The potential gains from geographical targeting of anti-poverty programs in Uganda

DAVID S KRAYBILL*
Department of Agricultural, Environmental, and Development Economics, Ohio State University

BERNARD BASHAASHA
Department of Agricultural Economics and Agribusiness, Makerere University, Kampala, Uganda

Abstract

Governments do not have enough resources to make anti-poverty programs available to everyone in many African countries. Targeting the poorest populations could increase the efficiency of available program resources. Anti-poverty programs could target either households or geographical areas. This study compares the potential poverty reduction impact of these two approaches in Uganda. The impact of various policy changes on the poverty rate in Uganda is simulated using the estimated parameters of an econometric model of household consumption. The policies examined are family-planning, increased primary school attendance, increased secondary school attendance, expansion of formal employment and micro-enterprise expansion. The results reveal gains in poverty rate reduction from program targeting as compared to randomly allocating finite program resources to a sub-sample of the population. Furthermore, geographical targeting is shown to be more effective than household targeting for most of the six policies examined in the study.

Keywords: Poverty; Geographical targeting; Household targeting; Policy simulation; Uganda

Dans beaucoup de pays africains, les gouvernements ne possèdent pas assez de ressources capables de mettre les programmes de réduction de la pauvreté à la portée de tous. Cibler les personnes les plus pauvres pourrait augmenter l'efficacité des ressources disponibles en matière de programme. Les programmes de réduction de la pauvreté pourraient viser soit les ménages soit les zones géographiques. Cette étude compare l'impact potentiel de la réduction de la pauvreté de ces deux approches, en Ouganda.On simule l'impact des divers changements de politique sur le taux de pauvreté en Ouganda en se servant de l'estimation des paramètres d'un modèle économétrique de la consommation des ménages. Les politiques examinées sont le planning familial, l'augmentation de la fréquentation dans les écoles primaires, une expansion de l'emploi en bonne et due forme ainsi qu'une expansion des micros entreprises. Les résultats révèlent des gains en matière de réduction de la pauvreté issus de la prise pour cible des programmes - en comparaison avec l'allocation hasardeuse de ressources limitées de programmes à un sous-échantillon de la population. De plus, la prise pour cible géographique s'avère être plus efficace que la prise pour cible des ménages, dans la plupart des six politiques examinées dans l'étude.

Mots clés : *Pauvreté ; Cible géographique ; Prise pour cible des ménages ; Simulation politique ; Ouganda*

* Corresponding author: kraybill.1@osu.edu

1. Introduction

Poverty has increased in sub-Saharan Africa over the past two decades both in absolute terms and as a share of the world's total poor (World Bank 2004). Efficient use of the limited public resources available for poverty alleviation is vital if the trend is to be reversed. One possible way of improving the efficiency of anti-poverty programs is to target the poorest populations (Besley & Coate 1993).

In countries where targeting has been implemented, targeted populations have been selected on the basis of household income, household demographic characteristics and geographical location (Bigman & Fofack 2000). Targeting on the basis of household income or demographic characteristics is widespread in industrialized countries but not in developing ones, which generally lack the detailed census information required to target individual households.[1] Since targeting, in principle, could improve program efficiency but information for household targeting is not available in many low-income countries, researchers have suggested geographical targeting as a fiscally feasible alternative (Bigman 1987; Ravallion 1998). Geographically based targeting is relatively easy to implement because it requires neither detailed information on every household nor program administrators to distinguish between the eligible and the ineligible households in selected localities. Furthermore, if the target area boundaries are chosen to correspond with local government boundaries, the overhead cost of program administration and monitoring can be minimized.[2]

The magnitude of reduction in poverty that could be realized through geographical targeting has been analyzed for only a few African countries: Burkina Faso (Bigman et al. 2000), Ghana (Fofack 2000) and Mozambique (Simler & Nhate 2005).[3] In general, these studies have found gains from geographical targeting, though the gains are relatively small. The magnitude of the gains is likely to vary by country and to date no studies of the poverty-reducing effect of targeting have been done for Uganda.

This paper estimates the effect of geographical targeting on poverty in Uganda. The analysis proceeds by first estimating a household-level consumption model. Adopting the widely used definition of poverty as the inability of households to achieve a given level of consumption, we then use the parameters of the regression model to simulate the poverty impacts of changes in policy-related variables and to compare geographical targeting with household targeting. While other researchers have estimated consumption models for Uganda, to our knowledge this is the first analysis of the effects of geographical targeting on poverty rates in Uganda.

Our first finding is that, for a given level of program resources, targeting reduces the poverty rate more than would random selection of program beneficiaries. Our second finding is that, for most of the six policies we analyze, geographical targeting is more effective than household targeting in reducing the poverty rate. This is an important conclusion since geographical targeting is more efficient than household targeting in terms of 'bang-for-the-shilling'.

Section 2 of the paper reports on an econometric analysis of consumption, an intermediate step in developing a policy simulation model and Section 3 presents policy simulations in which alternative ways of targeting program recipients are compared. Section 4 concludes.

---

[1] Even where detailed household census information is available, household targeting is problematic. In particular, the existence of program benefits provides an incentive for superficial changes in behavior or dishonest reporting to gain eligibility (Bigman & Fofack 2000).

[2] Of course, local governments may be corrupt and inefficient. It is not clear, however, that these problems are any greater when programs are administered by local than by national governments.

[3] Studies on the impact of geographical targeting have also been conducted for a number of non-African countries: Pakistan (Bigman 1987), Indonesia (Ravallion 1993), Venezuela, Mexico, and Jamaica (Baker & Grosh 1994) India (Datt & Ravallion 1993) and Bangladesh (Ravallion & Wodon 1997).

2. The household-level consumption model

2.1 Conceptual and empirical framework

Our econometric model of household consumption is similar to cross-sectional household consumption models used by Glewwe (1991), Appleton (2001a) and Mukherjee and Benson (2003). For the h^{th} household, the consumption model has the following form:

$$c_h = \alpha + \beta' \mathbf{x}_h + \theta' \mathbf{r}_h + \mu_h \quad (1)$$

where c_h (1x1) is the log of consumption per adult equivalent, $\mathbf{x}_h$ (kx1) is a vector of household characteristics, $\mathbf{r}_h$ (kx1) is a vector of community characteristics, and μ_h (1x1) is a normally distributed random error term with zero mean. The intercept parameter (α) is of dimension (1x1) and the parameters β and θ are of dimension (kx1).

A consumption function of this type could be derived from household production theory, where total consumption (income) is a function of factor endowments, factor productivity, and prices (Singh et al. 1986; Appleton 2001a). Relevant endowments include human capital, physical capital and land. Public capital (schools, healthcare facilities, roads) also affects total consumption and can be viewed either as a distinct factor of production or as a contextual force that affects the productivity of private endowments. While household production theory provides guidance for the broad categories of variables in equation 1, the usual pragmatic considerations guided our selection of explanatory variables in each of these categories. Nearly every conceivable hypothesized determinant of consumption may, in principle, be co-determined with consumption itself (Appleton 2001a). To avoid the simultaneity problem as much as possible, we chose variables deemed exogenous to *current* consumption (Mukherjee & Benson 2003).

The following household characteristics were selected as independent variables: household size by age cohort, the number of members attaining specified educational levels, educational attainment of household head, age and gender of household head, employment type (formal or informal), amount of land cultivated, value of livestock, and presence or absence of a household non-crop enterprise.

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

The dependent variable, consumption (c_h) per adult equivalent, was constructed using procedures similar to those used by the Uganda Bureau of Statistics (UBOS) for calculating the official consumption-based poverty rate (Appleton 1999, 2001b). The Uganda National Household Survey (UNHS), conducted by UBOS and used to estimate the country's official poverty rate, provides information on 145 household consumption items, summarized in Table 1. 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 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. No temporal price adjustments were made in the data since the national rate of inflation was very low (3.5% per annum) during the survey period, and the analysis does not involve comparisons over time.

Table 1: 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 purchased services	41	Last 30 days
Semi-durable and durable goods and services	43	Last 365 days

Source: UBOS (2003)

2.2 Estimation and data issues

National, rural, and urban models were estimated. The models were estimated using the weighted least squares regression procedure. Population weights indicating the number of households in the full population represented by each household in the sample were used. These improve the efficiency of the point estimates ($\hat{\beta}$).

The variance of the weighted least squares model was estimated using the Huber-White sandwich estimator of variance (White 1980). Use of this robust variance procedure is desirable because the survey sample is 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 most likely be biased and inappropriate inferences might be drawn. The robust variance procedure also has the advantage of correcting for heteroskedasticity (Baum 2006).

The problem of multicollinearity, which is common in cross-sectional analysis, is minimal in our dataset and does not appear to degrade the estimates substantially. The variance inflation factor (VIF) is low for all variables except age and age squared.[4] As is conventional in linear regression analysis, we deem the relatively high degree of correlation between age and its square as an acceptable consequence of allowing for the possibility of a nonlinear relationship between age and consumption.[5]

We developed our dataset from the UNHS. Poverty rate estimates at national and regional levels are shown in Table 2. The estimated official poverty rate in Uganda, based on the 2002/2003 UNHS, is 37.7%. This represents a 4% increase in poverty compared to the previous survey (1999/2003), raising concerns in Uganda about the adequacy of existing anti-poverty strategies.

[4] A standard rule of thumb is that a VIF of less than 10 implies that multicollinearity is not debilitating (Baum 2006).
[5] When a variable and its square are included in a model, high VIFs are a mathematical inevitability. Researchers often regard the increase in multicollinearity as an acceptable trade-off for reduction in parameter bias that might occur if the non-linearity is ignored. Indeed, the high multicollinearity of age and age squared most likely inflate the standard errors and may be the reason why these variables are not significant in any of our models. This is not serious, however, because hypotheses about age do not play a major role in our study and are not used in our policy simulations.

Table 2: National and regional poverty rates in Uganda, 1992–2003

	1999/2000	2002/2003
National	33.8	37.7
Rural	37.4	41.7
Urban	9.6	12.2

Source: UBOS (2003)

The 2002/2003 UNHS covered all of Uganda except for a small area representing less than 2% of the national population.[6] The household survey has four modules: socioeconomic, labor 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.[7] Informal sector activities included in the survey are (1) livestock, poultry, bee-keeping and fishing; (2) forestry, and mining, quarrying and manufacturing; (3) hotels, lodges and eating places; and (4) trade and services. The survey was conducted 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, ten 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 the 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.

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 9664 observations for use in the analysis. National-level descriptive statistics from the survey are presented in Table 3. Means in the table are weighted to reflect the population of Uganda rather than 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 0.26, implying that 26% of households are headed by females.

[6] Pader District and parts of Kitgum and Gulu districts were excluded because of insurgency in those areas.

[7] A household enterprise is defined by UBOS as a business managed by the household and lacking a fixed location outside the household. A non-household enterprise is a business with a fixed location outside the household. Non-household enterprises in urban areas were covered by a separate UBOS survey, the Census of Business Establishments.

Table 3: Variables in the Uganda household consumption model (national level)

Household characteristics					
Variable	*Description*	*Mean*	*Std. dev.*	*Minimum*	*Maximum*
lntotcexp	Natural log of household consumption per adult equivalent	7.02	0.79	4.24	12.57
hdage	Age of hh head	39.15	14.06	15.00	99.00
hdsex	Sex of hh head (0=male, 1=female)	0.26	0.45	0.00	1.00
size9	Number of individuals in hh aged 9 or younger	1.87	1.59	0.00	13.00
size10_17	Number of individuals in hh aged 10 to 17	1.11	1.36	0.00	14.00
sizef18_59	Number of females in hh aged 18 to 59	1.07	0.67	0.00	8.00
sizem18_59	Number of males in hh aged 18 to 59	0.91	0.73	0.00	7.00
size60	Number of individuals in hh 60 or over	0.16	0.42	0.00	4.00
schfp	Number of adult females who completed primary school	0.21	0.46	0.00	4.00
schmp	Number of adult males who completed primary school	0.32	0.51	0.00	5.00
schfs	Number of adult females who completed senior secondary school	0.02	0.16	0.00	2.00
schms	Number of adult males who completed senior secondary school	0.04	0.23	0.00	3.00
degf	Number of adult females who hold university degree	0.002	0.06	0.00	1.00
degm	Number of adult males who hold university degree	0.01	0.12	0.00	2.00
empformal	Number of hh members with formal employment	0.09	0.37	0.00	4.00
landcultpc	Per capita land cultivated by hh (acres)	0.44	1.91	0.00	166.67
lvaluepc	Per capita value of livestock owned by hh (thousands of Uganda shillings)	52.76	475.42	0.00	24799.00
ent	Does hh have a non-crop enterprise? (0 = no, 1 = yes)	0.60	0.49	0.00	1.00
Community characteristics					
elect	Is electricity available in LC1? (0 = no, 1 = yes)	0.27	0.49	0.00	1.00
disser	Mean distance in km 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)	10.96	9.25	0.00	57.12
outputmkt	Are there at least two outlets/markets to buy inputs within 5 km of center of the community? (0 = no, 1 = yes)	0.66	0.47	0.00	1.00
phone	Is there a place to make paid calls (phone booth, mobile phone) within 2 km of village center? (0 = no, 1 = yes)	0.30	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)	0.76	0.39	0.00	1.00
creditnocoll	Is there a source of credit not requiring collateral within 10 kms of village center? (0 = no, 1 = yes)	0.30	0.48	0.00	1.00

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 (UBOS).[8] 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% of Ugandans. The market value of this food basket is calculated using region-specific prices. Non-food expenditures are added to the poverty-line consumption bundle based on estimates derived from the non-food consumption of households at the poverty line (Ravallion & Bidani 1994).

2.3 Hypothesized signs and econometric results

As the econometric model is an intermediate step in our analysis of anti-poverty targeting, we discuss in detail only selected results from the estimation of the consumption models. Hypotheses and results are shown in Table 4. The consumption function (1) was estimated in semi-log form and therefore the coefficient indicates the percentage change in the dependent variable (daily consumption per adult equivalent) as a result of a unit change in the independent variable.

[8] UBOS uses a caloric standard recommended in a 1985 World Health Organization report. The standard varies by age and sex. For example, the daily minimum number of calories for males ages 18 to 29 is 3025.

Table 4: Hypothesized signs and regression results for Uganda household consumption model

	Hypothesized sign	Regression results		
		Nation	*Rural*	*Urban*
Age of head of household	-	0.003	-0.005	0.001
Age squared of head of household	+	0.000	0.000	0.000
Gender of head of household (0 = male, 1 = female)	-	-0.066***	-0.098***	0.022
Number of members age 9 and younger	-	-0.213***	-0.183***	-0.297***
Number of members age 10 to 17	-	-0.179***	-0.151***	-0.273***
Number of female members age 18 to 59	+	-0.188***	-0.160***	-0.266***
Number of male members age 18 to 59	+	-0.177***	-0.155***	-0.260***
Number of members age 60 and older	-	-0.100***	-0.077**	-0.176***
Household size squared	+	0.008***	0.007***	0.013***
Number of adult females with primary school certificate	+	0.283***	0.320***	0.171***
Number of adult males with primary school certificate	+	0.141***	0.144***	0.142***
Number of adult females with A-level certificate	+	0.250***	0.070	0.393***
Number of adult males with A-level certificate	+	0.334***	0.319***	0.329***
Number of females with university diploma	+	0.680***	-	0.693***
Number of males with university diploma	+	0.714***	-	0.686***
Number of members with formal employment	+	0.207***	0.218***	0.216***
Per capita land cultivated by household (acres)	+	0.044*	0.054*	0.021***
Per capita value of livestock of household (million Ushs.)	+	0.049***	0.055***	0.648*
Does household have non-crop enterprise? (0 = no, 1 = yes)	+	0.193***	0.186***	0.229***
Is electricity available in LC1? (0 = no, 1 = yes)	+	0.265***	0.182***	0.184***
Mean distance of LC1 to school and health facilities (kms)	-	-0.009***	-0.008***	-0.013***
Outlets for ag produce w/i 5 kms of LC1? (0 = no, 1 = yes)	+	0.022	0.068**	0.076
Paid phone calls w/i 2 kms of LC1? (0 = no, 1 = yes)	+	0.115***	0.013	0.229**
Road w/i in 1 km of LC1? (0 = no, 1 = yes)	+	-0.036	0.027	0.120
Credit w/o collateral w/i 10 kms of LC1? (0 = no, 1 = yes)	+	0.106***	0.096***	0.081
Intercept		7.547***	7.402***	7.514***
R2		0.43	0.30	0.46
N		9664	5611	4053

In general, the consumption models perform well. Most of the hypothesized relationships between the independent variables and consumption are statistically significant and have the expected sign. Only two of the statistically significant variables have signs opposite to the hypothesized signs. The statistical fit of the models is well within the range of acceptability in cross-sectional analysis; the R^2 indicator is 0.43 for the national model, 0.46 for the urban model and 0.30 for the rural model.

The number of dependents (persons under the age of 18 and over 59) is negative and statistically significant at the 1% level. Among all the variables, the main unexpected result was the negative sign on the number of adults, both male and female, aged 18 to 59. Persons in this age range normally perform household or field work or earn income in some capacity and would be expected to contribute to a net increase in consumption per adult equivalent. Our results, however, suggest the opposite: at the margin, adding one additional adult to a household leads to a decrease in consumption per adult equivalent. We experimented with many combinations of independent variables and the negative sign on working–age adults proved to be robust in all specifications. This result suggests there is a great deal of unemployment or underemployment of adults in the Ugandan economy.

The age of the household head is not statistically significant in any of the models. However, the gender of household head, where male was coded 0 and female 1, is negative and statistically significant in two of the three models.

All three models support the hypothesis that accumulation of productive assets is important in household consumption. The number of acres of cultivated land per capita and the value of livestock per capita are both positive and statistically significant.

Education has an unambiguously positive impact on household consumption. The primary, secondary and tertiary education variables all have positive signs and are statistically significant at the 1% level in the national and urban equations. In the rural equation, primary education is statistically significant for males and females while secondary education is statistically significant for males only. The tertiary education variable was dropped in the rural equation because the number of rural households with a university graduate living in the household is extremely small, and the large number of zeros for this variable caused near-perfect collinearity in the estimation of the model.

Evidence regarding four of the policy variables is particularly strong: household involvement in the formal labor market, household involvement in micro-enterprise activity, community electrification, and distance to public services. These variables are all statistically significant at the 1% level and have the expected sign in all models. These results imply that household consumption per adult equivalent increases when an additional household member obtains formal employment, when the household launches a non-crop micro-enterprise, when the community where the household is located is electrified, or when schools and health facilities are built closer to the community where the household is located. Results for the other policy-related variables are less clear cut. The existence of nearby outputs for the sale of agricultural output has a positive and significant effect on household consumption in the rural model but not in the national or urban ones. The existence of a phone service has a positive and significant effect in the national and urban models but not in the rural one. The availability of credit without collateral has a positive and significant effect in the national and rural models but not in the urban one. Roads, as measured by the road-related variable in our dataset, have no effect on consumption.[9]

3. Analysis of household and geographical targeting

3.1 Estimating the poverty rate

Using the parameter estimates from the regression models, we simulate levels of consumption arising from changes in policy-related exogenous variables. Expressed from the perspective of the h^{th} household, the simulation equation has the following form:

$$\hat{c}_h = \hat{\alpha} + \hat{\beta}'\mathbf{x}_h + \hat{\theta}'\mathbf{r}_h + \hat{\mu}_h \quad (2)$$

where a caret over a parameter indicates the value of the parameter estimated in the previous section. Each household's consumption estimated using equation (2) is then compared to the poverty-line level of consumption ($\widetilde{c}$) and the poverty count (percentage of households in poverty) is calculated using survey weights to extrapolate the population poverty rate from the survey data. The baseline 2002/03 poverty rate is 14.4% in urban areas and 42.7% in rural areas (UBOS 2003). We calibrated the poverty line used to compute the poverty rate so as to replicate these poverty rates.

[9] We are inclined to view the lack of statistical significance of roads as a consequence of the way roads are defined in the survey. In the community part of the survey, community leaders were asked whether a road lay within one kilometer of the center of the community (LC1), without any distinction between the types of road and without any information about the distance to the road. Thus, our dummy variable (1 if there is a road within one kilometer of the community center and 0 otherwise) mixes poor roads with good roads, so that the effect of roads is nullified. No other road information is available in the survey.

3.2 Choice of policies to be simulated

The policies whose effects we simulate are represented by variables in the household consumption model. Two criteria were used to select these policies. First, since we are comparing household targeting with geographical targeting, the policies must be ones that in principle could be targeted at individual households; otherwise no comparison could be made. On these grounds we eliminated policies that are always targeted at entire communities rather than at individual households, such as electrification or school and health clinic construction. Second, since geography is at the center of our targeting analysis, we simulate the effects only of policies associated with variables that were statistically significant at all three levels of geography (national, rural and urban) in the consumption regressions in the preceding section. Policies associated with variables that were not statistically significant in the consumption regressions are not simulated here. The six policies that meet these criteria and were therefore selected for the simulation are shown in Table 5.[10]

Table 5: Independent variables of the consumption model and associated policies

Model variable	Associated policy	How policy was simulated
Number of members age 9 and younger	Family planning programs	Reduce by one the children age 9 or younger in all households with children in this age category
Number of adult females with primary school certificate	Transfers to schools or to families of pupils	Increase by one the females with primary school certificates in all households with adult females
Number of adult males with primary school certificate	Transfers to schools or to families of pupils	Increase by one the males with primary school certificates in all households with adult males
Number of adult males with A-level certificate	Tuition subsidy for schools or students	Increase by one the males with A-level certificate in all households with adult males
Number of members with formal employment	Employment expansion policies such as tax abatements for business expansion and export assistance	Increase by one the persons with formal employment in all households
Household has non-crop enterprise	Micro-enterprise development programs	Assume the existence of a non-crop enterprise in all households that do not currently have one

We consider households to be eligible for family planning program participation if they have at least one child, for increased primary school enrolment if they have at least one person without primary schooling, for secondary schooling if they have at least one person without secondary schooling, for formal employment if they have at least one able-bodied adult currently without formal employment, and for micro-enterprise development if the household does not already have a non-farm enterprise.

In the simulations, we apply the policies to the same number of households under geographical targeting as under household targeting. The geographical targeting simulation is based on the assumption that the Ugandan government administers programs to all households in the poorest 10% of Local Council 1 (LC1) jurisdictions. We sorted LC1s by average household income per adult equivalent and selected the bottom decile of jurisdictions. There are 970 LC1s in the country, so our geographical targeting simulation targets 97 LC1s with a total population of around 2.5 million people living in approximately 500,000 households. The same number of households are targeted in the household targeting approach but instead of clustering the households in LC1s we drew the 500,000 poorest households from the universe of households in the country without regard to the LC1 in which they are located.

[10] All the household size-by-cohort variables were statistically significant in the consumption model but only one of these was used in the simulation exercise. Except for the variable representing number of members aged nine and younger, we felt there was no obvious policy that corresponded with these variables and therefore did not conduct simulations with them.

The decision to make the policies available to 10% of LC1s is arbitrary but our ultimate conclusions about the relative effectiveness of the two targeting approaches are not sensitive to the number of households treated by the policies. This is because the simulation model is linear and not subject to scale effects. As long as the number of treated households is the same in the geographical targeting simulation and the household targeting simulation, we are able to make a valid comparison of the impacts.

3.3 Comparison of geographical and household targeting

Separate simulations are performed for urban and rural areas because of the large differences in poverty conditions in these areas. The results of the policy simulations are shown in Table 6. As a benchmark against which targeting can be compared, we first drew from the survey data a random sample representing 500,000 households from the entire country. Our results indicate that making the policies available on a targeted basis is more effective in lowering the poverty rate than making them available to households selected randomly.

Table 6: Simulated poverty rates generated by alternative approaches to targeting anti-poverty policies

	Reduced family size	**Increased primary school attendance by females**	**Increased primary school attendance by males**	**Increased secondary schooling attendance by males**	**More formal employment**	**More micro-enterprises**
URBAN (Poverty rate 14.4% in 2002/03)						
Random selection of households	14.0	14.1	14.2	14.2	14.0	14.3
Target poorest locality	12.3	13.1	13.6	12.7	12.8	13.8
Target poorest households	13.4	13.7	13.8	13.3	13.6	14.0
RURAL (Poverty rate 42.7% in 2002/03)						
Random selection of households	40.7	39.3	41.0	39.9	40.1	41.6
Target poorest locality	40.1	38.3	40.5	39.4	39.2	41.3
Target poorest households	40.2	37.6	40.7	39.0	39.3	41.3

In urban areas, the gain from geographical targeting rather than random selection of households ranges from half a percentage point for the micro-enterprise policy to 1.7% percentage points for the family-size reduction policy. Geographical targeting in the urban simulations is more effective than household targeting in lowering the poverty rate in the case of all six policies. The reason why the simulated poverty rate decreases less under household targeting is that not all households treated by the policies escape poverty. The percentage of treated households that fail to escape poverty despite policy treatment is greater when program resources are allocated to the 500,000 poorest households than when the same program resources are allocated to 500,000 households in the poorest LC1s. Targeting poor urban households with the direst need may be a worthy objective but it lowers the poverty rate less than targeting poor LC1s.

In rural areas, too, targeting is more effective than random treatment of households in reducing poverty. Geographical targeting is more effective than household targeting in lowering the poverty rate for all but two of the policies, primary school for females and secondary school for males. For these policies, household targeting is more effective than geographical targeting because of the heterogeneity of consumption levels in rural areas. Even poor LC1s in rural areas have some households that are above the

poverty line, especially those located in towns, and allocating program resources to non-poor households does nothing to lower the poverty rate. In rural areas there is less segregation of households by consumption levels within LC1s than in urban areas and the possibility of 'leakage' of program resources to non-poor households is therefore greater in rural LC1 jurisdictions than in urban LC1 ones. Geographical targeting works best in places where consumption levels are relatively uniform across households.

Our results indicate that the gains from targeting are relatively small in Uganda. This is consistent with research by Ravallion and Wodon (1997) in Bangladesh, where the gains from geographical targeting were also found to be relatively small. On the other hand, the finding that in most cases in Uganda geographical targeting is more effective than household targeting is good news since, as pointed out earlier, geographical targeting is not very costly to implement, especially if a structure of local government is already in existence. Governance in Uganda is already decentralized and the central government has invested in programs of local government capacity building for more than ten years (Nsibambi 1998). Local governments already have the administrative capacity to implement various programs. What remains now is for the central government to engage in a systematic allocation of those resources to local governments in a manner that will have the greatest impact on the poverty rate. As the Government of Uganda lacks the budgetary resources to administer all its programs to everyone who wants them, geographical targeting appears to be a sound way to allocate these limited resources.

4. Conclusion

In this paper, we developed a framework for comparing geographical and household targeting of anti-poverty policies in Uganda. In an initial step, an econometric model of consumption is estimated using data from the Uganda National Household Survey. In a second step, the estimated parameters of the consumption model are then used to simulate the poverty rate when anti-poverty policies are implemented in two ways. In the household targeting simulations, the policies are targeted at 500,000 of the poorest households in the country. In the geographical targeting simulations, the policies are targeted at 500,000 households, both poor and non-poor, in the poorest local government jurisdictions. Our analysis indicates that for most policies there are moderate gains from geographical targeting. While the gains from targeting are not large, the effectiveness of many government programs in reducing the poverty rate could be increased somewhat by targeting the poorest localities.

Acknowledgements

The authors acknowledge the insightful comments of two anonymous reviewers.

References

Appleton, S, 1999. Changes in poverty in Uganda, 1992–1997. Mimeo, Centre for the Study of African Economies, Oxford University, UK.

Appleton, S, 2001a. The rich are just like us, only richer: Poverty functions or consumption functions? Journal of African Economies 10 (4), 433–69.

Appleton, S, 2001b. Poverty reduction during growth: The case of Uganda, 1992–2000. Mimeo.

Baker, J & Grosh, M, 1994. Measuring the effects of geographical targeting on poverty reduction. LSMS (Living Standards Measurement Study) Working Paper 99. World Bank, Washington, DC.

Baum, CF, 2006. An Introduction to Modern Econometrics Using Stata. Stata Press, College Station, Texas.

Besley, T & Coate, S, 1993. The principles of targeting. In Lipton, M & Van Der Gaag, J (Eds), Including the Poor. World Bank, Washington, DC.

Bigman, D, 1987. Targeted subsidy programs under instability: A simulation and illustration for Pakistan. Journal of Policy Modeling 9, 483–501.

Bigman, D & Fofack, H (Eds), 2000. Geographical Targeting for Poverty Alleviation: Methodology and applications. World Bank, Washington, DC.

Bigman, D, Dercon, S, Guillaume, D & Lambotte, M, 2000. Community targeting for poverty reduction in Burkina Faso. In Bigman, D & Fofack, H (Eds), Geographical Targeting for Poverty Alleviation: Methodology and applications. World Bank, Washington, DC.

Datt, G & Ravallion, M, 1993. Regional disparities, targeting, and poverty in India. In Lipton, M & Van Der Gaag, J (Eds), Including the Poor. World Bank, Washington, DC.

Fofack, H, 2000. Applying household expenditure survey data to improve poverty targeting: The case of Ghana. In Bigman, D & Fofack, H (Eds), Geographical Targeting for Poverty Alleviation: Methodology and applications. World Bank, Washington, DC.

Glewwe, P, 1991. Investigating the determinants of household welfare in Côte d'Ivoire. Journal of Development Economics 35, 307–37.

Mukherjee, S & Benson, T, 2003. The determinants of poverty in Malawi, 1998. World Development 31 (2), 339–58.

Nsibambi, A, 1998. Decentralisation and Civil Society in Uganda: The quest for good governance.: Fountain Publishers, Kampala.

Ravallion, M, 1993. Poverty alleviation through regional targeting: A case study in Indonesia. In Hoff, K, Braverman, A & Stieglitz, JE (Eds), The Economics of Rural Organization. Oxford University Press, Oxford.

Ravallion, M, 1998. Poor Areas. In Ullah, A & Giles DEA (Eds), Handbook of Applied Economic Statistics, Chapter 3. Marcel Dekker, New York.

Ravallion, M & Bidani, B. 1994. How robust is a poverty line? World Bank Economic Review 8 (1), 75–102.

Ravallion, M & Wodon, Q, 1997. Poor areas or only poor people? LSMS (Living Standards Measurement Study) Working Paper 1798. World Bank, Washington, DC.

Simler, KR & Nhate, V, 2005. Poverty, inequality, and geographic targeting: Evidence from small-area estimates in Mozambique. FCND (Food Consumption and Nutrition Division) Discussion Paper 192, IFPRI (International Food Policy Research Institute).

Singh, I, Squire, L & Strauss, J (Eds), 1986. Agricultural Household Models: Extension, application and policy. Johns Hopkins University Press, Baltimore, MD.

UBOS (Uganda Bureau of Statistics), 2003. Uganda National Household Survey 2002/2003: Report on the Socio-Economic Survey. UBOS, Entebbe, Uganda.

White, H, 1980. A Heteroskedasticity-consistent covariance matrix estimator and a direct test for heteroskedasticity. Econometrica 48, 817–30.

WHO (World Health Organization), 1985. Energy and Protein Requirements. WHO Technical Report Series No. 724. Geneva.

World Bank, 2004. World Development Indicators. Washington, DC.