Modelling Determinants of Multidimensional Poverty in Rural Tanzania

Geofrey Mhagama Charles
(Eastern Africa Statistical Training Centre, Tanzania)
geofrey.charles@eastc.ac.tz

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Geofrey Mhagama Charles
Eastern Africa Statistical Training Centre (EASTC)

This study adopted sen's capability framework that view poverty concept in a multidimensional perspectives (Sen, 1987). The concept has been recommended in Sarkozy commissionon by Stiglitz, Sen, and Fitouussi (2009) in the measure of economic performance and social affairs Europe and thereafter accepted by UN(1990) and worldbank as a proper approach to compile global multidimensional poverty Index(MPI) and treated as a measuring tool of extreme poverty globally (Alkire ,(2011) ; World Bank, (2018) ; Alkire et al., (2020) ; Chen et al., (2019) and UNDP, (2020) ,UNICEF (2016)).

Many studies that model determinants of poverty in Tanzania, until recently, use monetary (income) approach only. Therefore, this study aimed at covering the existing gap by using multidimensional approach.

The study used 2015/16 Tanzania National Household Demographic Survey data. The study the study adopted the Alkire-Foster (2011) methodology to examine multidimensional poverty index that was used as dependent variable of binary logit regression model to identify determinants of multidimensional poverty in rural Tanzania

The findings from Alkire and Foster estimates showed that, the overall multidimensional poverty incidence for the year 2015/16 was 74.43% of the whole rural area population, suggesting that, majority of the households in rural Tanzania was multidimensionally poor with multidimensional poverty index of 0.388.

 On the other hand, binary logit regression model findings showed that age, education attainment, sex, marital status, ever use family planning are among the determinants of multidimensional poverty in rural Tanzania and suggested that male-headed households have higher probability of being multidimensionally poor, while increase in the age, education level of the household head and being married decreases the probability to be multidimensionally poor significantly. Moreover, the binary logit regression model estimates showed that, people who use family planning methods are 0.79 times less likely to be multidimensional poor at 5% level of significance. Indicating that, the use of family planning decreases the probability of becoming multidimensionally poor.

Keywords: Alkire-Foster (2011) Methodology,(Multidimensional Poverty Index (MPI), Binary Logit Regression Model

BINARY LOGIT REGRESSION MODEL

Binary logit regression model was used to identify the determinants of multidimensional poverty. Its Dependent variable was a multidimensional poverty index generated the multidimensional poverty cut-off of k= 0.33 as adopted from Global MPI (Alkire S. et al. 2015). Since the response variable Y (MPI) is a binary variable with categories "poverty poor and poverty not poor", this study employed binary logit regression to examine those determinants. The dependent variable was defined by the rule;

$Y_i(MPI) = 1 \, if \, C_i \geq 0.33 \Rightarrow The$ household is multidimensionally poor

$Y_i(MPI) = 0 \, if \, C_i \geq 0.33 \Rightarrow The$ household is not multidimensionally poor.

The **age, sex, education attainment, marital status and ever use family planning** was treated as model explanatory variables.

Binary Logistic Model was expressed by;

$Logit (Y_i) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \mu_i$

Where, Y_i = Multidimensional poverty index (MPI) of each household; μ_i= stochastic error term of the model which takes into account unobserved factors that affects MPI $\beta_1, \beta_2, \beta_3, \beta_4,$ and β_5 = regression coefficients; X_1= Age of the household head, X_2= Sex of the household head X_3= Education attainment of the household head X_4= Marital status of the household head X_5= Ever use family planning

Table 1: Description of variable

Type of variable	Name of variable	Scale	Responses
Dependent	Multidimensional poverty index(MPI)	Binary	0 = non poor 1 = poor
Independent	Age of the head of household	Scale	
	Sex of the head of household	Nominal	1 = male 2 = female
	Education attainment of the head of household	Ordinal	1 = no education; 2 = primary education; 3 = secondary education ;4 = higher education and 5 = don't know
	Marital status of the head of household	Nominal	1 = never married; 2 = widow; 3 = divorced; 4 = married or living together
	Ever use family planning method		Nominal-1 = no and 2 = yes

ALKIRE AND FOSTER (AF) APPROACH FOR MODELING MULTIDIMENSIONAL POVERTY

The study applied Alkire and Foster (AF) Approach to determine the multidimensional poverty Index (MPI) by first identifying the poor and non-poor by using dual cut-off and aggregate multiple deprivation scores (c) of ten non-monetary indicators from three dimensions (Education, Health and Standard of living) to get MPI. The Household was considered as multidimensional poor if the weighted sum of its deprivations is higher than a defined poverty cut off ($C_i > k$). The deprivation score of each household (C_i) is calculated by:

$$C_i = w_1 I_1 + w_2 I_2 + w_3 I_3 + ... + w_d I_d$$ …………………………..…………………….(1)

where, $I_i = 1$ if the household is deprived in indicator i and 0 otherwise, and w_i is the weight attached to indicator i with

$$\sum_{i=1}^{d} w_i = 1$$…………………………………………………..…………………...(2)

The multidimensional poverty index (MPI) was the calculated as product of Multidimensional poverty incidence (H) and Multidimensional poverty intensity (A) .But Multidimensional poverty incidence (H) is given by;

$$H = \frac{q}{n}$$ …………………………………………………………….………….(3)

While Multidimensional poverty intensity (A) was expressed as;

$$A = \frac{\sum_{i=1}^{q} C_i(k)}{q}$$ …….…………………………………………………………(4)

Where, H=head count ratio /percentage of poor households/ incidence of poverty,

A= Multidimensional poverty intensity, q=number of multidimensional poor people n=Total population. C_i=is the deprivation score of each poor person.

Therefore,

$$MPI = H * A = \frac{q}{n} \times \frac{\sum_{i=1}^{q} C_i(k)}{q} = \frac{\sum_{i=1}^{q} C_i(k)}{n}$$ …………………….…………….…..(5)

Table 2: Dimension, indicators and deprived condition

DIMENSION AND ITS WEIGHT	INDICATOR AND ITS WEIGHT	DEPRIVED CONDITIONS
Education (1/3)	Years of schooling (1/6)	The household is considered deprived if no household member has completed five years of schooling
	School attendance (1/6)	The household is considered deprived if any school-aged child is not attending school up to class 8
Health (1/3)	Nutrition (1/6)	The household is considered deprived if any adult or child for whom there is nutritional information is malnourished in the household
	Child mortality (1/6)	The household is considered deprived if any under-five child has died in the family
Living standard (1/3)	Cooking fuel (1/18)	Members of the household are considered deprived if the household cooks with solid fuels: wood, charcoal, crop residues or dung
	Sanitation (1/18)	Members of the household are considered deprived if the household's sanitation facility is not improved or it is improved but shared with another household
	Safe drinking water (1/18)	Members of the household are considered deprived if the household does not have access to safe or safe drinking water is more than a 30-minute walk from home round trip
	Electricity (1/18)	Members of the household are considered deprived if the household has no electricity
	Flooring (1/18)	Members of the household are considered deprived if the household has a dirt, sand or dung floor
	Assets (1/18)	Members of the household are considered deprived if the household does not own more than one of: radio, tv, telephone, bike, motorbike or refrigerator and does not own a car or truck

Source: Adopted and modified from (Alkire S. et al. 2015) ; Alkire & Jahan, (2018) ; OPHI (2017