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Growth and Poverty Reduction in Uganda 1999-2000: Panel Data Evidence

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To explore factors underlying growth and poverty reduction in Africa, as well as the magnitude of future challenges, this article uses micro-level evidence from Uganda spanning the 1992-2000 period. Policy variables such as prices for agricultural exports, access to public goods such as health care, electricity, and infrastructure, as well as initial endowments of physical and human capital are found important. Simulations confirm that policies to confront widening regional disparities are feasible but will require a sustained effort.

Even though bringing about sustained growth in Africa remains one of the biggest challenges for the development profession (Collier and Gunning, 1999), the broad growth literature has had difficulty in coming to grips with the particular character of this continent. In virtually all cross-country growth regressions, the 'Africa dummy', i.e. some unexplained factor that causes African economies to show significantly lower growth than the rest, shows up uncomfortably large. Attempts to whittle it down (Freeman and Lindauer, 1999; Gallup and Sachs, 2000; Sachs and Warner, 1997) by changing the way in which specific variables are constructed or by introducing variables relating to institutional, physio-geographic and ethnic endowments have, in this context, had only limited success. As a result, even though there are large differences in recent growth performance between African countries, a large part of 'Africa's growth paradox' persists. Inability to explain this differential could reduce the applicability and acceptance of policy conclusions derived from such studies.

This article addresses the issue by exploring determinants of economic growth and poverty reduction for Uganda, using data from a panel of about 1200 households that span the 1992-2000 period. Uganda shares many of the structural factors generally quoted as responsible for low growth in an African context. For example, it is ethnically diverse, subject to tropical diseases such as malaria, has no direct access to the ocean, and has had to cope with a large onslaught of

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AIDS since the late 1980s. These obstacles notwithstanding, it has managed, over the past decade, to achieve some of the highest growth rates in Africa. Analysis of the factors underlying this performance can help to better understand growth and poverty reduction in an African context, producing policy-relevant insights that go beyond what is known from the cross-country literature. By providing a better understanding of the character and magnitude of the challenges ahead, it can also help formulate policies that might address these challenges.

To do so, we proceed in three stages. First, we estimate determinants of economic growth at the household level, drawing on the insights gained in the cross-country literature. Second, we expand this to a consideration of poverty reduction. Third, in order to make the analysis relevant for policy, we perform simulations. The variables included in the analysis are initial household characteristics and endowments, access to health and infrastructure, social capital and violence, as well as prices for the main agricultural outputs. Linking these together in a household-level data set allows us to overcome many of the shortcomings inherent in the cross-country literature and provides valuable insights with regard to the impact of policies, public services, and asset endowments.

A first finding is that price changes for the country's main tradable product, coffee, had a strong impact on increased growth. They also benefited the poor, as confirmed by evidence that many small producers were able to enter the coffee industry. Although this illustrates that liberalisation of agricultural markets has had a strong poverty-reducing effect, it also highlights the dangers posed by sudden falls in prices, especially for an agrarian economy with a very limited degree of diversification. Efforts to improve producer prices in other crops such as cotton and measures to help enhance diversification at the farm and the marketing and agro-processing stages remain an important part of the agenda for sustained poverty reduction.

A second finding is that access to key public goods such as health care, electricity, infrastructure, and the avoidance of civil strife has been a critical determinant of households' ability to increase their income and reduce the risk of falling into poverty. Providing such goods in an efficient and equitable manner appears to have potential for greatly improving the scope for future poverty reduction in Uganda. Finally, in view of the importance of initial endowments of physical and human capital, policies to encourage asset accumulation and investment are desirable.

The article is structured as follows. The next section reviews the literature and the econometric specifications to be applied. The third section describes the data and illustrates key changes in socio-economic variables in the aggregate as well as for poor and non-poor and different regions, plus changes in inequality for both income and assets (in the cross section) and in household poverty. The following sections discuss the econometric evidence for changes in per capita expenditure as well as poverty, and put forward suggestions for policy and research.

Key questions and methodology

Determinants of growth and, to a lesser degree, poverty reduction, have been explored in a large cross-country literature. Here we review some of the key methodological issues associated with the reliance on cross-country data and consider how use of household-level data can potentially improve on this.

Determinants of long-term growth: lessons from the literature

Following earlier studies (Mankiw et al., 1992; Barro, 1991), a rapidly expanding literature has tried to identify the relationship between initial endowments, government policies and other growth factors. Starting with the variables suggested by standard neoclassical growth models, the range of factors considered has expanded rapidly to include measures related to institutional infrastructure, the distribution of opportunities and assets, and physio-geographic and natural characteristics of the country under consideration. This was in tandem with a significant increase in the quality of some of the variables used for this purpose (for example, on human capital endowments).[1] The resulting insights have inspired thinking that might be conducive to higher levels of more broadly based growth. At the same time, these contributions leave open a number of questions (Rodriguez and Rodrik, 1999; Easterly and Levine, 2001).

First, the limited number of country observations available and the open-endedness of the underlying model set limits to the ability to test more rigorously the robustness of the underlying hypotheses and the parameters obtained. This, together with the fact that many of the explanatory variables are correlated, implies that any specific result may be highly dependent on the particular specification adopted. Also, given the need to use data from the national level, aggregation bias, together with measurement error, may pose problems. This would not only result in losing most of the information specific to gender but would also lump together all policy changes in a single time dummy. Also, many of the variables chosen are at best imperfect representations of what the model intends to measure. Differences or sudden shifts in standards and underlying definitions can conceal considerable heterogeneity within and across countries. This problem is aggravated by unobservable differences in the policy regime, which, in addition to increasing measurement errors, may be related to country-specific unobservable attributes (Brock and Durlauf, 2001).

Second, looking only at aggregate country-level data also makes it more difficult to deal with issues of poverty and inequality in addition to growth, and in an integrated framework. Whether policies that aim to increase growth will at the same time also help the poor has been widely debated in the literature (Dollar and Kraay, 2001; Rodrik 2000). Existing distributional data across countries are too noisy to make specific inferences on the issue (Deininger and Squire, 1998; Banerjee and Duflo, 2000), and it is unlikely that, barring a significant improvement in the databases available, cross-country data and approaches will allow us to resolve this issue (Bourguignon, 2000). This limits, for example, the ability to test empirically the extent to which initial asset endowments are a determinant for future growth, a possibility that is suggested by recent contributions to theory (Aghion et al., 1999; Bardhan and Ghatak, 1999).

Finally, to the extent that differences in growth are 'explained' with reference to immutable country-specific factors, the relevance of cross-country evidence for actual policy formulation is limited. Increased availability of country-level information that has led to Panel data can deal with such issues, although the availability of reliable information on the relevant variables becomes a serious issue. Factors such as the length of a country's coastline (or whether it is landlocked or not), its ethnic composition and location in the tropics can 'explain' a significant part of the variation in growth rates observed across countries, but the policy relevance of such a finding is limited. Ability to move includes variables such as gender and other policies.

In order to overcome these limitations and to gain additional insights into issues concerning behavioural relationships related to growth, poverty and inequality, a number of authors have

1. See Durlauf and Quah (1998) for a comprehensive overview of the 'standard' growth models and Aron (2000) for a discussion of the more specific institutional variables incorporated. Some of the more important variables relate to institutional issues and the rule of law, initial mineral wealth and other factors such as distance to the equator and land-lockedness, inequality, policy variables such as price distortions and levels, fertility, government consumption, health, and socio-economic variables such as religion and war.

resorted to micro-level panel data. A panel covering four periods in six provinces in China permits exploration of households' ways of smoothing consumption and coping with risk (Jalan and Ravallion, 1999). A 4-year panel from Vietnam not only illustrates the regionally differentiated nature of growth but also identifies factors that helped households escape from, or caused them to fall into, poverty (Glewwe et al., 2000). If such panel data span broad policy changes at the macro-level, such as liberalisation of input or output prices, modification of subsidy schemes related to social services and education, or a large contraction due to balance-of-payment difficulties, the ability to use information about the same household in two periods will produce more precise and less biased estimates. A 4-year panel from Peru enables exploration of how differences in initial endowments affected households' ability to deal with a macroeconomic crisis (Glewwe and Hall, 1998).

Although data for Africa have been somewhat more limited in the past, a number of recent panel data sets allow an analysis of similar questions in this continent. The differential impact of pre-existing differences on the ability to overcome pre-existing cleavages, and in particular the impact of initial asset endowments as a factor in allowing blacks to make up for previous discrimination in the immediate post-apartheid period, i.e. 1993-98, is explored for South Africa (Carter and May, 2001). A shorter panel from Ethiopia demonstrates the importance of price variables as well as exogenous shocks (rainfall) for analysing growth at the household level (Dercon, 2001).

Our analysis builds on these contributions and aims to apply them to the study of growth determinants in Uganda. We use panel data from Uganda that span not only a relatively long period (1992-2000) but also coincide with considerable changes in policy, in particular, liberalisation of agricultural trade in the early 1990s, a coffee price boom up to 1995/96, and the adoption of a programme of Universal Primary Education in 1997.[2] While there is little dispute that, over this period, Uganda has experienced a remarkable fall in aggregate poverty, the contribution of different policy factors to this outcome, as well as the regional distribution of poverty reduction, are disputed and can be only insufficiently explored using cross-sectional data. In this context, the panel allows a direct analysis of factors that contribute to changes in households' expenditure as well as their poverty level, thus allowing a simulation of the impact of specific factors on changes in poverty. In addition, we are able to consider the impact of a much richer set of initial variables, many of which correspond to those used in the cross-country literature but are likely to be much less affected by measurement error and problems of comparability. Before discussing the econometric specification, we describe the data and the variables included.

Data sources, choice of variables, and relation to the literature

Our data come from two large-scale Ugandan household surveys. The first is the 1992 Integrated Household Survey, a comprehensive multi-purpose survey based on a nationally representative sample of 9,886 households. In addition to the standard socio-economic and expenditure information, this survey contains detailed information on economic activities for enterprises operated by the household in six sectors, namely, crop and livestock farming, manufacturing, services, trade, and hotels. The second source of data is the 1999/2000 Uganda National

2. However, the long period spanned by the panel, which captures only end-point observations, omits other dynamics such as young households entering the society. In the absence of several waves of panels, such life-cycle effects are best accounted for using cohort data constructed from a time series of cross-sectional data.

Household Survey (UNHS), a nationally representative survey of 10,696 households fielded between August 1999 and September 2000. Even though it contains less detail on other enterprises, it includes a highly disaggregated account of agricultural production.[3] Both surveys were also accompanied by an elaborate community module that allows linking households' use of social services to changes in the supply of such services at the community level. Moreover, the UNHS included a panel element of about 1,300 of the same households that were included in the 1992 survey. We use the panel, together with information on initial household characteristics, infrastructure, health, social capital, and output prices, to make inferences on determinants of growth and poverty reduction at the household level. The justification for choosing specific variables, as well as some details regarding their construction, is explained below.

Physical and human capital assets If credit market imperfections or other indivisibilities in investment imply that only households with a minimum level of assets can make investments that enable them to enhance the return to their labour (Birdsall et al., 1998),[4] or if changes in macro-policy such as liberalisation result in a sudden increase of returns to existing assets, initial asset endowments will have a significant impact on changes in households' consumption and poverty, as well as their ability to overcome shocks (Aghion et al., 1999). Inclusion of households' initial asset endowment, based on retrospective information given in the 2000 survey,[5] allows us to test to what extent ownership of higher initial endowments of physical capital has been associated with higher levels of growth or has enhanced households' ability to escape from poverty.

Although cross-country regressions have in some cases had difficulty in obtaining clear results,[6] numerous microeconomic studies confirm that, especially in situations where technology or other economic conditions change rapidly, human capital will have a key impact on growth (Rosenzweig, 1996). In Uganda, analysis of the impact of education on subsequent growth is of particular interest in assessing whether the recent emphasis on expanding access to education through government programmes, especially the Universal Primary Education initiative (UPE), has indeed managed to target one of the more critical factors for subsequent development. We use the mean number of school years completed in the household to represent the initial human capital endowment.

Infrastructure A key lesson from the empirical literature on cross-country growth is the significance of infrastructure and 'endowment' variables, such as whether or not a country has access to the sea (Sachs and Warner, 1997), the length of its coastline, or the presence of minerals that can be exploited. Although these estimates may be biased insofar as they may capture other

3. For more detail on survey design see UBOS (2000).
4. An illustration for the latter would be investments to improve land or housing which will not be undertaken if the household is a tenant and does not own any of the assets in question.
5. To measure assets in a comparable way, the 2000 survey asked for current as well as past values of 12 categories of household assets, including buildings, 9 types of livestock plus structures for livestock rearing, and 10 categories of enterprise assets: land, tools, transport equipment, and other enterprise assets. The need to rely on retrospective information arose because of deficiencies in the 1992 data. In-depth study of the extent to which there is mis-reporting or mis-recording of assets in the survey could provide important methodological and substantive insights, but clearly exceeds the scope of this article. As the survey asked households only about the relative level of asset ownership (somewhat less, much less, somewhat more, much more) as compared to the present, we imputed the 1992 asset values by multiplying the value for each of the items by 0.75, 0.5, 1.25, and 1.5, respectively).
6. A number of ways to construct appropriate measures of countries' human capital stock have been discussed in the literature (see Lee and Barro, 2001). In many cases, however, coefficients in cross-country regressions turned out to be either insignificant or even negative (Forbes, 2000; Freeman and Lindauer, 1999).

country-level fixed effects,[7] more careful construction of the stock of infrastructure available finds a smaller, though still significant, impact (Canning, 2000), and a number of sub-regional studies find government spending on infrastructure highly significant (Fan and Hazell, 2001; Fan et al., 2000). Two key infrastructure assets in Uganda are availability of electricity and roads. To assess the extent to which infrastructure access affects a household's growth opportunities – and one could thus make a case for government to increase provision of such infrastructure – we use the availability of electricity at the household level and the community-level distance to the municipality.

Health While earlier literature paid scant attention to health issues, a number of recent studies have pointed out the importance of disease pressure, proxied initially by a 'tropical dummy' and subsequently by infant mortality or proxies for the incidence of malaria, as a possible constraint on economic growth, especially in Africa (Gallup and Sachs, 2000). Given the limited time variation in this measure, the variable may largely pick up other unobserved country-specific effects. Use of household-level information on whether or not diseases were experienced in the initial period allows us to partly overcome this constraint. Based on the finding that observed illness is strongly related to supply-side factors such as the non-availability of medicines, bad quality of service, or lack of doctors, we use a dummy for observed illness to measure access to health services in the regression.

Social capital Following the identification of ethnic diversity as a factor that is directly or indirectly responsible for much of Africa's 'growth tragedy' (Easterly and Levine, 2001),[8] a wide range of social capital-related variables have been constructed and included in country-level growth regressions (Aron, 2000). There are two types of social capital variables. One primarily affects the cost of entering into and conducting economic transactions of all kinds (Fafchamps and Minten, 2001). This would include variables such as the density of the social network, the existence of mutual trust, confidence in local institutions, and levels of ethnic diversity. A second set of variables related to conflict and civil strife can not only impede economic transactions but also cause direct damage and destruction of the economy's stock of human and physical capital (Collier and Gunning, 1999).[9] We use initial levels of ethnic diversity and civil strife as indicators for each of these aspects, respectively. The former is justified in view of the fact that Uganda has a high level of ethnic diversity[10] and also the variable of interest is constructed from community-level information on the share of the five most important ethnic groups in the community, normalised to fall between 0 and 1. To capture the incidence of civil conflict, we include a household-level variable, equalling 1 if, in 1992, the household's economic activity was affected by civil strife, and 0 otherwise, a variable that was obtained from the 1999/2000 survey.

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7. One could think of many such variables. For example, the density of the road network, the agro-climatic potential including variables such as soil quality and rainfall, as well as natural disease pressure and the availability of (public or private) preventive and curative infrastructure. Household data allow us to use more specific measures for each of the above. For example, the landlocked nature and distance to the equator are factors that do not vary over time and are likely to proxy for other unobserved characteristics, such as transport costs.
8. Note that this view is not undisputed (Arcand et al., 2000).
9. In fact, a strong and negative impact of civil strife on economic growth has recently attracted independent attention (Collier and Hoeffler, 2000). A more detailed analysis of this phenomenon is available in Deininger (2001).
10. Clearly, with 51 recognised ethnic groups many of which cannot understand each other's languages, ethnic differences continue to be a major determinant of social interaction in today's Uganda.

Output prices Although the central role of government policies is well recognised in the literature on cross-country growth (Easterly and Levine, 2001), it has been difficult for this literature to find appropriate proxies for such policies, leading to the use of very indirect proxies for policy variables. One of the key features of the recent policy reforms in Uganda as well as other African countries has been the elimination of taxes and other controls on prices for agricultural output, something that resulted in a significant increase in farm-gate coffee prices. To capture this price increase, we use the change in regional median prices for coffee between 1992 and 2000.

Econometric specification

Let Y_{it} be the per capita expenditure including the home consumption of household i in period t and the growth rate of this variable between t-1 and t (here taken to represent 1992 and 2000) be defined as ΔY_i (i.e., $\Delta Y_i = Y_{it} - Y_{it-1}$). Then, the growth equation to be estimated regresses observed growth on a set of initial conditions, i.e.

$$\Delta Y_i = \alpha + \beta X_{it-1} + \gamma Z_{it-1} + \varepsilon_i \qquad (1)$$

where $\boldsymbol{X}_{it-1}$ is a vector of initial household-level characteristics, including human and physical capital endowments derived from the Solow growth model as well as variables relating to health, gender, and household composition. $\boldsymbol{Z}_{it-1}$ denotes a vector of initial community-level variables, including access to infrastructure, other public goods and 'bads' (violence and ethnic fractionalisation), price changes, and initial income and poverty levels at the community level (excluding household i), as explained above..[11] Note that use of changes in income will not necessarily eliminate household fixed effects but will result in more efficient estimates (Glewwe and Hall, 1998).

In addition to examining the impact of initial conditions on households' income growth, we are interested in the effect of the same variables on changes in the level of poverty. To measure poverty, we use the poverty line constructed by Appleton (1999) and let ΔP^{α}_i be the change in the Foster-Greer-Thorbecke index P^{α} ($\alpha = 1, 2$) for household i between the two periods.[12] We can then define a reduced form regression similar to the one above for changes in poverty with right-hand-side variables defined analogously.

$$\Delta P^{\alpha}{}_i = \alpha + \beta\, X_{it-1} + \gamma\, Z_{it-1} + \delta\, P^{\alpha}{}_{it-1} + \varepsilon_i \qquad (2)$$

The right-hand-side variables are the same as those included in the growth equation discussed earlier. Since the dependent variable is the change in the level of poverty, it will help to identify variables (and thus policies) that are of particular relevance to poverty reduction. Comparisons between the two regressions would thus potentially allow us to identify policy issues which would have particular benefits for the poor, something that will be of relevance in discussing the results.

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11. Questions on community-level infrastructure access were asked retrospectively as well, but revealed relatively little change over time, forcing us to use only initial conditions in the regression.
12. As the poverty headcount (P0) is just a discrete representation of (continuous) changes in P1, we do not include it separately.

As a key purpose of the analysis is to identify changes in the incidence of poverty, we complement this evidence with a multinomial logit regression based on a variable ΔP_i which takes three values (-1, 0, and 1) for households which escaped from poverty, remained in their previous status (either poor or non-poor), or fell into poverty, respectively. Using, again, a set of right-hand-side variables that is similar to what was reported earlier, this multinomial logit regression is defined as

$$\Delta P_i = \alpha + \beta X_{it-1} + \gamma Z_{it-1} + \varepsilon_i \qquad (3)$$

The advantage of this specification is that it allows us to distinguish between factors that contribute to households falling into poverty and those that help them to escape from it, an issue that need not always be symmetric.

Evidence on growth and inequality in Uganda

This section discusses data sources underlying the analysis together with a number of descriptive statistics regarding changes in income, assets, and poverty, as well as the distribution of income and assets in the overall sample. In the 1992-2000 period, economic growth in Uganda was considerable and the per capita expenditure distribution in 2000 is greater than that in 1992. At the same time, the fact that relative disparities seem to have widened suggests that not everybody benefited equally from economic growth. To set the stage for this analysis, we briefly describe how the panel households differ from the overall sample and discuss changes in the level of poverty they experienced.

Changes in socio-economic characteristics

Table 1 contains descriptive statistics from the two cross-sectional surveys to illustrate the extent of changes between the two years as well as changes in the data included in our sample. Information is provided for the total sample (columns 1 and 2) and for poor (columns 3 and 4) and non-poor households in both periods. Table 2 contains the same information disaggregated by region.

Table 1: Descriptive statistics for the whole population and poor and non-poor households, 1992 and 2000 (%)

	Total		Poor		Non-Poor	
	1992	2000	1992	2000	1992	2000
Occupation of head						
Agriculture	70	69	72	78	53	53
Other primary	3	4	3	4	6	3
Manufacturing & trade	16	14	14	9	23	22
Services	12	14	11	9	18	23
Female-headed household	30	27	29	27	33	27
Education of head						
Head has no education	31	26	31	30	26	17
Head has some primary education	27	33	26	25	35	46
Head has completed primary	15	16	14	10	24	27

Assets						
Total asset value (US$ equivalent)	2167	2670	1384	1419	3570	4914
Of which land	57	51	64	56	53	48
Housing materials and water						
Roof thatched	61	42	61		56	33
Dirt floor	55	46	56	51	43	38
Piped water	7	11	6	5	14	21
Flush toilet	2	2	2	0	4	4
Electricity in house	7	7	6	2	13	17
Use firewood	85	84	86	92	68	68
Enterprise activity and credit						
Has a non-farm enterprise	46	45	46	42	46	51
Credit from formal institution	15	7	15	7	18	8
Credit from informal institution	9	10	9	9	9	11
Other characteristics						
Sickness in the last month	52	72	53	74	42	69
Affected by civil strife	7	10	7	10	5	9

Occupation and sources of income Information on the occupation of the household head indicates that Uganda continues to be a predominantly rural society where the agricultural sector remains of paramount importance. With about 70% in both years, the large majority of Uganda's households draw their main livelihood from this sector. In fact, the share of the poor who indicate that they derive their main livelihood from agriculture has increased, from 72% to 78%, indicating the critical role of rural and agricultural growth in poverty reduction. About 27% of households were headed by females in 2000, as compared with 30% in 1992. While agriculture is a major source of income, the fact that about 46% of households had a non-farm enterprise in 1992 indicates that Ugandan households rely on a diversified portfolio of income sources. At the same time, the large majority of these enterprises are very small-scale, and only about 15% of those with non-agricultural enterprises employ any labour. The fact that neither the share of households with non-farm enterprises nor the employment intensity of these enterprises appears to have expanded over time suggests that such enterprises were either characterised by high rates of mortality or that the observed income increases are mainly due to expansion of existing family-based enterprises.

Table 2: Descriptive statistics by region, 1992 and 1999 (%)

	Central		**East**		**North**		**West**	
	1992	**1999**	**1992**	**1999**	**1992**	**1999**	**1992**	**1999**
Occupation of head								
Agriculture	55	56	74	72	85	77	74	76
Other primary	4	4	2	2	4	6	3	3
Manufacturing & trade	26	20	12	13	3	7	13	12
Services	14	20	12	13	8	10	10	10
Female-headed household	33	29	26	24	34	35	26	22
Education of head								
Head has no education	22	17	31	25	35	36	37	29
Head has some primary education	33	41	27	32	27	24	21	31
Head has completed primary	21	23	14	16	12	11	9	12

Assets								
Total asset value (US$ equivalent)	3691	4657	1518	1597	734	798	1974	2624
Of which land	57	50	62	50	30	31	61	59
Housing materials and water								
Roof thatched	35	15	65	51	91	91	64	28
Dirt floor	64	55	42	32	56	38	58	58
Piped water	12	21	5	7	2	1	6	10
Flush toilet	3	2	2	2	1	0	2	1
Electricity in house	15	17	4	4	1	1	2	3
Use firewood	71	67	87	88	93	94	93	93
Enterprise activity and credit								
Has a non-farm enterprise	56	49	48	46	33	49	42	38
Credit from formal institution	20	6	6	9	17	5	18	10
Credit from informal institution	14	9	4	12	9	4	8	13
Household characteristics								
Sickness in the last month	49	64	57	84	59	77	46	68
Affected by civil strife	2	4	8	11	13	13	5	12

Education During the period under review, one of the main pillars of government policy has been the expansion of education. The relatively small overall fall in the share of household heads without education (from 31% to 26%) suggests that it will take time for this policy measure to permeate the system. Still, the share of non-poor households whose head has no education has dropped dramatically, from 26% to 17%. Comparing this with the stagnation in the case of poor households (where the figures are 31% and 30%, respectively) could indicate that even a minimum level of education allowed households to escape from poverty. It may suggest that education is indeed an important determinant of the ability to escape from poverty, something that will be explored in more detail in the regressions.

Asset accumulation While descriptive data cannot provide direct insights into the extent to which low asset endowments increase the probability of poverty, they highlight two key facts. First, the degree of asset accumulation differed markedly between poor and non-poor. Investment was, with an average of 0.3% per annum, virtually absent for the poor, while the non-poor were able to accumulate assets at a rate of more than 4% per annum. Together, this implies an increase in the typical household's asset stock of only 2.7% per annum. Even though the rate of investment at the household level may differ from total investment in the economy, this figure is very low. A second feature of interest is that the share of enterprise assets other than land remains quite limited, implying a high, though naturally declining, share of land in the asset endowment of the population. In both periods, land constitutes more than 50% of the assets held by the average household. Policies relating to land issues, for example those that aim to increase access to land, transparency of land administration and transferability of land, will have important implications for households' wealth. This can explain the heated discussion and the politically sensitive and contentious nature of legal changes, such as the passage of the 1998 Land Act.

As housing is normally strongly correlated with wealth, information on housing conditions, in particular the change of such conditions over time, can provide a quick assessment of changes in income and wealth over time. The fact that the share of households with a thatched roof has dropped considerably, from 61% to 42%, as well as reductions in the share of households with a dirt floor (from 55% to 46%), suggests that, according to this measure, there was indeed an

improvement in overall living standards. Roofing, and to a lesser degree flooring, have also improved markedly for the poor (from 61% to 47% and 56% to 51%, respectively). At the same time, and compared with the increase in households' own investment, the provision of public infrastructure services seems to have expanded at a more modest pace. While availability of piped water increased, access to electricity has been stagnant (and decreasing for the poor).

Health Observed levels of sickness are affected by exposure to different sources of environmental risk and access to preventive and curative services. The data point towards a significant increase in the number of days lost to illness by the average household in the month immediately preceding the survey, from about 8 days in 1992 to 12 days in 2000. As the AIDS epidemic in Uganda is widely believed to have reached its peak by or before 1992, it is unlikely that an increase in AIDS-related illness underlies this phenomenon. A more likely reason is a worsening of access to health services that was associated with higher levels of cost recovery and absence of clear policy directives comparable with the UPE strategy in education. In 2000, almost two-thirds of sickness incidents and an even greater share of days lost were due to malaria.[13] The data also indicate that more than one-fifth (23%) of households experienced the death of a family member aged between 15 and 40 during the period under review, most of them probably related in some way to AIDS. The potential for such a large proportion of deaths to have a broader economic impact on the survivors as well is illustrated by the fact that two out of every five households (42%) contain at least one orphaned child.

Ethnicity and civil strife To measure the incidence of civil strife, theft, and inter-personal violence, the 2000 survey asked households whether they had been affected by any of these in 1992 or 2000. The variable allows us to draw three conclusions of interest (Table 1). First, instead of the fall in the incidence of civil strife over time which one would expect in a 'post-conflict' society, we find a marked increase in the number of households which report being affected by such unrest, from 7% in 1992 to 15% in 2000.[14] Secondly, with an incidence of 15% in 2000, households unequivocally report civil strife as a more important source of economic damage than theft (10%) and personal violence (4%), the levels of which have also increased much less during the period under review. Thirdly, comparison of the incidence of civil strife at the community and the household level suggests that civil strife affects a large number of communities but only comparatively few households within each community.

Changes in the distribution of income and assets

Table 4, line 1, provides descriptive evidence on growth in per capita expenditure for the panel households. We note that, even though Uganda has achieved high rates of growth by African standards, large differences across regions persist. While growth of consumption has been marked in the West, the Centre, and the East, it was very limited in the North of the country. Similar large regional differences are found for growth of earned income. This is reflected in the changes

13. No information on the type of illness is available for 1992, precluding us from making a direct comparison of the incidence of different types of sickness between the two periods.
14. There is a possibility that part of the increase in the measured incidence of civil strife is due to higher levels of economic activity (the question was 'were you economically harmed by civil strife?'), something which could be checked by questions at the community level. At the same time, the fact that it is the same households which answer both questions should reduce the bias due to differential interpretation. This is another area where follow-up interviews for selected communities (with large increases or decreases in the incidence of civil strife as measured by individuals' answers) could provide important methodological insights.

observed in poverty rates to be discussed in more detail below. While poverty declined markedly in the Centre, the East, and the West, the North was again lagging behind; in fact, for the panel households included in our sample, the level of poverty remained completely stagnant.

A graphical illustration of the extent to which overall per capita expenditure increased between 1992 and 2000 is provided in Figure 1 which plots the cumulative density of the logarithm of this variable across households for the 1992 and the 2000 survey. It is clear from the figure that the second distribution (thin line) dominates the former, i.e. that, if ranked by the distribution of income, households were unequivocally better off in the second than in the first period.[15] To illustrate, in 2000 less than 20% of households had a per capita income below US$120 (the middle point in the picture), while in 1992, about 35% of households had less than this amount available. Thus, in the aggregate, and in absolute terms, growth has made everybody better off.

To explore the extent to which such improvement in absolute levels of expenditure has translated into a narrowing of the *relative* disparities across regions as well as between rural and urban sectors, we compare inequality in the distribution of per capita

15. This does not include the possibility that individual households' income decreased over the period, an issue for which panel data will be required.

Table 3: Measures of inequality of per capita income and assets, 1992 and 1999

Inequality Measure		Income inequality 1992	Income inequality 1999	Asset inequality 1992	Asset inequality 1999
Rural-urban disaggregation					
Relative mean	Rural	0.8694	0.7731	0.6735	0.6495
	Urban	1.7923	2.2153	2.9049	2.8796
Theil index	National	0.2828	0.3899	1.7545	1.5592
	Rural	0.2399	0.2532	1.4023	1.1294
	Urban	0.2375	0.3311	2.843	2.6076
Decomposition	Within groups	0.2393	0.2804	1.573	1.3617
	Between groups	0.0435	0.1096	0.181	0.1975
Regional disaggregation					
Relative mean	Centre	1.3275	1.5199	1.7165	1.7504
	East	0.8717	0.8379	0.6222	0.6048
	North	0.7388	0.5104	0.3682	0.3129
	West	0.9367	0.8771	0.9830	0.9871
Theil index	Centre	0.2732	0.3749	2.6058	1.9312
	East	0.2613	0.3044	1.3832	1.1542
	North	0.2540	0.2837	2.5757	1.2797
	West	0.2298	0.2285	1.3360	0.9852
Decomposition	Within group	0.2579	0.3204	2.1041	1.3820
	Between group	0.0249	0.0695	0.1365	0.1772

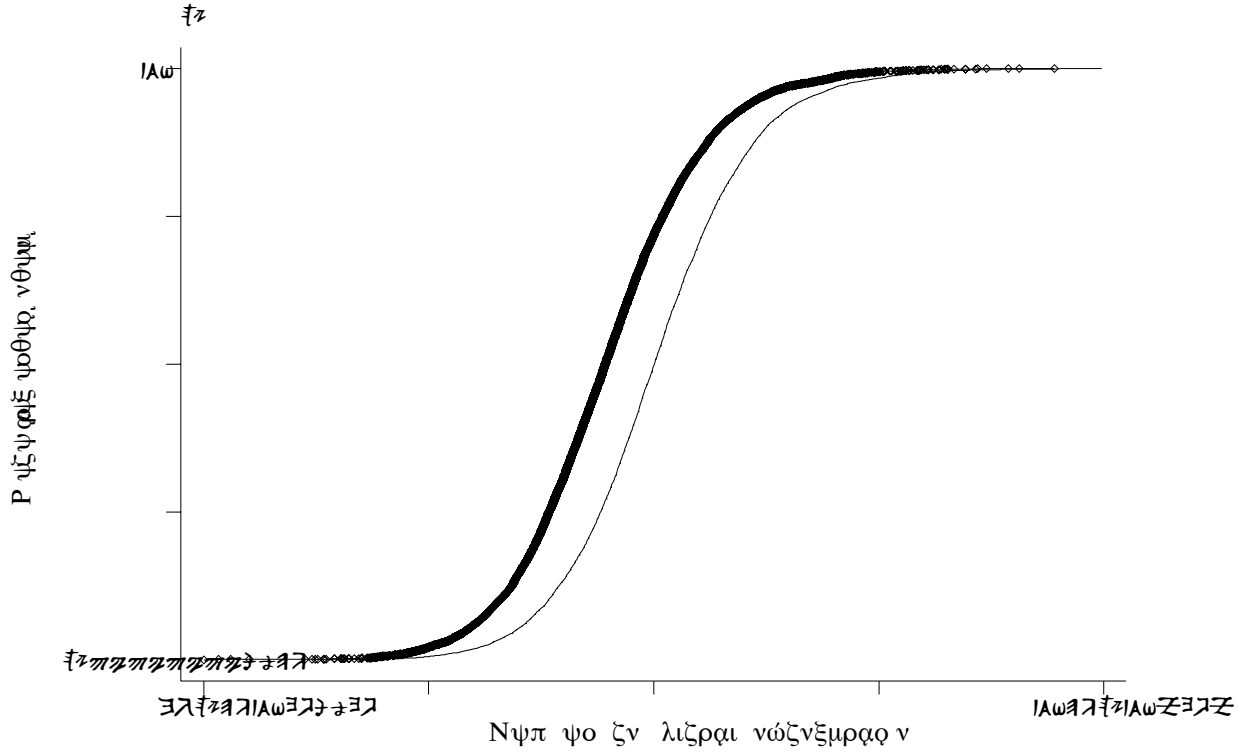
Table 4: Changes in income measures and poverty, 1992/2000 (%)

	National	Regional			
		Centre	East	North	West
Mean growth of per capita expenditure	3.560	3.963	1.666	1.535	5.378
Poverty headcount in 1992	53.9	41.1	57.2	66.3	58.2
Poverty headcount in 1999	36.3	22.6	36.3	66.3	35.4
Change in headcount	-17.5	-18.5	-20.9	0.0	-22.8
Share of households escaping poverty	29.2	26.4	34.3	17.4	34.1
Share of households falling into poverty	11.7	8.2	13.4	17.4	11.3

Source: Own computation based on 1313 panel households included in the 1999/2000 UNHS.

income as well as household assets (Table 3) by comparing relative means and indicators of inequality such as the Theil index. The most notable fact is the continued importance, and even widening, of inter-regional disparities: While, in 1992, the average household in the Central region spent 80% more per capita than the average household in the North, a net gain in the Centre and a loss in the North implied that, in

Figure 1: Cumulative density of per capita expenditure in 1992 and 2000, Uganda



2000, the mean household in the Centre spent more than three times the Northern one.[16] Also, despite the government's emphasis on a pro-rural policy, rural-urban disparities have widened. In 1992, rural inhabitants' expenditure amounted to about 87% of the mean (compared with 1.80 times by urban ones), a share which, in 2000, had dropped to 77% (as compared with 2.21). The widening of rural-urban and inter-regional disparities is confirmed by the decomposition of the Theil index of inequality, which points to a small increase in within-group inequality but a significant increase in between-group inequality. Emphasis on relative rather than absolute welfare could thus explain that, in participatory exercises, many households feel that their (relative) situation has failed to improve, even though mean income has increased for everybody, thus

16. No regional price deflators were applied. However, to the extent that relative prices remained constant during the two periods, this will not affect the figures obtained. If, on the other hand, terms of trade shifted systematically against the North, our figures would be a lower bound on the true changes in household welfare. This is left for further investigation.

providing a possible explanation for the fact that qualitative surveys found many households to be quite dissatisfied with their present situation as compared with earlier (McGee, 2001).

Finally, although inequality of income and expenditure is important for subjective perceptions of welfare, households' ability to overcome long-term poverty may be more affected by levels of asset ownership. We note that, at the national level, as well as for rural and urban areas separately, the level of asset inequality prevailing in 1992 has been reduced, for example from 1.75 to 1.56 at the national level. As illustrated in Table 3, there has been an insignificant increase in between-group inequality and a marked reduction in within-group inequality. This suggests that, during the period, asset-poor households have had the opportunity to catch up with their more wealthy neighbours. Nevertheless, evidence as to the low overall level of such assets suggests that, in addition to adopting policies that would allow them to make productive use of such assets, it may also be useful to consider policies that would increase the overall level of investment. This conclusion is reinforced by the fact that, as illustrated in Section 2 of Table 3, levels of asset inequality have decreased considerably in all of the regions under review, suggesting that in the past increased investment opportunities did not contribute to widening inequality in the distribution of assets which might then lead to dualistic patterns of development. The finding that, at the same time, inequality in households' asset endowments has narrowed, suggests that growth opportunities have been shared relatively equitably, and provides a motivation for the empirical investigation of this issue based on the household panel.

Changes in poverty

The second half of Table 4 identifies changes in the incidence of poverty for panel households. We note that, similar to what had been found for the cross-section, poverty in the panel declined significantly, from 54% in 1992 to 36% in 2000. In addition, and slightly different from the cross-sectional results, the panel also points towards continued large differences between regions. While poverty has almost halved in the Centre (from 41% to 23%), it remained very high in the North where, insofar as panel households are concerned, no improvement can be detected. Poverty levels in the West and the East also showed a marked decrease, declining from about 58% to around 36%.

Disaggregation of changes in poverty for the panel households across regions and the urban and rural economy highlights the fact that reductions in poverty were more pronounced in urban than rural areas and also points to a considerable lag in the rural North. Using the poverty headcount, we find that 42% of households emerged from poverty in urban areas, compared with only 25% in rural ones. Regional differences in the reduction of poverty are pronounced as well; in rural areas of the North and the East, only 22% and 18% of the panel households, respectively, emerged from poverty. In the same regions, 14% and 9% of previously non-poor panel households fell into poverty (the national average for both rural and urban areas is about 6%). This may well explain why, despite a tremendous reduction of overall poverty levels, qualitative studies especially in these regions may find a sense that 'things are not getting better'.

Because the pattern of attrition is likely to be non-random, inclusion of a panel component in a multi-purpose household survey will not necessarily yield a nationally representative sample even if the original survey was designed to be representative (Demery and Grootaert, 1993). As this danger increases with the amount of time elapsed between the two survey periods, it could be of particular relevance in our case. Running a probit regression where the probability of being included in the panel is a function of initial household characteristics suggests that, as one would intuitively expect, the probability of attrition decreases with household size and with education

and assets. The results from such a regression, reported in Appendix Table 1, indicate that having one additional household member decreases the marginal probability of being in the panel by 0.6 percentage points. Households which initially lived in urban areas or had access to electricity were significantly less likely to re-appear in the panel than rural ones. Concerning the regional distribution of the sample, we note that panel households are disproportionately concentrated in Central and Western regions and least likely to be encountered in the North and the East. While keeping these characteristics in mind will be useful in interpreting the results from subsequent descriptive statistics and regressions, we conclude that, even though descriptive data derived from the panel will not be representative of the population as a whole, use of the panel element to identify behavioural relationships is unlikely to impose unreasonable bias, as has been confirmed for other household surveys (Alderman et al., 2001).

Determinants of growth and poverty reduction

This section provides estimates from regressions of household-level changes in per capita expenditure and the incidence of poverty on initial conditions. Results suggest that initial asset ownership as well as health status have been important in facilitating growth, that the effect of education was closely linked to access to modern infrastructure (electricity) that provided an opportunity to apply the skills acquired, and that civil strife had a significant growth-reducing effect. The positive impact of asset ownership and the negative effect of civil strife are particularly pronounced for the poor.

Determinants of income and expenditure growth

Results from the household-level growth regression with the mean annualised rates of per capita income and expenditure growth as the dependent variables are reported in Table 5. They provide confirmation for the hypotheses discussed earlier and at the same time allow us to support and put into perspective many of the issues discussed in the macro growth literature. In particular, we find that, while there is strong convergence in terms of initial levels of income, households' initial endowments of physical as well as human capital clearly enhance subsequent growth rates. Comparing the magnitude of both effects, we find that the latter are large enough to easily counteract any convergence effect. We also find clear indication of a negative impact of health conditions (which is supply-related).

Endowments A first result of interest is the finding of strong convergence in income, but divergence in physical and human capital assets. As illustrated in Table 5, the level of initial expenditure or income has a significant and negative effect on subsequent growth, implying that households with high levels of initial income or expenditures will, over time, regress towards the mean. At the same time, controlling for initial expenditure or income, higher levels of assets put their owners on a permanently higher growth path. The magnitude of this effect is considerable; a difference of one standard deviation in terms of initial assets would, according to the regression, translate into a difference of more than 2 percentage points in terms of growth of per capita expenditure and 3 percentage points in terms of income.

The importance of assets becomes even more pronounced if, in addition to physical capital, we consider endowments of human capital. Shifting households from the current median level of three years to having completed primary education (i.e. 7 years) would, according to the regression, result in an increase of 2.8 points in growth of consumption and 3.6 points in growth of

income – a formidable change. Moreover, the results suggest that the impact of higher levels of education is convex, implying that further advances in terms of subsequent secondary enrolment will yield even bigger

Table 5: Determinants of changes in per capita expenditure and income, 1992-9

	Growth of p.c. expenditure		Growth of p.c. income	
Assets in 1992 (log)	1.546 [a]	4.068 [a]	2.065 [a]	6.390 [a]
	(9.30)	(2.88)	(8.25)	(2.63)
Education (years)	-0.224	-0.243	-0.165	-0.209
	(1.16)	(1.25)	(0.51)	(0.65)
Education squared	0.070[a]	0.071 [a]	0.086 [a]	0.090 [a]
	(4.19)	(4.29)	(2.99)	(3.15)
HH had health problems in 1992	-1.208 [a]	-1.177 [a]	-1.835 [a]	-1.801 [a]
	(2.96)	(2.89)	(2.92)	(2.88)
HH had electricity in 1992	6.012 [a]	6.073 [a]	3.560[c]	3.626 [c]
	(5.03)	(5.07)	(1.74)	(1.79)
Change in coffee price	0.064 [a]	0.171 [a]	0.046 [a]	0.228[b]
	(8.27)	(2.85)	(3.59)	(2.20)
Female-headed household in 1992	-1.045 [b]	-0.995 [b]	-1.749 [b]	-1.677 [b]
	(2.28)	(2.17)	(2.24)	(2.14)
No. of members aged 6-14 in 1992	-0.941 [a]	-0.926 [a]	-0.571 [a]	-0.543 [a]
	(8.74)	(8.53)	(3.61)	(3.42)
No. of members aged 15-60 in 1992	-0.772 [a]	-0.763 [a]	-1.199 [a]	-1.174 [a]
	(4.30)	(4.18)	(5.48)	(5.26)
No. of members aged > 60 in 1992	-0.847 [b]	-0.839 [b]	-2.013 [a]	-1.977 [a]
	(2.31)	(2.30)	(3.36)	(3.30)
Dist. to municipality (10 kms)	-0.669	-0.709	1.338 [b]	1.311 [b]
	(1.42)	(1.50)	(2.05)	(2.00)
Ethnic fractionalisation in 1992	1.981 [a]	2.044 [a]	3.274 [a]	3.391 [a]
	(3.18)	(3.27)	(3.31)	(3.41)
Affected by civil strife in 1992	-0.679	-0.746	-5.283 [a]	-5.419 [a]
	(0.81)	(0.88)	(3.81)	(3.92)
Initial assets *Δ coffee price		-0.008*		-0.014[c]
		(1.82)		(1.80)
Initial value of cons./income	-11.911 [a]	-11.893 [a]	-11.669 [a]	-11.693 [a]
	(33.93)	(33.95)	(30.98)	(31.11)
Constant	115.519 [a]	81.908 [a]	103.502 [a]	46.426
	(24.19)	(4.21)	(18.11)	(1.41)
Observations	**1222**	**1222**	**1165**	**1165**
R-squared	**0.53**	**0.53**	**0.53**	**0.53**

Notes: Robust t statistics in parentheses. a) significant at 1%; b) significant at 5%; c) significant at 10%.

benefits. This not only reinforces the emphasis on measures to promote investment but also suggests that the programme of Universal Primary Education (UPE), which aims to eliminate the scope for drop-outs for financial reasons and thus gradually increase enrolment, is targeting one of the critical areas for the country's future development. With regard to other initial household characteristics, we find that both income and expenditure of households which were female-headed in 1992 grew more slowly, by about 1 and 1.7 percentage points, respectively. Also, larger households (i.e. those with a higher number of members) grew more slowly than small ones, even in per capita terms.

Health The importance of the supply of curative and preventive health services is supported by an estimated strong impact of initial health conditions on growth. Regressions suggest that households which, in 1992, were affected by health problems, experienced growth of income or consumption that was 1.2 or 1.8 percentage points lower than for those which had been free from such problems. To interpret this figure, note that local supply of health services is one of the most important determinants of ill health (Deininger, 2001). For Uganda, this implies that a consistent policy, comparable to what has been implemented in the education sector, could have considerable benefits. At a broader level, and with malaria responsible for more than 80% of all incidents of sickness, this supports the hypothesis that malaria can constitute an important impediment to African development (Gallup and Sachs, 2000).

Infrastructure Our regressions point to a very pronounced effect that is associated with initial access to electricity at the village level. Households with such access saw their income and expenditure increased by 3.5 and 6 percentage points more than those which had to do without. Even at the village level, initial access to electricity is not completely exogenous. To the extent that such supply was geared towards areas with high potential returns, the estimated coefficient would be biased upwards. However, in view of the exceedingly low level of coverage (with access standing at only 2% for the poor), one would still expect ample space for expansion before decreasing returns set in.[17] This conjecture is supported by the fact that local industrialists and investors have consistently mentioned limited access to, and reliability of, the electricity grid as one of the main impediments to future growth and investment and in many cases investing considerable resources to establish their own generators (Svensson and Reinikka, 2001). In fact, with a rapidly expanding supply of more educated workers in the wake of UPE, supply of infrastructure could easily develop into a binding constraint that might, in the extreme, reduce the scope for generating well-remunerated employment, thereby affecting the incentives to acquire education.

Social capital and violence The measure of ethnic fractionalisation emerges as important and positive, in contrast to what one would expect from the cross-country literature where this variable reduced growth. One explanation could be the scope for realising synergies so long as ethnic differences do not give rise to open conflict.[18] Indeed, whether or not a household was affected by civil strife in the initial period is shown to have had a significant impact on growth of income, but

17. One might even argue that, at such a low level of coverage, political pressures to extend coverage might have been more important than economic ones – up to the extreme case where the coefficient in the regression is actually biased downwards. It is impossible for us to ascertain the extent to which this has been the case in Uganda.
18. Note that violent conflict is included as a separate variable. Also note that ethnic diversity is greatest in urban areas; indeed, the index of ethnic fractionalisation and an urban dummy are positively correlated ($\rho = 0.28$), although the introduction of such a dummy does not eliminate the significance of the fractionalisation index.

not of expenditure. This remains true if, rather than postulating a linear effect, we allow for a possible non-linearity in the impact of this variable or use various cut-off values for 'intermediate' levels of ethnic diversity, as suggested by Bigombe et al. (2000). The size of the coefficient is very large, suggesting a reduction of per capita income growth of 5 percentage points for households which have been affected by conflict. In view of the fact that this appears to be one of the first times the negative impact of violence on economic performance at the household level has been empirically demonstrated and quantified, more research on this would be warranted.

Price policies By suggesting that higher coffee prices have had a significant and quantitatively large impact on household income and welfare, our regression supports the importance the government attached to liberalisation of agricultural output prices early on in the liberalisation process. The large elasticity is of particular importance in view of the fact that prices for other cash crops such as cotton that are of great regional importance have declined considerably, thus greatly reducing the scope for growth especially in the Northern part of the country.

Critics often point out that, even though such price changes may have a positive impact on the rural economy in the aggregate, they tend to leave out the poor who, because of barriers preventing them from entering the cash crop economy, will at best reap only indirect benefits from such price changes, for example through labour markets. To explore the extent to which this is true in the case of Uganda, we interact coffee price changes with initial household asset endowments (Table 5, columns 2 and 4). The negative and significant (at 10%) coefficient suggests that, contrary to this argument, price changes have been particularly beneficial for the poor, implying that entry barriers into cash crop production were low. Thus, in addition to contributing to higher incomes for existing producers, the price changes have spurred a significant supply response by the less well-off, thereby allowing the poor to make better use of their labour.

While it appears that the price changes have not benefited only the rich, the high estimated elasticity implies that price decreases could have a marked negative impact on Uganda's rural economy.[19] This is of special relevance in view of the fact that, with few alternative cash crops to coffee, options for risk diversification are severely limited. Although coffee prices were already well below their historical peak at the time of the survey, they have since declined even further. Avoiding the declines in producers' welfare that would be predicted by our regressions will require the development of options for crop and portfolio diversification by rural producers, by creating an environment for the development of marketing channels and processing infrastructure, in the country's different regions.

To sum up, the results for growth of income and expenditure not only support the importance of policies, public services and initial endowments of physical as well as human capital more clearly than has been the case in cross-country regressions, but also illustrate some of the trade-offs between these variables. The data on sickness suggest that better access to health services, and the associated lower levels of sickness, can increase scope for future growth. The same is true for electricity and, to a lesser degree, road infrastructure. We confirm the importance for economic growth of policies to increase prices of tradables as well as the fact that initial endowments have a strong impact on levels of income growth.

Poverty determinants

19. Also note that coffee production is concentrated in some regions.

To explore measures that might be of particular relevance for reducing poverty, we first re-estimate equation (2) with the change in the poverty gap and the squared poverty gap, respectively, as dependent variables, thereby confirming that the factors identified earlier have similar effects on growth as well as poverty.[20] Secondly, we use the classification of households which escaped from or fell into poverty as reported in Table 4 to run a multinomial logit regression of changes in poverty status. Third, we use the estimates obtained in this equation to assess the impact of various policy interventions on the poverty headcount, thereby helping to quantify the magnitude of policy interventions needed to overcome the inter-regional discrepancies in poverty in Uganda.

Results from the regression of poverty levels on initial conditions, reported in Table 6, largely confirm the importance of the factors identified earlier. Initial asset levels, in terms of both human and physical capital, are found to be of overriding importance. Households suffering from health problems in 1992 were characterised by higher levels of poverty in 2000, reinforcing the importance of an adequate supply of health services. The importance of public services is also illustrated by the significant and large coefficient on access to electricity and infrastructure, both of which were associated with significantly lower levels of poverty in the second period. Although being subject to civil strife in 1992 did not have any impact on poverty levels in 2000, the level of initial ethnic fractionalisation had a significant poverty-decreasing impact, in line with what was observed earlier. While there was no indication that female-headed households had higher poverty levels, contrary to their lower growth rates, larger household size, however, was associated with higher levels of poverty. Finally, the scope for increases in agricultural productivity and market integration to reduce poverty is illustrated by the significant and large coefficient on the price of agricultural tradables. Although this should not come as a surprise, in view of both the predominance of agriculture as a source of employment for Uganda's poor and the relatively limited market integration of most rural producers, it illustrates the importance of using productive policies as a means of poverty reduction. In view of the importance of agricultural prices for observed poverty levels, it is quite likely that the precipitous drop in prices for cotton, the main agricultural cash crop in the North, is one of the main reasons for the limited progress in poverty reduction that is observed in this region. The regression thus supports attention to market incentives in the productive sector.

20. It is easy to show that the coefficients for this equation with the initial level included will be the same as for the change. Also note that, because many of the dependent variables are censored, we use a tobit rather than a OLS framework.

Table 6: Determinants of poverty in 1999 (tobit regressions)

	Dependent variable			
	Poverty gap		Squared poverty gap	
Assets in 1992 (log)	-0.054[a]	-0.087[a]	-0.031[a]	-0.049[a]
	(6.80)	(10.34)	(7.27)	(10.72)
Education (years)	-0.013[a]	-0.023[a]	-0.007[a]	-0.012[a]
	(3.25)	(5.28)	(3.46)	(5.22)
HH had health problems in 1992	0.089[a]	0.046[b]	0.053[a]	0.031[a]
	(3.87)	(2.07)	(4.35)	(2.61)
HH has electricity in 1992	-0.204[b]	-0.203[b]	-0.109[b]	-0.112[b]
	(2.25)	(2.16)	(2.20)	(2.13)
Change in coffee price	-0.004[a]	-0.003[a]	-0.002[a]	-0.002[a]
	(10.48)	(6.95)	(11.44)	(7.76)
(Squared) poverty gap in 1992	0.246[a]	0.174[a]	0.168[a]	0.115[a]
	(5.34)	(3.91)	(4.69)	(3.29)
Female-headed household in 1992		0.008		0.017
		(0.32)		(1.28)
No. of members aged 6-14 in 1992		0.037[a]		0.019[a]
		(6.83)		(6.37)
No. of members aged 15-60 in 1992		0.046[a]		0.026[a]
		(6.52)		(6.78)
No. of members aged > 60 in 1992		0.025		0.018[c]
		(1.30)		(1.78)
Dist. to municipality (10 kms)		0.055[b]		0.037[a]
		(2.50)		(3.14)
Ethnic fractionalisation in 1992		-0.105[a]		-0.060[a]
		(3.19)		(3.34)
Affected by civil strife in 1992		0.055		0.033
		(1.45)		(1.59)
Constant	1.790[a]	1.748[a]	1.027[a]	0.992[a]
	(12.37)	(12.29)	(13.45)	(13.07)
Observations	**1259**	**1222**	**1259**	**1222**
Log-likelihood	**-533.39**	**-457.67**	**-206.73**	**-139.29**

Notes: Absolute value of t-statistics in parentheses. a) significant at 1%; b) significant at 5%; c) significant at 10%.

As discussed earlier (see Table 4), the net reduction in poverty levels is composed of the number of households which escaped from poverty minus those which fell into poverty. To explore the underlying dynamics in more detail, and in particular to distinguish whether there are specific factors that are more important for households falling into poverty and others that play a key role in helping them to escape from poverty, we run a multinomial logit regression with the dependent variables discussed earlier. Results, illustrated in Table 7, suggest that most of the independent variables, in particular household composition, assets and social capital, are equally important for escaping from poverty or (in their absence) falling into poverty. Two variables that are more significant for falling into poverty than the other way round are ill-health and electricity. The former is easily explained by the fact that, while good health may not convey a particular advantage, ill-health can, especially in an environment characterised by AIDS and other diseases, easily throw a household into poverty. The latter is likely to emerge because, in areas where electricity was available, there were significant indirect impacts (for example, through higher

demand for labour) that reduced the probability of households falling into poverty. The conclusion is that provision of public infrastructure, by helping to cope with shocks and by indirectly increasing demand for labour, can significantly reduce households' vulnerability, i.e. the danger of falling into poverty.

Table 7: Multinomial logit for changes in poverty status between 1992 and 2000

	Probability of	
	Escaping poverty	**Falling into poverty**
Asset endowments in 1992 (log)	0.322[a]	-0.432[a]
	(5.09)	(5.67)
Mean education (years)	0.135[a]	-0.136[a]
	(3.86)	(3.55)
HH had health problems in 1992	0.169	0.428[c]
	(0.91)	(1.84)
HH had access to electricity in 1992	-0.801	-2.026[b]
	(0.61)	(2.24)
No. of members aged 6-14 in 1992	-0.241[a]	0.220[a]
	(5.25)	(4.25)
No. of members aged 15-60 in 1992	-0.204[a]	0.274[a]
	(3.27)	(4.28)
No. of members aged > 60 in 1992	-0.084	-0.067
	(0.55)	(0.36)
Dist. to municipality (10 kms)	-0.242	-0.010
	(1.35)	(0.04)
Ethnic fractionalisation in 1992	1.215[a]	-1.147[a]
	(5.03)	(3.96)
Affected by civil strife in 1992	-0.400	0.032
	(1.29)	(0.08)
Change in coffee price	0.011[a]	-0.006[b]
	(4.90)	(2.21)
HH was poor in 1992	23.410[a]	-42.550
	(28.07)	(0.00)
No. of observations	**1237**	
Log-likelihood	**-653.15**	
	0.4314	

Notes: Absolute value of z statistics in parentheses. a) significant at 1%; b) significant at 5%; c) significant at 10%.

Simulation of poverty changes

To illustrate these results numerically and at the same time highlight the magnitude required for policy initiatives to tackle the inter-regional inequalities characterising Uganda, Table 8 reports the results of a number of counterfactual 'policy experiments' where key policy parameters are changed to explore their potential impact on the poverty levels observed in 2000. The baseline scenario, with the observed poverty headcount in 1992 as well as the headcount predicted by the regression for 2000, is presented in lines 1 and 2. While the national headcount would have decreased from 54% to 37% over the period, we note the marked differences across regions.

Marked reductions in the Centre (to 21%), the East (to 35%), and the West (to 39%) are accompanied by hardly any reduction in the North, where 65% of households are predicted to fall below the poverty line.

Table 8: Simulated impact of various policy interventions on the predicted poverty headcount (%)

	Regions				National
	Centre	**East**	**North**	**West**	
Baseline scenario					
Poverty headcount 1992	41.1	57.2	66.3	58.2	53.9
Predicted headcount for 2000	21.3	35.3	64.5	39.2	36.9
1. National level price changes (+10%)					
Share of people escaping poverty	31.9	37.7	22.4	35.4	32.8
Share of people falling into poverty	6.8	8.6	15.7	9.4	9.4
Predicted level of poverty	15.8	28.4	59.5	32.1	30.6
2. National level price changes (-10%)					
Predicted level of poverty	28.1	42.8	69.2	46.8	43.7
3. Overall increase in initial assets (to US$3000)					
Share of people escaping poverty	32.9	41.4	31.5	36.7	35.8
Share of people falling into poverty	6.7	7.1	10.9	8.5	8.0
Predicted level of poverty	14.7	23.3	45.6	29.9	26.2
4. Region-specific price increase					
Share of people escaping poverty	29.1	50.4	36.0	31.3	35.7
Share of people falling into poverty	9.8	1.8	7.6	12.1	8.3
Predicted level of poverty	21.6	8.9	37.8	39.0	26.6
5. Region-specific price plus initial asset increase					
Share of people escaping poverty	29.1	53.7	48.2	31.3	38.4
Share of people falling into poverty	9.8	1.0	3.3	12.1	7.5
Predicted level of poverty	21.6	4.9	21.2	39.0	23.1

The first policy experiment consists of a price change for the main tradable, coffee, that is 10% higher than what was actually observed. Compared with the baseline case, this results in a reduction of the poverty headcount by about 6 percentage points, thus illustrating the high elasticity of poverty with respect to prices. The change is fairly evenly distributed across regions; overall it is predicted that 33% of households would escape from poverty and 9.4% fall into poverty. The high elasticity of poverty with respect to output prices illustrates the potentially large benefits from liberalisation of agricultural trade, a policy measure that enjoys wide support among the Ugandan population (UPPAP, 2001). Also, it illustrates the economy's vulnerability to a sudden price drop. This is illustrated by the second experiment which consists of a downward shift in coffee prices. Not surprisingly, in view of the linear character of the regression, we find that the poverty increases by slightly more than 6% in the aggregate. This is of particular relevance in view of the recent fall in coffee prices, illustrating the need for a more diversified portfolio of cash crops, the prices of which are not very highly correlated, as a way of insuring against the possibly pervasive negative impact of a negative price shock.

In view of the fact that asset endowments vary considerably across regions, the third counterfactual was an increase in the value of total (initial) assets owned to US$3,000 from an average in the panel of slightly above US$2,000. Note that, in view of the vast differences in initial asset endowments (which, in the panel, ranged from US$852 in the North and $1,212 in the East to $2,245 in the West and $2,809 in the Centre), this implies a far bigger change in percentage terms (i.e. more than tripling the initial asset endowment for dwellers in the North) for the regions that are least well-off. The impact, though modest in terms of overall poverty headcount figures which decrease by only 10% from what had actually been observed in 2000, illustrates the importance of assets – with poverty in the North decreased by more than 20 percentage points compared with 13 in the East, 10 in the West, and 7 in the Centre. This, together with the vast differences in poverty levels across regions, suggests that region-specific policies might be needed in order to make a bigger dent in overall poverty and at the same time reduce the increasing disparity within regions that was confirmed by earlier regression results.

To respond to the need for a regionally differentiated policy, the last two simulations provide evidence on the potential impact of regionally targeted increases in output prices and increases in asset endowments. Line 4 reports the result of a 50% increase in the price of the main tradable that is limited only to the East and the North. The results, in terms of the incidence of poverty, are clearly impressive; the incidence of poverty declines by about 26 percentage points in both regions and the predicted decline of 9% in the East becomes the lowest in the whole country, while the North, with a headcount of 38%, is able to catch up with the West. Although this is clearly a big shift, the underlying assumption is by no means unrealistic. Evidence from the household survey indicates that, at the national average, prices for cotton, the main cash crop cultivated in the North and the East, declined by 40% in the 1992-2000 period, owing to structural factors. World cotton prices, by comparison, were stable or showed slight increases between 1992/93 and 1998/99.[21] Restoring cotton prices to their original level would thus yield almost all that is required. Further improvements in technology as well as road infrastructure, especially if combined with reductions in the transaction costs of trading, could easily account for the remaining 10%, suggesting that this scenario, and the associated decrease in poverty, is by no means unattainable.

The last simulation combines this scenario of a regionally limited price increase with a regionally limited increase in the asset endowment to US$3,000. Results suggest that, with such a measure, the poverty headcount in the North would approach the levels (i.e. slightly above 20%) currently observed in the Centre, while poverty in the East would decline to 5%. Even though these extrapolations are of an illustrative nature, they highlight the challenges to be confronted as well as the opportunities inherent in an activation of the productive sector of the rural economy.

Conclusion and policy implications

Inspired by the traditional cross-country literature, and using similar variables, household-level analysis allows us to enhance the precision of the coefficients and the policy relevance of the recommendations derived from such analysis, in a number of ways.

With respect to price policy, our results are broadly supportive of the strategy taken by the Government of Uganda but also illustrate a number of challenges. The importance of prices for agricultural tradables, as proxied by coffee, supports Uganda's emphasis on quick and decisive liberalisation of output markets for agricultural produce in the early 1990s. Moreover, the fact that

21 According to the FAO trade data-base (www.fao.org), prices for the US as well as for Mali increased slightly, by 6% and 2%, respectively, for the period under review. Unfortunately, data for 2000 are not yet available.

such price changes have been particularly beneficial to the poor not only explodes the myth of liberalisation being anti-poor but, more importantly, points to the decline in cotton prices and in the associated agricultural opportunities in the North as a possibly major reason for the continued high levels of poverty observed in this region. At the same time, the high elasticity of growth as well as poverty with respect to output prices means that both price increases and decreases will have a strong impact, implying that, unless there are options for diversification, producers will be very vulnerable to negative price shocks. This is an issue that is of particular relevance for the poor.

Even though we find convergence in income, households' initial asset endowment is a significant determinant of subsequent growth performance, and of even higher importance for poverty reduction. The large impact of households' initial endowments of assets and education – for growth as well as poverty reduction – supports the emphasis on expanding opportunities for basic education through the UPE as a basis for a sustained increase in the country's human capital base. At the same time, it highlights the danger of being unable to have sufficient physical capital assets, especially in light of the relatively low level of investment at the household level that is emerging from the survey. Sound macroeconomic policy needs to be complemented by government actions geared towards facilitating broad economic growth and poverty reduction.

The importance attributed by our regressions to education as well as health-related variables is in sharp contrast to the weak and often indirect evidence from the cross-country literature. It illustrates that analysis of micro-data in one country has the potential of providing insights that go beyond what is revealed by aggregate regressions across countries. Together with the significance of access to other infrastructure such as electricity and the income-reducing impact of civil strife, this illustrates the fact that education needs to be complemented by access to other infrastructure in order to become fully effective and that without a peaceful overall environment it will be difficult for the economy to thrive. Further efforts to enhance quality of service delivery and to reduce civil conflict are thus likely to have a large pay-off. Unless sound policies are complemented by provision of the public goods needed for sustained income growth, the opportunities opened up by those policies may be utilised mainly by the more affluent, and may exacerbate pre-existing inequalities between urban and rural as well as different regions in the country. Ensuring the equality of opportunity needed to avoid such an outcome is an important challenge for the government in the years ahead.

Although the above discussion provides an interesting illustration of the way in which household-level panel data can be used for policy analysis, the reduced form estimates are only a very first attempt to address the associated issues. Further work to identify the channels and mechanisms through which the different variables operate would be of great interest. It would also provide an opportunity to address many methodological and substantive issues associated with the collection, interpretation and analysis of panel data to which there are no clear answers at the moment. It is our hope that Uganda will be in the forefront of efforts to address these issues, thus leading to results that will be of broader relevance for the region.

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Appendix Table 1: Probit selection equation for panel households

	Dependent variable: household in panel
Household size	0.006[a] (3.01)
Education (years) in 1992	0.007[b] (2.54)
Education squared in 1992	0.000[b] (2.01)
Assets (log)	0.005[a] (4.85)
Female-headed household in 1992	-0.001 (0.08)
At least 1 member sick last month (1992)	-0.014[c] (1.72)
No. of days lost to sickness	0.000 (0.52)
HH has electricity in 1992	-0.059[a] (4.58)
No. of members aged 6-14 in 1992	0.002 (0.59)
No. of members aged > 60 in 1992	0.009 (1.40)
Urban community	-0.100[a] (12.21)
Eastern region	-0.030[a] (3.45)
Northern region	-0.055[a] (6.14)
Western region	0.004 (0.42)
No. of observations	**9923**
Log-likelihood	**-3724.39**
Pseudo R^2	**0.0650**

Note: Robust z-statistics in parentheses. a) significant at 1%; b) significant at 5%; c) significant at 10%.