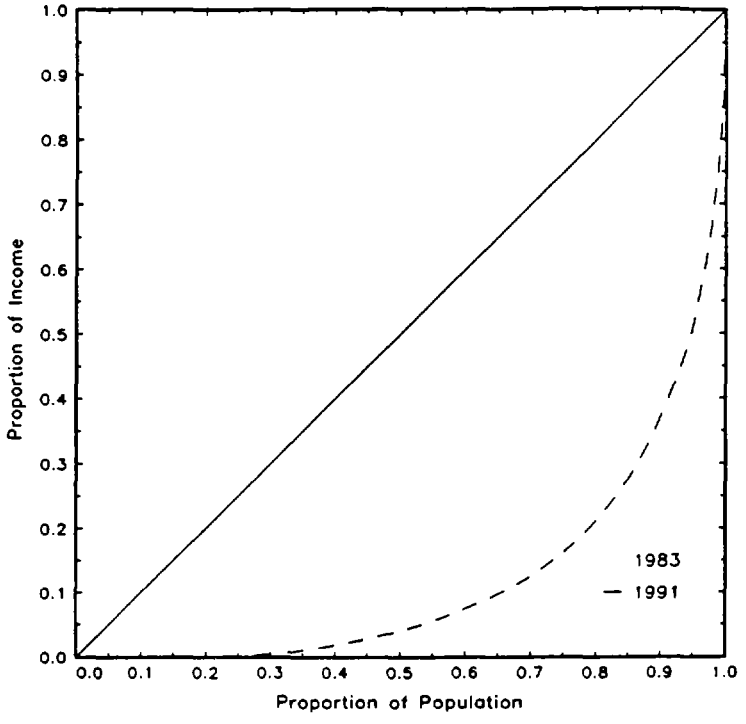

Figure 4.2: Lorenz Curve for the Distribution of Income (Rural)

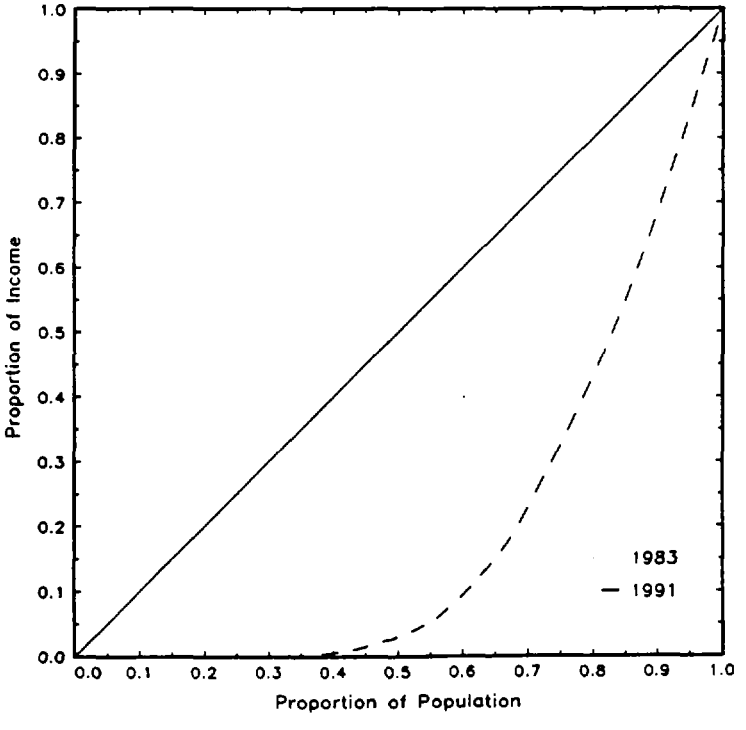

Figure 4.3: Lorenz Curve for the Distribution of Income (Hard-Core Poor)

11. This increase in inequality is consistent with Kuznet's hypothesis that income inequality tends to first increase and then decrease during the process of economic development. However, the results should be considered with caution:

a. First, income data, rather than expenditure data, were used. If families can dissave or borrow, actual standards of living are not constrained by current income. In fact, empirical evidence suggests that households are able to adjust to substantial transitory income fluctuations through savings and dissavings.

b. Second, 1991 was a bad agricultural year; this may have been reflected in the non-negligible number of households with negative estimated incomes.

c. Third, we are comparing a sample of four regions in one year (1983) with all the rural regions in another year (1991). If the four regions represent a higher income sample, the comparison is underestimating the improvements that occurred in terms of income and reduction of poverty.

d. Fourth, the sample size is relatively small for both years, and extreme observations may prove to be highly influential.

e. Finally, further research is needed to determine whether rural inequality is primarily caused by inter-region or intra-region differences. This is a crucial determination in terms of potential for targeting.

Poverty: Growth and Inequality

12. Income inequality can be decomposed into inequality between the poor and non-poor (inequality due to differences in the average income) and inequality within the poor and the non-poor (inequality due to unequal distribution of income within the two groups). [10] This enables us to answer two different sets of questions:

a. How much of the overall inequality of the income distribution results from the fact that some groups are better off than others?

b. How much of the overall inequality in rural Tanzania is due to inequality among the poor, and how much is due to inequality among the better off?

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[10] Some inequality indices cannot be decomposed (e.g. Gini coefficient) in the sense that a residual term due to overlapping arises. However, in our case, the division is between poor and non-poor--two mutually exclusive groups--, no element in one group has an income greater than the income of an element in another group, so overlapping is zero.

13. According to the results of this study, summarized in Figure 4.4, the most important source of inequality between poor and better-off (or non-poor) in both years (as well as between non-very poor and very poor) is the "within group" inequality. Furthermore, the increase in overall rural inequality between 1983 and 1991 is due more to an increase of the inequality within groups than between groups.

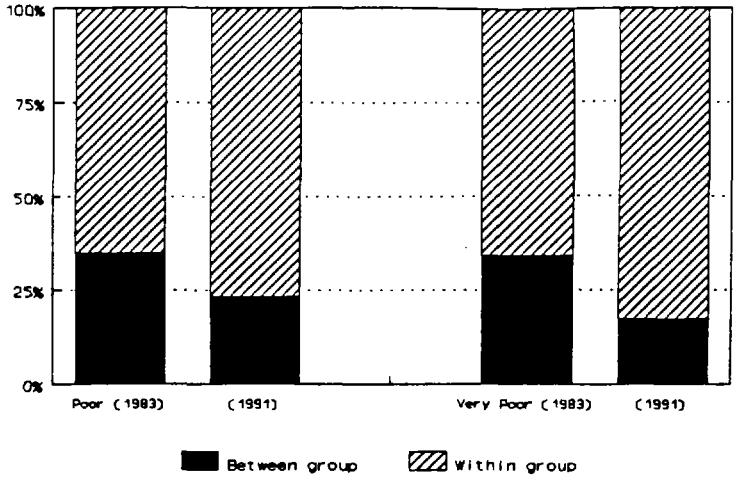

Figure 4.4: Breakdown of the Overall Gini Coefficient

14. This study uses income data to assess the inequality in income distribution among the population of rural Tanzania. As mentioned previously, the income estimate does not account for the value of implicit public transfers that are biased against the poor. Neglecting the consumption of public goods that generate utility is likely to lead to an underestimation of the level of inequality in the distribution of welfare. The public expenditure review (World Bank, 1994), reveals that, for the fiscal year 1993/1994 "per annum, the government spends Tsh 6,600 on each student in primary schools; Tsh 75,000 on each student in secondary schools; [...] and an astounding Tsh 1,575,000 on each student at the two universities". Since there is evidence that the poor do not benefit directly from high level education, this structure of transfers increases, rather than decreases inequality. The composition of health expenditures is also biased against the poor. In fiscal year 1994, only 14 percent of total health expenditures were budgeted for preventive services and programs; and within the curative sector, the share allocated to health centers and dispensaries declined. These are just a few examples of how the composition of public expenditures is biased against the poor. The government subsidizes luxury goods when there is a shortage of funds for basic "consumption" goods.

Decomposition of Changes in Poverty

15. This section addresses the extent to which each group captured the benefits of the reform. Tanzania's economy experienced solid income growth in the late 1980's and early 1990's. How much of this growth effectively benefitted the poor is an interesting question that has not been quantified in any

study of Tanzania. Datt and Ravallion (1992)[11] present a decomposition of poverty indices into the relative contributions of income growth and redistribution of income. Following Ravallion and Datt (1991) or Datt and Ravallion (1992), the change in the P_α index of poverty can be written as the sum of a growth component, a redistribution component, and a residual term:

$$P_\alpha^{91} - P_\alpha^{83} = P_\alpha(z/y_{91}, L_{83}) - P_\alpha(z/y_{83}, L_{83}) + P_\alpha(z/y_{83}, L_{91}) - P_\alpha(z/y_{83}, L_{83}) + \text{Residual}$$

where z is the poverty line, y_t is the income at time t, and the inequality of the income distribution is summarized in the parameters describing the Lorenz Curve, L_t. The growth component-- $P_\alpha(z/y_{91}, L_{83}) - P_\alpha(z/y_{83}, L_{83})$ --captures the effect on the P_α measure of poverty of the change in mean income between 1983 and 1991, while holding constant the income distribution for 1983 (our reference period). The redistribution component-- $P_\alpha(z/y_{83}, L_{91}) - P_\alpha(z/y_{83}, L_{83})$ --captures the effect of the changes in the distribution of income between 1983 and 1991, while holding income constant at the 1983 level. The residual component reflects the interaction between changes in the mean and in higher moments of the income distribution.[12]

16. The changes in the incidence of rural poverty, which occurred in Tanzania between 1983 and 1991, are the result of an increase in the mean level of adult equivalent income. The reduction in poverty would have been much greater if the increase in the inequality of income distribution had not been as biased against the poor. This section presents quantitative evidence to support this assertion.[13] Table 4.6 presents our estimates of the decomposition of changes in rural poverty, using adult equivalent income as the criterion to rank households. As previously seen, the incidence of poverty decreased 14.1 percentage points for the higher poverty line. If the distribution of income had not changed, the reduction

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[11] See Annex A for more on the methodology and formulas.

[12] The residual will vanish if:

(1) the reference period is chosen such that it is the mid point year between the base and the terminal year; or

(2) either the mean income, or the Lorenz curve, does not change within the period under analysis.

[13] The estimated Lorenz curves used in this study, for both 1983 and 1991, tracked the data extremely well (see Annex A for results).

Table 4.6: Decomposition of Changes in Poverty

Poverty Line	Growth Component	Redistribution Component	Residual	Total Change in Poverty
		Head Count Index		
High	-38.45	11.8	12.55	-14.1
Low	-34.4	16.7	5.7	-12.0
		Poverty Gap Index		
High	-23.7	20.5	1.6	-1.6
Low	-19.0	22.9	-1.9	2.0

Notes: High = Poverty line of Tsh 3,052.6 per year in 1983, and Tsh 15,029.8 per year in 1991.
Low = Poverty line of Tsh 2,268.8 per year in 1983, and Tsh 11,170.8 per year in 1991.

that occurred in poverty would have been much higher and equal to 38.45 percentage points. The distributional shifts accounted for an increase of 11.8 percentage points. The residual accounted for a balance of 12.55 percentage points. Thus, while the poor benefitted from growth over the period, the rich captured a much greater share of economic improvement. In fact, not only did the changes in the distribution have the effect of attenuating the growth effect, but also the observed decrease in poverty was entirely due to the positive growth in income. According to our estimates, the depth of poverty is likely to have increased between 1983 and 1991. This increase is entirely due to a shift of the income distribution biased against the poor.

17. While the growth component dominates the redistribution component, regardless of what poverty line or criterion is used, the relative importance of the two factors can vary greatly according to which measure of poverty is used. The redistribution effect becomes stronger as greater weight is given to those whose incomes are farther below the poverty line. If approximately 20 percent of the increment to the better off had been targeted through income transfers to the poor and very poor, there would have also seen a reduction in the depth of poverty between 1983 and 1991. Thus, a standard strategy to alleviate poverty is for the government to target subsidies for social services to the poor--basic primary education and basic health care--and, "where necessary these measures should be supported by safety nets for those people who are unable to take advantage of growth or those who might be adversely affected by adjustment process." (World Bank 1994b) These findings indicate that significant improvements could be financed from general economic improvement.

5

Characteristics of the Rural Poor in Tanzania

1. This section describes how the poor (and the very poor) differ from the rest of the population, and whether these differences have changed between 1983 and 1991. First, we examine the socio-economic and demographic characteristics of these different populations. Second, we look at three assets of the poor: human capital (as measured by formal education), land, and livestock.[1]

Demographic Characteristics

2. Clearly, there were no major changes in the socio-demographic structure of the population between 1983 and 1991 (see Figure 5.1). In both years, Tanzania was characterized by a very young population. More than 50 percent of the rural population was younger than 20 years old, and approximately 28 percent of the rural population was younger than 10 years of age. These values are similar across the sub-populations of the poor and the very poor. The major difference between 1983 and 1991 is in the age group of 10 to 19 year old, which witnessed a significant increase in its relative representation among the poor.

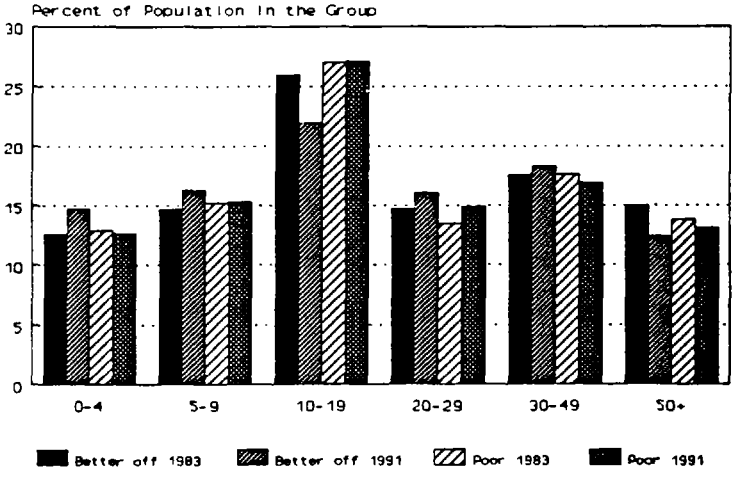

Figure 5.1: Poverty and Age Distribution of the Population

[1] The other crucial asset of the rural population is labor. The absence of information on agricultural self-employment activities (in 1983) prevents us from making a comparison.

Table 5.1: Demographic Characteristics by Type of Household

	All		Better -Off		Poor		Very Poor	
	1983	1991	1983	1991	1983	1991	1983	1991
Household Size	6.89	6.62	6.25	6.58	7.26	6.65	7.17	6.52
Adult Equivalents	4.26	4.10	3.89	3.97	4.46	4.13	4.41	4.04
Dependency Ratio (Percent)	1.21	1.25	1.13	1.27	1.25	1.23	1.24	1.26
Average Age of Household Head	48.8	47.3	47.9	46.9	49.2	47.8	49.1	47.4
Average Number of Children Younger Than 7	1.64	1.64	1.47	1.73	1.73	1.54	1.71	1.50
Average Number of Children Younger Than 14	3.18	2.97	2.90	2.98	3.30	2.95	3.30	2.90
Average Number of Children Younger Than 18	3.95	3.68	3.60	3.58	4.21	3.77	4.20	3.75
Average Number of Adults Older Than 64	.30	.41	.26	.44	.32	.38	.30	.39

Note: The variable dependency ratio is defined as the proportion of people younger than 14 and older than 65, to the number of people between the ages of 15 and 64.

3. Table 5.1 provides further analysis of the changes that occurred in the socio-demographic characteristics of the overall population, and its subsets--non-poor, poor and very poor--between 1983 and 1991. The average family had 6.89 members in 1983 and 6.61 in 1991. Between 1983 and 1991, the average number of children younger than 7 years of age increased among the better off and decreased among both the poor and the very poor. A different evolution occurred in the "average number of children younger than 14", and "average number of children younger than 18". Among all groups, both variables declined after 1983. However, the average number of older people increased due to increased life expectancy, which reflects improved standards of living. This increase was higher among the better off than among the poor and very poor.

Characteristics of Economic Activity

4. Table 5.2 displays details of the economic activity. The following facts become evident from the comparison between 1983 and 1991:

a. The percentage of households hiring labor to help with agricultural activities doubled between 1983 and 1991. In 1983, 12 percent of the households hired labor to complement or substitute the household labor, while this value was 22 percent in 1991. Among the better off, this value jumped from 16 percent to 27 percent. This reflects the fact that the use of hired labor was officially discouraged before liberalization.

b. The proportion of the rural population using fertilizer did not change significantly between 1983 and 1991. Nevertheless, it increased slightly among the better off and

decreased among the poor and very poor.

Table 5.2: Some Characteristics of the Economic Modus Operantis

	All		Better off		Poor		Very Poor	
	1983	1991	1983	1991	1983	1991	1983	1991
Hiring labor in Agr.	12.1	22.3	16.1	27.4	9.9	17.3	10.0	17.7
Buying Fertilizer	27.7	26.7	27.3	29.3	27.9	23.9	27.0	22.3
Buying Pesticides	16.1	18.8	15.3	23.3	16.5	14.3	17.5	15.5
Using Plough	12.0	20.6	14.1	23.5	10.8	17.8	10.1	18.6
Using Cart	1.8	7.4	2.9	7.3	1.2	7.6	1.0	7.5
Hiring labor in Business	6.3	3.0	8.6	3.3	5.0	2.7	5.2	3.2

Note: Households were classified as poor according to their adult equivalent income.

c. The same qualitative trend is observed in the estimate of the percentage of households buying pesticides. In 1983, 16 percent of the rural households bought pesticides versus 19 percent in 1991. However, the increase in the overall value for the rural populations is due only to increases among the better off. As a matter of fact, both among the poor and the very poor, a decrease in these estimates occurred between 1983 and 1991.

d. The use both of plough and cart increased between 1983 and 1991, regardless of the groups considered. This, together with the fact that the dependency ratio increased slightly, may mean that farmers attempted to overcome the labor constraint by implementing more intensive techniques: hiring labor and using machinery.

Holdings of Assets

5. Analysis of asset ownership (as well as other basic needs) provides a non-money measure of welfare. This section will analyze the evolution of ownership of three important assets: human capital, land, and livestock. There are hardly any differences between the poor and the rural population in general terms of ownership of important productive assets, such as land and livestock. However, there is a striking difference in human capital ownership between the poor and the better off in the rural areas of Tanzania. Therefore, more important than increasing access of the poor to productive assets, is to raise the return on those assets.

Human Capital

6. The literacy levels were very similar in 1983 and 1991. From Table 5.3, one can infer that as

Table 5.3: Literacy Among People Older Than 14

	Four Regions		Income						Gender			
			Better Off		Poor		Very Poor		Male		Female	
	1982	1991	1982	1991	1982	1991	1982	1991	1982	1991	1982	1991
Read and Write	59.1	61.0	61.0	67.6	58.0	54.5	56.7	52.8	71.1	70.7	48.4	51.2
Read Only	6.2	6.3	6.0	4.3	6.2	8.3	5.9	9.2	4.5	7.3	7.6	5.4
Neither	34.8	32.7	33.0	28.1	35.8	37.2	37.4	38.0	24.4	22.1	43.9	43.4
Total	100	100	100	100	100	100	100	100	100	100	100	100

Note: Households were classified as poor according to their Adult Equivalence Scale Income.

much as 40 percent of the rural population older than 14 were illiterate in both years. If we break down the figure by gender, then we can see that women were more likely to be illiterate than men. However, two facts are reassuring in terms of narrowing the gender gap:

a. The literacy rate among women slightly increased (though the increase is not statistically significant) between 1983 and 1991.

b. The gender gap in illiteracy is due to higher illiteracy rates among older women (see Figure 5.2). The elderly are more likely to be illiterate in general, and older women are particularly affected by illiteracy. The fact that female illiteracy is thus concentrated is reassuring. There is ample evidence that female education has a very strong impact in terms of improving mortality rates, decreasing fertility rates, and improving the nutritional status of children. Cochrane *et al.* (1980) were able to quantify this impact as being twice as strong as that of male education.

7. Table 5.3 also disaggregates the literacy rates by poverty status. While the literacy rates among the better off increased by approximately 7 percentage points between 1983 and 1991, they deteriorated among the poor and the very poor. Further analysis is needed to infer what, if any, is the relationship between education and poverty.

8. As demonstrated previously, the illiteracy rate in rural Tanzania did not exceed 30 percent in either year. When compared with other sub-Saharan African countries in terms of the literacy rate, Tanzania is performing relatively well. However, as Table 5.4 shows, 51.6 percent of the rural population older than 14 did not have any formal education beyond the primary level in 1983 (61.6

percent in 1991). By 1991, nearly 4 percent had achieved some secondary education. This constitutes a substantial improvement in comparison to 1983, when the value was only 1.5 percent. Nevertheless, this value is too low both in absolute terms and in relative terms, *vis-à-vis* sub-Saharan Africa.

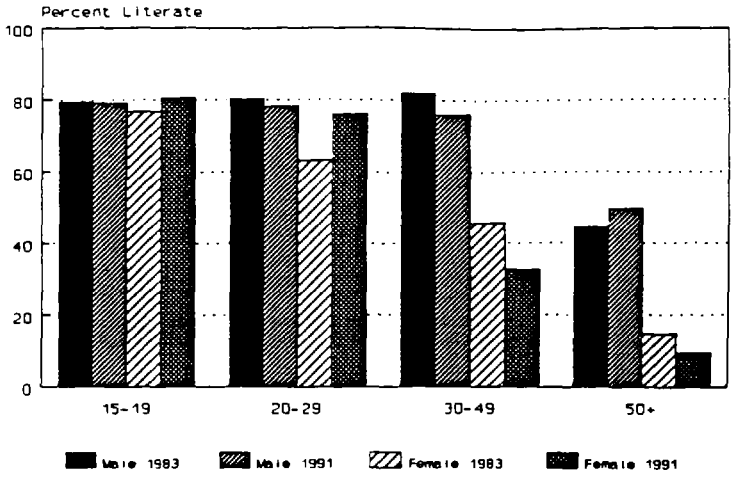

Figure 5.2: Literacy by Gender: 1983 and 1991 compared

9. Very few of those who continue beyond primary education live in households that were classified as poor (or very poor). Accordingly, among the better off, 6 percent had attended secondary school in 1991, while among the poor and the very poor this value was approximately 1 percent. The question that remains is whether the under-representation of people from poor households among the more highly educated respondents indicates that the educational system is biased against poor people, or that higher education is the route out of poverty.

Table 5.4: Highest Education Achieved (People Older than 14)

	All		Income						Gender			
			Better -Off		Poor		Very Poor		Male		Female	
	1982	1991	1982	1991	1982	1991	1982	1991	1982	1991	1982	1991
None	30.6	30.6	28.9	24.3	31.6	37.0	32.4	36.6	20.1	19.9	40.0	41.4
Primary	51.6	61.6	50.1	65.2	52.5	58.3	51.9	58.0	62.6	75.5	41.8	52.3
Secondary	1.5	3.6	2.2	6.1	1.3	1.0	1.2	1.2	2.0	5.0	1.2	2.0
University	0	0	0	0	0	0	0	0	0	0	0	0
Adult Literacy/Other	16.2	4.2	18.9	4.5	14.6	3.8	14.4	4.0	15.3	4	17.0	4.2
Total	100	100	100	100	100	100	100	100	100	100	100	100

Note: Households were classified as being poor according to their equivalent income.

10. The gender gap in education is evident in higher levels of education. Among men older than 14 in 1991 (1983), 14.5 (2) percent had some secondary education, while among women, only 2 (1.2) percent had attended secondary school. The proportion of the population that attended secondary school

increased for both males and females, but the increase was much greater for men.

Table 5.5: Percentage of Children Enrolled in School

Agegroup	All		Income						Gender			
			Better -Off		Poor		Very Poor		Male		Female	
	1982	1991	1982	1991	1982	1991	1982	1991	1982	1991	1982	1991
7-9	31	27	37	28	28	28	28	26	26	30	37	26
10-13	78	65	78	69	79	60	79	59	75	58	79	70

Note: Households were classified as being poor according to their adult equivalent income.

11. If education is a way out of poverty, then Tanzania's falling enrollment rates and decreasing expenditures on education are very worrying. The fraction of children enrolled in school decreased between 1983 and 1991 (see Table 5.5). As the estimates show, many children only enter school after age nine. In 1983, only 31 percent of children ages 7-9 were attending school. By 1991, this figure had decreased to 27 percent. Among the children ages 10-13, 78 percent were in school in 1983, *vis-à-vis* 65 percent in 1991. The only positive sign to emerge from this negative trend is that, within this age group, the fall in the enrollment rate is significantly lower among females than males. Among the better off households, the proportion of children in the age group 10-13 enrolled in school was higher than among the poor and very poor in 1991. However, the percentage of children enrolled in school decreased for both economic groups.

12. From 1983 to 1991, both in real terms and nominal terms, the per capita government expenditure on education decreased. The private sector did not compensate for this decline and total expenditures declined in real terms over the period (see Table 5.6). Even using a very conservative estimate of the inflation rate, a one-tail test of significance indicates that the average education expenditures per student were higher in 1983 than in 1991.[2] If the average private

Table 5.6: Education Expenditures per Person in School (current prices)

	1983	1991	Ratio
All	310.5	781.8	2.5
Better Off	329.4	821.0	2.5
Poor	301.6	739.3	2.5
Very Poor	284.8	547.2	1.92

[2] The difference may be smaller than it looks. The 1983 survey asked about individual expenditures on education, while in the 1991 survey asked for total household expenditures on education. There is some evidence that respondents tend to recall better when asked about more detailed items.

expenditures per pupil reflect the willingness to pay for education, then this willingness to pay declined sharply between 1983 and 1991. In absolute terms, the decline was stronger among the poor and the very poor than among the better off.

13. According to a World Bank study of the East Asian Miracle (1993d), a substantial share of the success of the East Asian economies is due to an accumulated stock of human capital. Education policies and public spending focused on primary and secondary education, generating rapid increases in labor force skills. For example, in the mid-1980's, Indonesia, Korea and Thailand devoted more than 80 percent of their public education budgets to basic education. These values contrast markedly with the structure and the levels of public expenditures in Tanzania. This fact, together with falling enrollment rates, presents an alarming picture for the coming years in Tanzania.

Land

Table 5.7: Ownership and Distribution of Landholdings

	All		Poor		Very Poor	
	1983	1991	1983	1991	1983	1991
Owners (%)	99.7	96.4	99.7	96.5	99.7	97.3
Mean	3.28	4.66	3.37	4.1	3.37	4.10
Median	2.39	3.00	2.39	3.00	2.39	3.00
Coefficient of variation	.97	1.41	.96	.98	.96	.99
Gini Coefficient	.45	.50	.45	.44	.45	.44
Theil Coefficient	.29	.40	.29	.29	.29	.30

Note: Households were classified as poor according to their adult equivalent income.

14. In Tanzania, unlike in countries like India and Pakistan, quantity of land is not a major determinant of poverty status and income distribution. Very few rural households are excluded from owning land (see Table 5.7). In 1983 almost 100 percent of the households owned at least one plot of land, regardless of their income status. The average landholding was 3.28 hectares in 1983 and 4.66 hectares in 1991.[3] However, landholdings were unequally distributed. Nearly 50 percent of the households had less than 2.39 ha (median) in 1983, and less than 3 in 1991. Nevertheless, the inequality in income distribution is much greater than the inequality in landholdings.

[3] Bevan *et al.* report a similar estimate, but the units are in acres rather than hectares. However, their questionnaire asked for the area in hectares, not in acres.

15. Figure 5.3 displays the Lorenz curves for the distribution of land in the rural areas of Tanzania for 1983 and 1991. From the relative position of the curves, it appears that the distribution of the land was slightly more "egalitarian" in 1983 than in 1991. The different indices of inequality that were estimated (see Table 5.7) also indicate that, among the overall rural population, the inequality of landholding distribution increased slightly. Among the poor and very poor, all the estimates indicate that there was no significant change in the distribution of landholdings. Nevertheless, the estimates indicate a relatively low level of inequality compared to other countries. Nafziger (1988) presents an estimate of the Gini coefficient for 15 Afro-Asian countries of .53. This is higher than our estimate for Tanzania. This is not surprising as land is relatively abundant in Tanzania.

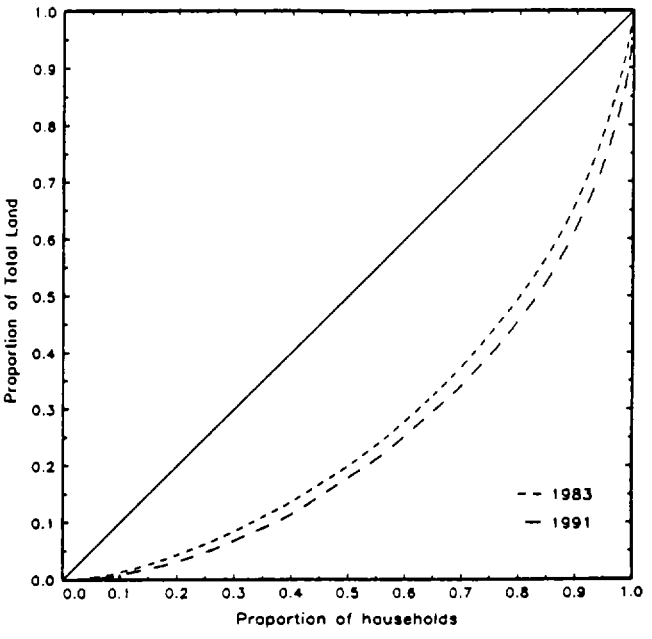

Figure 5.3: Lorenz Curve for the Distribution of Land

Livestock

Table 5.8: Ownership and Distribution of Livestock

	All		Poor		Very Poor	
	1983	1991	1983	1991	1983	1991
Owners (%)	65.4	63.5	59.8	63.2	58.3	55.6
Mean	4.9	5.06	3.39	2.61	2.74	2.35
Mean (for Index > 0)	7.6	7.7	5.7	4.7	4.7	4.2
Median	.56	.32	.30	.15	.27	.15
Coefficient of variation	2.97	2.74	3.10	2.77	2.85	3.03
Gini Coefficient	.83	.82	.84	.85	.83	.86
Theil Coefficient	.80	.78	.81	.81	.79	.82

16. The proportion of households owning some small or large stock was approximately the same in

1983 and in 1991 (see Table 5.8). Table 5.8 also demonstrates that the same conclusion holds true for the average index[4] of livestock owned: approximately five for both years when all rural households are considered, and approximately seven for those whose ownership is strictly positive. Among the poor and very poor, these values are significantly lower than among the better off, but relatively unchanged between the two years considered.

17. As mean values may mask information on the distribution of livestock values, several measures of inequality in the distribution of livestock ownership were estimated. According to these estimates, the inequality in livestock ownership distribution decreased between 1983 and 1991 for the overall rural population. Among the poor and very poor, the inequality decreased or increased depending on the inequality index used. However, as depicted by the empirical Lorenz curves, the conclusion is ambiguous even for the overall rural population. According to Figure 5.4, the distribution of livestock ownership in 1991 has more Lorenz inequality at the bottom and less at the top than does the distribution of livestock ownership in 1983.

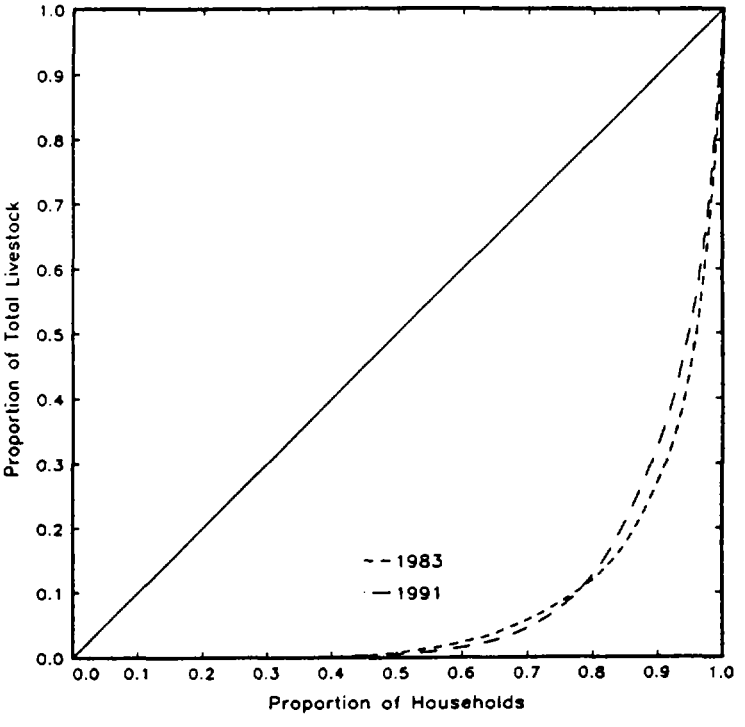

Figure 5.4: Lorenz Curve for the Distribution of Livestock

Pattern of Agricultural Production

18. A large majority of the rural population engages in agricultural activities. Therefore, a complete understanding of the trend on poverty and income distribution requires the simultaneous consideration

[4] An index of livestock values (see World Bank 1993b) was used to produce a homogeneous measure of livestock values. These values were used both in 1983 and in 1991. It is worth noting that the weighted estimates using the 1983 data and the 1991 data were very similar.

Table 5.9: Pattern of Crop Production

	All		Better off		Poor		Very Poor	
	1983	1991	1983	1991	1983	1991	1983	1991
	Percent of households producing:							
More than one crop	84.8	57	83.8	65.4	85.4	48.6	85.2	46.3
2 or 3 crops	68.8	42.7	66.1	42.9	70.5	42.3	73.5	39.8
4 crops	9.6	8.2	9.5	12.1	9.7	4.3	8.0	4.3
1 cash crop	50.0	26.0	48.2	24.2	51.2	20.3	49.8	17.1
More than 1 cash crop	3.9	3.7	3.6	6.8	4.1	.7	4.1	.9
1 cereal crop	28.7	59.5	24.9	12.9	31.2	21.5	33.5	20.0
More than 1 cereal crop	61.2	42.3	67.2	51.9	59.2	32.8	57.1	33.1
Proportion of Sales of Cash Crops on Total Sales	.34	.53	.34	.60	.33	.40	.34	.40

Note: Households were classified into poor according to their adult equivalent income.

of crop production and crop sales patterns. Unfortunately the small sample size of the two surveys preclude us from conducting a detailed analysis. Table 5.9 presents some aggregate information of the production patterns in 1983 and 1991.

Table 5.10: What Crops Are Farmers Producing? Changes Between 1983 and 1991

Type of Crop	All		Better-Off		Poor		Very Poor	
	1983	1991	1983	1991	1983	1991	1983	1991
Local Maize	55.1	55.2	60.5	56.7	51.6	53.8	52.4	54.4
Hybrid Maize	22.2	29.9	19.6	33.2	23.9	26.8	24.4	21.6
Beans	29.1	48.4	36.2	48.4	24.5	48.4	22.6	47.9
Millet	22.9	21.2	20.7	23.4	24.3	19.3	23.1	19.2
Sorghum	9.7	7.6	7.9	7.9	10.9	7.3	8.9	6.6
Cassava	7.6	12.7	9.4	13.2	6.4	12.1	4.6	11.1
Groundnuts	15.4	10.1	13.6	9.9	16.6	10.3	14.3	7.8
Wheat	12.2	2.8	6.9	3.1	15.6	2.5	17.1	2.5
Rice	15.3	8.1	22.1	6.4	10.8	9.6	9.7	10.7
Coffee	19.5	9.2	17.0	13.9	21.2	4.9	21.8	3.6

Other crops are not presented because of the very small number of observations.

19. The following conclusions become apparent:

    a. In 1991, for the rural population in general, a household was less likely to produce a

high number of crops, than in 1983.

b. However, among the better off, a household was twice as likely to produce more than one cash crop in 1991 than in 1983.

c. The proportion of revenues from the sale of cash crops on total sales increased significantly between 1983 and 1991. The increase occurred mainly among those that were classified as better off. This is the result of a fall in the prices of food crops--whether in the parallel or in the official market (see Figure 2.5)--relative to export crops that began in the late 1980's.[5] During the height of the crisis, given that cash crops returns decreased in relative terms, the percentage of sales income from cash crops declined as income increased. As Bevan *et al.* (1989:53) concluded: "the policy of depressing the producer prices of cash crops had therefore been carried to the point at which was regressive within the peasant community."

20. Table 5.10 presents more detailed information on the types of crop produced in 1983 and in 1991. Among the overall rural population, the percentage of farmers producing maize--local and hybrid--was slightly higher in 1991 than in 1983. However, among the better off, the proportion of those producing local maize decreased, while the proportion of those producing hybrid maize increased 13 percentage points. Among the poor, and very poor, the reverse occurred. The production of cassava and beans increased substantially among all the population groups, while the production of wheat and rice decreased substantially. This is consistent with expectations, since the prices of beans increased substantially relative to other crops. According to these results the percentage of households growing coffee in 1991 was about half of that in 1983. This is probably due to the sampling scheme used in 1983, in which coffee farmers were oversampled. However, it should be noted that, relative to other food crops, the price of coffee decreased during the 1980's. Thus, this decrease may reflect not only the particularities of the 1983 survey, but a supply response from rational economic agents as well.

[5] This evolution in the relative prices of food crops and export crops occurred despite a fall in the world prices of the major relevant export crops. This is due to compensating domestic policy, which has included considerable devaluations.

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ANNEX A

Methodological Background

Fitting Lorenz Curve Distributions

1. The P_α index of poverty in the time period t can be written as a function of the poverty line z, the mean income μ_t, and of the inequality of the income distribution as summarized in the parameters describing the Lorenz curve (L_t) (Datt and Ravallion,1992):

$$P^{\alpha}_{t+n} - P^{\alpha}_{t} = [P(z/\mu_{t+n}, L_r) - P(z/\mu_t, L_r) \quad \text{Growth Component}$$

$$+ P(z/\mu_r, L_{t+n}) - P(z/\mu_r, L_t) \quad \text{Redistribution Component}$$

$$+ R(t,t+n;r) \quad \text{Residual}$$

where the residual component will vanish if either the mean income for the periods in the comparison are equal, or the Lorenz curve is the same. The residual will also vanish if the reference period is any point in time between t and $t+n$, rather than either t or $t+n$. We chose $r=t$.

Table A.1: Results from Fitting Lorenz Curves

Parameter Estimates	Adult Equivalent Income		Per Capita Income	
	1983	1991	1983	1991
alpha	1.1597	2.5121	1.1611	2.4081
	(6.6091)	(4.9974)	(6.9716)	(5.1282)
beta	.5221	.2996	.5071	.2891
	(13.457)	(9.312)	(14.787)	(9.964)
R^2	99.9	99.9	99.9	99.9

Note: t-ratios are inside parentheses.
All the parameter estimates are significantly different from zero at the 1% confidence level.

2. In order to decompose the poverty measures into growth and redistribution components, one must estimate a Lorenz Curve. Several different functional forms were adjusted (e.g. Kakwani and Podder,

1973; Rasche *et al.*, 1980; Ortega *et al.*, 1991; and Kakwani, 1980). Conditional on consistency with the theoretical conditions for a valid Lorenz curve, the choice of the Lorenz curve specification was made according to the goodness of fit. Thus, we chose the functional form proposed by Ortega *et al.* (1991) for the specification of the Lorenz curve. The goodness of fit for the Generalized Quadratic specification (Villasenor and Arnold) was higher, but for the year 1991, the condition that $L(p)$ must be non-negative was violated. Define p as the proportion of population and $L(p)$ as the Lorenz curve. Then the specification for the Lorenz curve proposed by Ortega *et al.* is given by:

$$L(p) = p^{\alpha}[1 - (1-p)^{\beta}]$$

where α, and β are parameters to be estimated. The results from the estimation are presented in Table A.2 for the full samples in 1983 and 1991, using either per adult equivalent income or per capita figures. For the functional form to be a valid Lorenz curve, the following conditions must be met: L(1) is one, L(0)=0, L(p) is non-negative in the interval [0,1], the first derivative of L(p) exists and is non-negative in the interval]0,1[, and the second derivative of L(p) exists and is non-negative in the interval]0,1]. This requires that the parameter estimate for α be non-negative, and for β to take only values strictly greater than zero, but smaller than one.

Additional Results

Using Per-Capita Income To Rank Households

3. This study presents the majority of the results using households ranked by adult equivalent income, rather than per capita income. A concern with theoretical consistency guided this choice. Table A.2 presents the percentage of population living in poverty, if per capita income rather than adult equivalent income were used to rank households. In both years and for both poverty lines, the number of people living in poverty is much higher using per capita income rather than adult equivalent income. This is not unexpected. The most interesting result is that everyone classified as poor on the basis of their respective household adult equivalent income remains so on the basis of their household per capita income.

Table A.2: Per Capita Income versus Adult Equivalent Income as a Criterion to Rank Households

1983

		Per Capita Income		
		Better Off	Poor	Total
Adult Equivalent Income	Better off	20.8	14.55	35.35
	Poor	0	64.65	64.65
	Total	20.8	79.2	100

1991

		Per Capita Income		
		Better Off	Poor	Total
Adult Equivalent Income	Better off	36.9	12.6	49.5
	Poor	0	50.5	50.5
	Total	36.9	63.1	100

Additional Figures

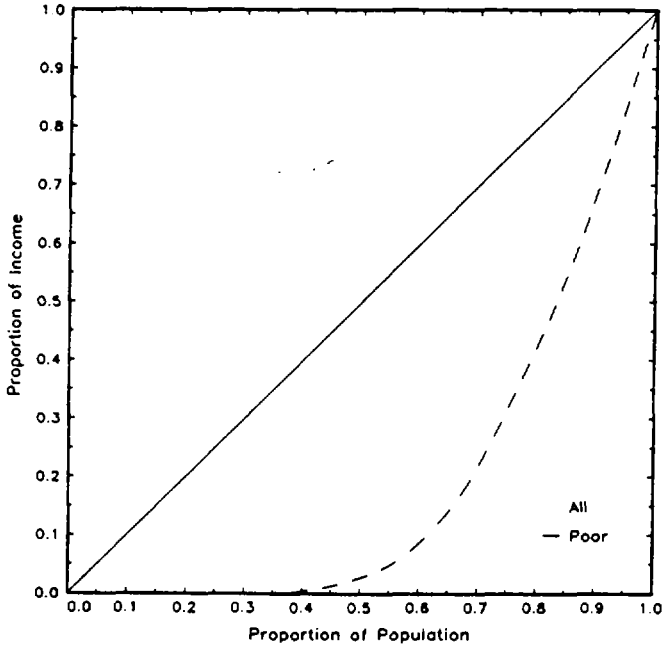

Figure A.1: Lorenz Curve for the Income Distribution in 1991

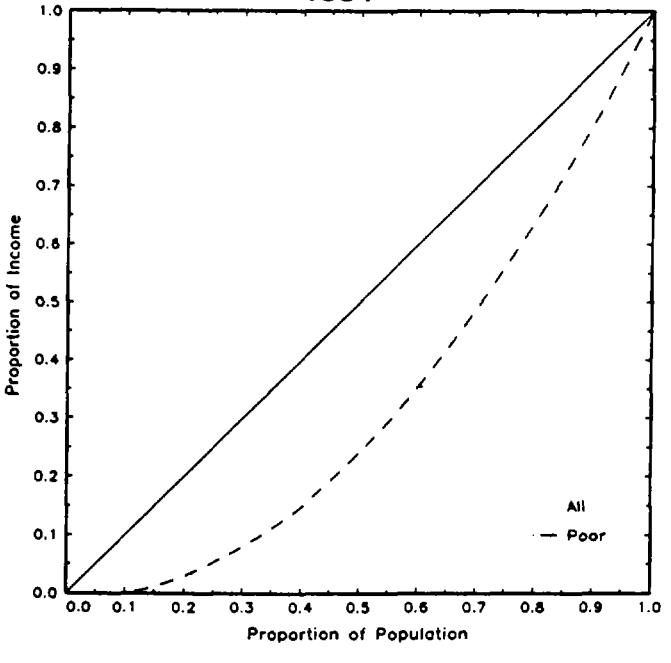

Figure A.2: Lorenz Curve for the Income Distribution in 1983

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