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Explaining Poverty in Uganda: Evidence from the Uganda National Household Survey

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Abstract: The broad aim of the research was to establish a tool for identifying cost effective poverty alleviation strategies in Uganda. The objectives were to test hypotheses on causes of poverty in Uganda and to develop a poverty simulation model for policy analysis. Data for 9,710 households from the 2002/2003 Uganda National Household Survey (UNHS) was used to estimate a semi-log econometric model. The model included 19 households' level characteristics and 8 community level characteristics as explanatory variables. The dependent variable was the natural logarithm of household consumption per adult equivalent. The model was estimated at both national and regional (5 regions) by weighted least squares with robust variance. The results identified 8 particularly promising poverty reducing policies namely: expansion of formal employment, secondary education, reduction in population growth, rural electrification, off-farm activities, collateral free credit, telephone services and reducing distance to community services. The study highlights the policy implications of the results.

Introduction

Poverty has risen in Africa, both as a share of the world's total poor, and in absolute terms within Africa. By 2015, one in every two poor people in the world will live in Africa, according to a recent World Bank report, whereas in the 1980s, only one in ten poor persons worldwide lived in Africa.

The Millennium Development Goals is an effort of the United Nations to reduce the number of people living in poverty worldwide by half by 2015. To reach this goal, African economies would have to grow seven percent per year, much higher than the current per annum growth rate of 2% (World Bank, 2001).

Tools for identifying the relative effectiveness of policies in reducing poverty are needed in Africa. In this paper, we utilize a comprehensive statistical framework for analyzing the poverty alleviation potential of various anti-poverty strategies. The empirical basis of the analysis is a household survey conducted in Uganda in 2002/2003.

Policy Context in Uganda

The objective of the Poverty Eradication Action Plan (PEAP) formulated by the Government of Uganda (GOU) is to reduce poverty to 10 percent by 2017. The PEAP is Uganda's Poverty Reduction Strategy Paper (PRSP). This is a target even more ambitious than that of the Millennium Development Goals. According to the Uganda Ministry of Finance, Planning, and Economic Development (2004), the purpose of the PEAP is "to provide an overarching strategic framework and to guide public action to reduce poverty, defined as low incomes, limited human development, and powerlessness." The PEAP document outlines anti-poverty strategies for numerous social and economic sectors.
The PEAP has been developed by the Ministry of Finance, Planning and Economic Development (MFPED) working with officials from various government ministries, civil society, and foreign aid donors. A variety of methods, many of them based on expert judgment, have been used to develop the PEAP document. This paper demonstrates how household survey data could be used for analytical and prescriptive purposes in anti-poverty policy planning in Uganda. Better planning offers the promise of greater effectiveness per shilling in lowering the poverty rate.

Household Survey and Estimation of Official Poverty Line

The Uganda National Household Survey (UNHS) is used by the Ministry of Finance, Planning and Economic Development to estimate the official poverty rate. Poverty rate estimates at national and regional levels since 1992 are shown in Table 1. Based on the 2002/2003 UNHS data, the estimated national poverty rate is 37.7 percent. This represents a four percent increase in poverty compared to the previous survey (1999/2003), raising concerns in Uganda about the adequacy of existing antipoverty strategies.

The 2002/2003 UNHS survey covered all of Uganda except for a small area representing less than two percent of national population. The household survey has four modules: socioeconomic, labour force, informal sector, and community. The informal sector module provides information on household and non-household enterprises in rural

areas and household enterprises in urban areas. Informal sector activities included in the survey are (1) livestock, poultry, bee-keeping, and fishing; (2) forestry; mining, quarrying, and manufacturing; (3) hotels, lodges, and eating places; and (4) trade and services. Enumerators conducted the survey over the period May 2002 to April 2003.

A two-stage sampling design comprising Enumeration Areas (EAs) and households was used by UBOS (2003). At the first stage, 972 EAs (565 rural, 407 urban) were identified. Population estimates for EAs were developed from the 2002 Population and Housing Census. In most instances, EAs are identical to the Local Council 1 (LC1) level of government. At the second stage, 10 sample households were drawn from a listing of households in each EA. Each of the 56 districts in the country is treated as a stratum and divided into three sub-strata: rural, district town, and other urban areas. Some sub-populations, such as urban residents and the unemployed were over-sampled to ensure that selected activities and issues were covered.

In addition to the household survey, a community-level survey was conducted in each enumeration area (Local Council 1). Respondents were local officials. The primary focus of the community survey was public and private services and community projects.

Descriptive statistics from the UNHS survey are presented in Table 2. Means in the table are weighted to reflect the population of Uganda rather than merely the survey sample. For binary variables (0,1), the mean indicates the population proportion. For example, the mean of "sex of household head" (0 = male, 1 = female) is 0.25, implying that 25 percent of households are headed by females.

The poverty line, used in calculating the official poverty rate in Uganda, is based on the shilling value of a basket of food that meets a caloric standard. Many bundles with differing compositions would provide the caloric minimum. The particular bundle used by UBOS in the poverty rate calculation is the average bundle consumed by the poorest 50 percent of Ugandans. After the market value of this food basket is determined, minimum expenditures are also added for non-food items. Non-food expenditures in the poverty-line consumption bundle are calculated based on the non-food consumption for households at the poverty line (Ravallion and Bidani, 1994).

Conceptual Framework

We define poverty as the inability of a household to achieve a given level of consumption, including the consumption of purchased items, home-produced items, and items received as gifts. Our objective is to explain the cross-sectional variation in consumption and, hence, poverty across households. To avoid endogeneity, we select household characteristics determined by previous rather than current decisions of the household (Mukherjee and Benson, 2003).

The following conceptual model of household consumption is posited:

$$c = f(\text{household characteristics, community characteristics, regional characteristics})$$

where c is current consumption per capita or per adult equivalent.

Consumption is a function of both cash income and the capacity of the household to produce for its own use in a largely or partially subsistent economy. Based on microeconomic theory, the requirement of exogeneity of independent variables, and data availability, we selected the following household characteristics: age of head of household, household size by age cohort, educational attainment, employment sector, employment type (formal or informal), the relative importance of agriculture as a source of income, and presence or absence of a household non-crop enterprise.

Household returns to land, human capital, and physical capital are affected by the proximate economic and social environment. This environment was viewed as consisting of the local community (Local Council 1) and the region of the country where the household is located. Local services and community projects may affect the productivity and, ultimately, the consumption of the household. Local services typically may have a public-goods nature though they may not be pure public goods, and some (such as telephone) may be available through private vendors rather than through local governments. The community characteristics we selected are village electrification, distance to health facilities and schools, proximity to input vendors, existence of a road, existence of telephone facilities, and availability of credit without collateral.

Broad regional characteristics that span many communities may also affect consumption. Regional characteristics that may affect household consumption are climate, topography, existence and density of transportation and communications networks, and population density.

Empirical Model

The following linear regression model of consumption was estimated:

$$\ln c_i = \beta x_i + \varepsilon_i$$

where c_i is average daily consumption per adult equivalent of the ith household expressed in Ugandan shillings; x_i is a vector of exogenous household, community, and regional characteristics; and $\varepsilon_i \sim N(0,\sigma^2)$ is a random error term.

The dependent variable (c_i) was constructed using procedures similar to those employed by UBOS for calculation of the official consumption-based poverty rate (Appleton, 1999, 2001). The UNHS survey provides information on 145 household consumption items, summarized in Table 3. Major consumption categories are food and related items, non-durable goods and frequently-consumed services, and semi-durable and durable goods and services. Food consumption includes purchased items consumed at home, purchased items consumed away from home, home-produced items that are consumed within the household, and items received as gifts. Items in the latter two categories are valued at market prices. Food expenditures, except for bottled beverages, and imputed values of subsistence consumption were adjusted for regional price differences, using price indices calculated by UBOS. Non-consumption expenditures, such as taxes, pensions, remittances, gifts, and funeral expenses, are excluded. Daily consumption values were summed across all consumption categories for each household and then divided by the number of adult equivalents in the household. For our analysis, no temporal price adjustments were made in the data since the national rate of inflation was very low (3.5 percent per annum) during the survey period, and the analysis does not involve comparisons over time.

Some of the original 9711 household observations in the UNHS 2002/2003 data were incomplete. After dropping incomplete observations and outliers, we were left with 9096 observations for use in the analysis.

Six models were estimated: one for the nation, four for rural regions (Central, East, North, West), and one for all urban areas combined. All models have the same variables with the exception of the urban model where the agricultural variables were dropped.

The model is estimated using weighted least squares with robust variance (White, 1980). Population weights indicating the number of households in the full population represented by each household in the sample are used. The population weights improve the efficiency of the point estimates ($\hat{\beta}$). The use of a robust variance procedure is necessary for making valid inferences because the survey sample is intentionally drawn from clusters (enumeration areas), and therefore the standard assumption of independence of observations is violated. If an ordinary variance-covariance matrix were estimated in this case, the standard errors would be estimated incorrectly and inappropriate inferences might be drawn.

Econometric Results

The model is semi-log in form. Therefore, the coefficient indicates the percent change in the dependent variable (daily consumption per adult equivalent) as a result of a unit change in the independent variable. The results are presented in Table 4. The R-squared indicator of goodness of fit ranges from 0.28 to 0.46..

Household characteristics

Age of household head is not statistically significant in the national equation. It is possible that older age is not associated with declining household consumption because as individuals get older they may accumulate productive assets that offset the physical productivity of the individual. In the regional equations, age of head of household is statistically significant only in the West Rural region, where the older the household head, the higher the level of consumption (significance is at five percent level). The age-consumption relationship in the West Rural region is nonlinear, as indicated by the negative and statistically significant coefficient on age squared. However, the coefficient on age squared is extremely small, indicating that the age-consumption relationship is almost linear.

The gender of household head is and negative statistically significant at the one percent level in the national equation. On average, consumption in female-headed households is 8.7 percent lower than in male-headed households. Gender is statistically significant in two of the five regions, East Rural and North Rural. The largest impact is in the North Rural region, where female-headed households consume16.9 percent less than male-headed households.

Household size has a large impact on consumption. Because the productive capacity of household members varies over the life cycle, we disaggregate households into age cohorts. The 18-to-59 age cohort is further broken down into gender categories. In the national equation, coefficients for all cohorts are statistically significant and negative, implying that larger households are poorer on average. Children age nine and younger bring about the greatest reduction in consumption (20.8 percent) because they contribute little or nothing to production. Even in the productive years of 18-59, adding an additional person lowers consumption (14.0 percent for males, 15.0 percent for females), implying great inefficiency in labor usage. A similar relationship between household size and consumption obtains at

the regional level where coefficients for the two child categories are negative and statistically significant in all regions. Coefficients on the regional adult categories are all negative, with the exception of 60-and-older variable in the Central Rural region, though some coefficients are not statistically significant. The "consumption penalty" for large households is greatest in the North Rural and Urban regions, probably due to a civil war that has waged in the north for nearly two decades and to high unemployment levels in urban areas.

Educational attainment of household members also has a large impact on household consumption. The number of adults age 25-59 with a primary school certificate has a positive and statistically significant impact on household consumption. Results for the national and four rural equations indicate a 24-25 percent consumption increase if households add one more female adult who completed primary school, while in urban areas, the increase is 17.1 percent. The consumption gain from primary education is lower for males than for females. Adding one dult male with primary school education increases consumption by 11.1 percent in the national equation and by 7.9 percent to 17.6 percent in the regional equations. The higher return to primary education for females as compared to males may be due in part to the dampening effect of education on fertility rates.

The number of adults who have completed A-level secondary school is statistically significant and positive in the national equation. On average, adding one more female adult with A-level education raises consumption by 20.8 percent while adding one more male adult raises consumption by 27.9 percent. In the regional equations, the sign on the number of females with A-level certificate is positive and significant in two regions and insignificant in three regions. The consumption boost due to female secondary schooling is higher in urban as compared to rural areas with the exception of the North Rural region, where the consumption gain from female schooling is 72.6 percent. This enormous gain may be due to the interaction of civil war and economic status. The relatively few women with A-level educational attainment in this region are likely to be located in towns earning an income, in contrast to the nearly two million people who live in dire poverty in internally-displaced-person camps created as a result of civil war. For males, the consumption effect of secondary schooling is positive and significant in all regions.

University education boosts household consumption by more than 50 percent. In the national equation, the marginal effect of another person with a university diploma is a consumption increase of 54.4 percent for females and 56.9 percent for males. No attempt was made to estimate the effect of university education on households in the rural regions because households with degree-holding members are non-existent or extremely small in number. In urban areas, the consumption effect of university education is 64.7 percent for females and 67.3 percent for males.

Sector of employment affects the level of household consumption. To control for the total number of workers while examining the differential impacts of the sector of employment, we include three variables, representing the number of usually-employed household members working in the primary (agriculture, fisheries, forestry, and mining), secondary (manufacturing), and tertiary (services, commerce, various professions, and government) sectors. Adding an additional worker in the primary sector implies switching him/her away from the secondary or tertiary sectors, a change which would lower household consumption, according to the regression results. The coefficient on primary-sector employment is negative and statistically significant in all equations, national and regional. The interpretation is that the return to primary-sector employment is lower than the return averaged across the secondary and tertiary sectors. Adding an additional worker in the secondary sector, which would involve switching him/her away from the primary or tertiary sectors, would reduce consumption in the national, West Rural, and Urban equations. This implies that the return to labor in the secondary sector is lower than the return averaged across primary and tertiary sectors. Manufacturing in Uganda is rudimentary and production is primarily for the national market, so it is not surprising that wages of secondary-sector workers is relatively low. Adding an additional worker in the tertiary sector has a positive and statistically significant impact on consumption in all equations except West Rural and Urban. This implies that the returns to tertiary-sector employment are higher than the averaged return across primary and secondary sectors. The relative impact of tertiary-sector employment depends on location. In urban areas, the impact of tertiary employment is neutral, perhaps because the vast majority of urban tertiary-sector jobs, even those that constitute "usual employment," have wages that are below the average local (urban) wage. In contrast, the marginal impact of tertiary-sector employment in three of the four rural regions is positive and significant, perhaps because "usual employment" in the tertiary sector is relatively rare in rural areas, and the few tertiary-sector jobs that constitute "usual employment" in those areas typically involve skilled occupations (public administration, health, or education) for which earnings exceed the average local (rural) wage.

The number of household members with formal employment is statistically significant and positive. Adding one more household member employed in the formal sector increases household consumption by 13.5 percent in the national equation and up to 22.6 percent in the regional equations. Separating the effects of education from the effects of formal sector employment is difficult because upper secondary or university education is generally a prerequisite for formal employment in Uganda. Therefore, the coefficients on secondary and university education are undoubtedly picking up some of the difference in consumption between households with formally-employed members and those that have none.

Dependence of the household on agriculture as the primary source of income is positive and statistically significant in the national equation and two of the regional equations (East Rural and North Rural). At the national level, consumption in households that rely on agriculture as their major income source is 4.1 percent higher than in households who dominant reliance is not on agriculture. Among the regions, the East Rural region registers the highest consumption gain from reliance on agriculture (9.7 percent).

Land area cultivated per capita by the household is statistically significant and positive in the national equation and three of the rural regions (Central, East, and North) . The land constraint is most binding in the East Rural region, where an increase of one acre per member of the household would increase household consumption by 15.8 percent. This corresponds with the general perception of land scarcity in that region. West Rural is the only region where the land variable is not statistically significant, suggesting that land is not a constraining factor in household consumption.

Per capita value of livestock is positive and statistically significant in the national equation. On average in Uganda, increasing the value of livestock holdings by one million shillings (equal to the price of three to five head of local-breed cattle) per member of the household would increase household consumption by 4.7 percent. At the regional level, the livestock variable is positive and statistically significant in two of the rural regions (North and West). In the North, increasing the value of livestock holdings by one million shillings is associated with a consumption increase of 89.3 percent. This large impact may be due to economic anomalies arising from the civil war in that region, reflecting a relationship between livestock holding and consumption unique to that region. The war has made cattle there rare and expensive, and the few households able to keep livestock probably have consumption levels and security unrelated to their cattle holdings.

Household-based non-crop enterprise activity is statistically significant and positive in all equations, national and regional. In the national equation, enterprise activity boosts consumption by 16.3 percent. The West Rural region, where reliance on agriculture was not significant, registers the greatest increase (25.9 percent) in consumption from non-crop enterprises. The East Rural region, which gained the most from reliance on agriculture, gains the least (10.5 percent) from non-crop enterprises.

Community characteristics

The presence of electricity at the Local Council 1 (LC1) level of government is statistically significant and positive in the national and urban equations. The result from the national equation suggests that living in a community where electricity is available raises consumption by 19.6 percent. This boost in well-being may be due to an increase in commerce and rudimentary manufacturing that creates jobs, directly and indirectly, and generates earnings that may accrue even to household with no electricity. In the rural equations, village electrification is not statistically significant.

Distance of the community from educational and health services is negative and statistically significant in the national equation and three of the regional equations, suggesting that proximity to community services is important. This variable measures the average distance in kilometers from the center of the community to public and private schools and public and private health care facilities (see Table 2 for details). Reducing the distance by one kilometer is associated with a consumption increase of 0.8 percent in the national equation and with an increase of 0.7-1.0 percent increase in the regional equations where the coefficient was statistically significant.

The presence of at least two markets or outlets for the sale of agricultural produce within five kilometers from the center of the community is positive and statistically significant in three of the rural regional equations (East, North, and West) but not in the national equation. This variable is binary (0,1). The availability of such an outlet is associated with a consumption boost of 9.1 to 17.6 percent.

The presence of a place to make paid telephone calls within two kilometers of the community center is positive and statistically significant in the national and urban equations. This variable is also binary. The consumption boost associated with phone service is 9.2 percent in the national equation and 23.9 percent in the urban equation. Phone service, like electricity, is a facilitator of economic activity. For example, Uganda's national agricultural commodity information service uses telephones to gather and disseminate daily information on the price and availability of a wide range of agricultural commodities, probably leading to an increase in market transactions. In urban areas, also, phone service is used heavily in economic activities. However, it is possible that this variable picks up the effect of various unspecified urban characteristics that are associated with but not caused by phone service.

The presence of a road within one kilometer of the community center is statistically significant only in the East Rural equation, where the boost in household consumption in communities with a road is 8.3 percent. Inadequacy of the road network is widely believed to be a constraint on development in Uganda, and it is surprising that roads are not statistically significant in the other equations. This is a binary variable based on a definition so broad that 86.8 percent of communities reported having a road. All routes ranging from unmaintained, dirt feeder roads to paved, all-weather

roads where included in the single question dealing with roads in the household survey. Given its crudeness, this variable should not be interpreted as measuring the effects of good roads. We retain it on the assumption that any bias in the other coefficients resulting from ignoring roads is less if the variable is included rather than dropped.

The presence of a source of credit without collateral within ten kilometers of the community center is positive and statistically significant in the national equation and two of the regional equations (North Rural and Urban). In Uganda, such a source of credit is typically a microfinance institution or program. Presence of a non-collateral credit source is associated with an 8.3 percent increase in consumption in the national equation, 13.0 percent in the North Rural equation, and 9.4 percent in the Urban equation. Like village electrification and phone service, credit is a facilitating factor that enables other economic activities.

Anti-Poverty Policy Simulations

We now use parameter estimates from the regression models to simulate the effects of changes in policy-related exogenous variables. We simulate the effects of 12 experiments, most of them representing potential anti-poverty policies. The results of these simulations are presented in Table 5. The effect on consumption is reported in terms of percentage change in consumption from the actual situation in 2002/2003. The reported change in poverty is the number of percentage points by which the poverty rate changes as compared to the official poverty rate in 2002/2003. The poverty rate is computed using the "p0" headcount of poverty measure developed by Foster, Greer, and Thorbecke (1984):

$$p0 = \sum_i \max(1 - c_i / z), 0)^0$$

where c_i is daily consumption per adult equivalent and z is the poverty line.

Simulation 1: Community Electrification: In this experiment, we examine the income and poverty effects of providing electricity in all communities where it did not exist in 2002/2003. Electrification, especially in rural areas, is very expensive. The simulation model could be used to predict the benefits of such a change. These benefits to household income and consequently national income could then be compared to the cost of implementing universal electrification to determine the merits of such a policy. Indeed, net benefits could be estimated for alternative policies and the policies with the greatest net benefits could be selected.

Community electrification is a binary variable in our model. Introducing electricity in all communities simply involves changing this binary variable to a value of one for every community in which it is zero in the UNHS data.

We estimate that electrifying all communities that currently have no electricity would increase average household consumption by seven percent. Due to the increase in consumption, the poverty rate in the country would fall by 9.3 percent. In other words, from the 200-2003 poverty rate of 37.7 percent, the new rate would be 28.4 percent. In reality, is unlikely that the entire country would be electrified simultaneously. We simulate the extreme case here, however, to demonstrate the importance of electrification. For policy purposes, where policymakers face inevitable budget constraints, it would be an easy matter to scale down the scope of electrification so that only a portion—say, ten percent--of communities would be electrified in any given period of time.

Simulation 2: Reducing Distances to Community Services: Reducing the distance to vital health services and schools is likely to have two effects. First, improved access to these services will increase the productivity of the household. Less time will be wasted in transit. Second, consumption of these services is likely to increase because the relative cost will now have declined.

We estimate that cutting the distance from the center of the community to schools and health facilities throughout the country would increase average household consumption by 2.6 percent. The poverty rate would decline by 3 percent.

Simulation 3: Improving Access to Inputs Markets: Reducing the distance to markets and outlets that sell inputs would also increase the productivity of the household and, at the same time, would lower cost of acquiring inputs. Consumption of inputs is likely to rise as the effective price of inputs falls.

We estimate that providing at least two outlets or markets to buy inputs within 5km of the community center in all communities where this does not currently exist would increase average consumption by 1.2 percent and would lower poverty by 1.6 percent.

Simulation 4: Improving Access to Telephones: Improving access to telephone service would similarly increase household productivity, lower the cost of the service, and increased consumption of telephone services.

We estimate that providing phone service within 2km of all communities in Uganda where such service does not currently exist would increase average consumption by 2.4 percent and would lower poverty by 4.3 percent.

Simulation 5: Improve Access to Credit without Collateral: Making credit without collateral available to households has the potential to increase the productivity of poor households. Credit could permit households to purchase inputs for their existing productive activities, and it could also make it possible for them to start new activities, such as home-based enterprises.

We estimate that making a source of credit not requiring collateral available within 10km of all communities where it is currently not available would increase average consumption by 4.5 percent and would lower poverty by 4.4 percent.

Simulation 6: One more Household member with formal Employment : Availability of formal employment leads to income stability and consumption. Adding one more household member with formal employment increases average consumption by 11 percent and would lower poverty by 7.6 percent.

Simulation 7: Adding a non-crop enterprise in every household currently without one: This would increase consumption by 6 percent and lower poverty by 4.1 percent.

Simulation 8: Increasing land cultivated per capita by 0.25acres in all agricultural households: This would increase average consumption by a mere 0.3 percent while slightly lowering poverty by 0.4 percent.

Simulation 9: Increase animal holdings by 25 percent in all animal –holding households:
This would have dismal impacts on average consumption and the poverty rate.

Simulation 10: Add one more Adult female who completed secondary school: This would increase average consumption by 10.8 percent and would lower poverty by 8.2 percent.

Simulation 11: Add one more Adult male who completed secondary school: This would increase average consumption 11.3 percent and would lower poverty by 8.2 percent.

Simulation 12: Add an additional child if a household already has at least one child: This would decrease average consumption by 11.2 percent and increase poverty by 10.8 percent.

Conclusion

We find the Uganda UNHS data very useful and adequate for policy analysis and planning. The statistical performance of our model is satisfactory. Sectors, sub-populations and regions could be targeted better in Uganda's anti poverty strategy using this and similar analyses. We find the following poverty reducing policies particularly promising.

First, expansion of formal education, implying enhancement of Universal Primary Education (UPE), and giving serious consideration to Universal Secondary Education (USE). Second, working towards reduction of population growth implying giving more emphasis on family planning education and increasing the availability of family planning facilities. Third, give serious consideration to village electrification. Fourth, facilitating rural households' transition from primary to secondary and eventually tertiary production has great potential to address poverty through non-crop enterprises. Fifth, encouraging micro finance institutions (MFI) to avail credit not requiring collateral has great potential to reduce poverty. We however, did not investigate interest rates which are currently very high in Uganda. Sixth, Information, Communication, Technology (ICT) has a potential role in rural development. This underscores the need to further encourage village phones in Uganda. Seventh, availability of support services closer to the people serves as a means of facilitating their productive activities.

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Table 1: National and Regional Poverty Rates in Uganda, 1992-2003

	1992	1997	1999/2000	2002/2003
National	55.7	44.4	33.8	37.7
Rural	59.7	48.7	37.4	41.7
Urban	27.8	16.7	9.6	12.2
Central rural	54.3	34.5	25.2	27.6
Central urban	20.8	11.8	6.1	7.8
East rural	60.8	56.8	36.7	48.3
East urban	40.4	25.2	17.1	17.9
West rural	54.3	44.0	27.4	32.7
West urban	28.9	19.7	5.7	16.9
North rural	73.0	61.8	65.4	65.0
North urban	55.2	34.0	28.6	31.4

Source: Uganda Bureau of Statistics (2003)

Table 2: Variables in the Uganda Household Consumption Model

Household Characteristics					
Variable	*Description*	*Mean*	*Standard deviation*	*Minimum*	*Maximum*
lntotcexp	Natural log of household consumption per adult equivalent	7.12	0.79	4.24	12.57
hdage	Age of hh head	38.45	13.92	17.00	90.00
hdsex	Sex of hh head (0=male, 1=female)	0.25	0.45	0.00	1.00
size9	Number of individuals in hh aged 9 or younger	1.85	1.59	0.00	13.00
size10_17	Number of individuals in hh aged 10-17	1.09	1.36	0.00	14.00
sizef18_59	Number of females in hh aged 18-59	1.08	0.67	0.00	8.00
sizem18_59	Number of males in hh aged 18-59	0.92	0.73	0.00	7.00
size60	Number of individuals in hh 60 or over	0.15	0.42	0.00	4.00
hhsizesq	Household size squared	34.11	39.84	0.00	961.00
schmax	Maximum educational level attained by any adult aged 20-59 in hh (0=no schooling, 1=completed P4, 2=completed P7 or J3, 3=completed S4, 4=completed degree)	2.29	1.00	0.00	4.00
schfs	Number of adult females who completed senior secondary school	0.01	0.10	0.00	2.00
schms	Number of adult males who completed senior secondary school	0.02	0.14	0.00	3.00
indp	Number of usually-employed hh members with primary industry occupation	1.16	1.12	0.00	9.00
inds	Number of usually-employed hh members with secondary industry occupation	0.13	0.39	0.00	6.00
indp	Number of usually-employed hh members with tertiary industry occupation	0.57	0.78	0.00	6.00
empformal	Number of hh members with formal employment	0.11	0.37	0.00	4.00
agdep	Is agriculture the main source of hh earnings? (0 = no, 1 = yes)	0.33	0.46	0.00	1.00
landcultpc	Per capita land cultivated by hh (acres)	0.42	1.91	0.00	166.67
lvaluepc	Per capita value of livestock owned by hh (Uganda shillings)	48536.32	475894.29	0.00	24800000.00
ent	Does hh have a non-crop enterprise? (0 = no,	0.62	0.49	0.00	1.00

	1 = yes)				

Community Characteristics					
elect	Is electricity available in LC1? (0 = no, 1 = yes)	0.34	0.49	0.00	1.00
disser	Mean distance in kilometres to nearest services (government primary school, private primary school, government secondary school, private secondary school, government health centre, government hospital, private or NGO clinic, pharmacy)	8.55	8.06	0.00	109.00
mkt	Are there at least two outlets/markets to buy inputs within 5 km from center of the community? ? (0 = no, 1 = yes)	0.64	0.48	0.00	1.00
	Table 2 (continued)				
phone	Is there a place to make paid calls (phone booth, mobile phone) within 2 km of village center? (0 = no, 1 = yes)	0.36	0.49	0.00	1.00
road92to02	Was there a feeder road / rural access road / all-weather road passing within 1 km of village center in 1992, 1996, 2002? (0 = no, 1 = yes)	0.78	0.39	0.00	1.00
creditnocoll	Is there a source of credit not requiring collateral within 10 kms from village center? (0 = no, 1 = yes)	0.33	0.48	0.00	1.00
agproj	Were there ag-related projects (demonstration gardens, improved varieties/new crops, improved agricultural	0.45	0.50	0.00	1.00

	techniques) in community in last 3 years? (0 = no, 1 = yes)				
animalproj	Were there animal-related projects (livestock improvement, poultry/bird, animal vaccination) in community in last 3 years? (0 = no, 1 = yes)	0.83	0.34	0.00	1.00

Table 3: Categories, Number of Items, and Expenditure Period of Household Expenditures in the Uganda National Household Survey

Category	Number of Items	Expenditure Period
Food, beverages, and tobacco	61	Last 7 days
Non-durable goods and frequently purchase services	41	Last 30 days
Semi-durable and durable goods and services	43	Last 365 days

Source: Uganda Bureau of Statistics (2003)

Table 4: Regression Results from Uganda Household Consumption Model

	Nation	Central Rural	East Rural	North Rural	West Rural	Urban
Age of head of household	0.0003	-0.005	-0.008	-0.003	0.017**	0.005
Age squared of head of household	$-2.7e^{-5}$	$1.6e^{-5}$	$8.2e^{-5}$	-1.2^{-5}	$-2.0e^{-4}$**	$6.2e^{-5}$
Gender of head of household (0 = male, 1 = female)	-0.087***	-0.055	-0.092**	-0.169***	-0.014	0.005
Number of members age 9 and younger	-0.208***	-0.154***	-0.139***	-0.227***	-0.224***	-0.298***
Number of members age 10 to 17	-0.178***	-0.118***	-0.121***	-0.229***	-0.203***	-0.278***
Number of female members age 18 to 59	-0.150***	-0.063	-0.071	-0.180***	-0.187***	-0.259***
Number of male members age 18 to 59	-0.140***	-0.058	-0.096***	-0.242***	-0.166***	-0.246***
Number of members age 60 and older	-0.076**	0.005	-0.148***	-0.120*	-0.011	-0.184***
Household size squared	0.008***	0.004***	0.006***	0.013***	0.011***	0.013***
Number of adult females with primary school certificate	0.249***	0.246***	0.248***	0.241***	0.240***	0.171***
Number of adult males with primary school certificate	0.111***	0.079*	0.102***	0.176***	0.108***	0.123***
Number of adult females with A-	0.208**	-0.137	-0.232	0.726*	0.156	0.351***

level certificate						
Number of adult males with A-level certificate	0.279***	0.483***	0.312**	0.237*	0.141*	0.336***
Number of females with university diploma	0.544***	-	-	-	-	0.647***
Number of males with university diploma	0.569***	-	-	-	-	0.673***
Number of members working in primary industry	-0.094***	-0.054*	-0.073**	-0.090***	-0.080***	-0.078**
Number of members working in secondary industry	-0.064***	-0.012	-0.013	0.054	-0.091*	-0.085**
Number of members working in tertiary industry	0.055***	0.088**	0.103**	0.172***	0.033	0.025
Number of members with formal employment	0.135***	0.118*	0.087	0.226**	0.095*	0.179***
Is agriculture the main source of earnings (0 = no, 1 = yes)	0.041*	-0.053	0.097**	0.085*	0.030	-
Per capita land cultivated by household (acres)	0.025***	0.078***	0.158***	0.145***	0.023	-
Per capita value of livestock of household (Million U.shs.)	0.047***	0.002	0.045	0.893**	0.046**	-
Does household have non-crop	0.163***	0.157***	0.105***	0.107**	0.259***	0.198***

enterprise? (0 = no, 1 = yes)						
Is electricity available in LC1? (0 = no, 1 = yes)	0.196***	0.087	0.101	0.167	0.100	0.148*
Mean distance of LC1 to school and health facilities (kms)	-0.008***	-0.009*	-0.007***	-0.001	0.001	-0.010**
Outlets for ag produce w/i 5 kms of LC1? (0 = no, 1 = yes)	0.036	-0.017	0.104**	0.176***	0.091**	-
Paid phone calls w/i 2 kms of LC1? (0 = no, 1 = yes)	0.092**	0.073	-0.015	-0.098	-0.010	0.239**
Road w/i in 1 km of LC1? (0 = no, 1 = yes)	0.025	0.062	0.083**	-0.033	0.058	0.137
Credit w/o collateral w/i 10 kms of LC1? (0 = no, 1 = yes)	0.083***	0.014	-0.037	0.130**	0.016	0.094*
Intercept	7.483***	7.571***	7.214***	7.193***	6.992***	7.524***
R2	0.46	0.35	0.28	0.40	0.31	0.45
N	9096	1396	1467	989	1382	3862

Table 5: Simulation Results Using Predictions from the National Model

Poverty Alleviation Strategy	Percentage Change in Consumption Per Adult Equivalent	Change in Poverty Rate
Electrify communities not currently electrified	9.0	-11.8
Halve the distance to community services	1.6	-1.8
Create at least two outlets/markets to buy inputs within 5 km from center of community in all communities where this does not currently exist	1.6	-2.0
Create place to make paid phone calls within 2 km of village center in all villages where this does not currently exist	2.7	-3.5
Build road within 1 km of village center in all villages where this does not currently exist	0.5	-0.8
Source of credit not requiring collateral made available within 10 kms from village center where this does not currently exist	4.7	-4.8
Add one child to each household if household already has at least one child	-11.2	10.4
Increase number of adult females who have completed secondary school by one	18.9	-13.8
Increase number of adult males who have completed secondary school by one	17.4	-11.2
Increase number of household members with formal employment by one	23.9	-15.6
Each household now without a non-crop enterprise starts one	7.2	-5.0
Increase per capita land cultivated by 0.25 acres in each household that is currently cultivating	0.4	-0.4