Do poverty traps exist in Uganda? Household level evidence from panel data

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Abstract

*This study aimed at providing new evidence on the existence of poverty trap among Uganda's households using Uganda National Panel data. Evidence of the existence of a poverty trap is fundamental in guiding the development of sound policies and interventions targeted to assist in pulling households out of poverty trap. Analysis was based on two sets of panel data comprising 8,122 households from 3 waves (2009/2010-2011/2012) and 12,199 households from 4 waves (2013/2014-2019/2020). Using the PCA constructed asset index approach based on a parametric regression model, we show that a poverty trap exists. This is revealed by the negative quartic polynomial coefficients of the asset index and asset values (-0.004** & -0.010***) respectively. Bivariate level results confirm that 18% (1,314,000) of Uganda's households are trapped in poverty. A comprehensive, well-structured, targeted asset accumulation and poverty trap reduction interventions including cash transfers, should be implemented by the government for poverty-trapped households.*

Key words: *Poverty-trap, existence, panel-data, household, Uganda*

JEL*: I32, D12, C12*

1. Introduction

Poverty still remains a thorn in the flesh of economic progress, especially among low income economies, despite remarkable progress in economic growth over the last three decades (Yong Qin et al, 2021; World Bank, 2019; World Bank., 2021). There is evidence of increased number of individuals and or households living in poverty traps in recent times (Ikegami et al., 2019; Barrett et al., 2016; McKay and Perge, 2013; McKay and Lawson, 2003,). Poverty traps are states of social-ecological systems in which self-reinforcing mechanisms keep individuals, households and communities in poverty persistently (Sonja et al, 2021; Haider, Boonstra, Peterson, & Schlüter, 2018).

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 https://doi.org/10.56279/ter.v15i1.228

In a typical household setting, poverty traps are often multi-dimensional in the sense that they involve economic, biophysical and social processes continually interacting to produce reinforcing dynamics that maintain trap status (Haider, Boonstra, Peterson, & Schlüter, 2018; Lade et al., 2017; Sonja et al., 2020; Alkire and Robles, 2015; Anand and Sen, 1997). Incomes and asset levels of households living in poverty trap are perpetually very low in their entire lives (Arndt, McKay & Tarp, 2016). Notwithstanding a remarkable reduction in global poverty, literature continues to show that extreme poverty is persistently increasing among Sub-Saharan Africa (SSA) countries. For instance, in 2019, it was shown that 23 out of 27 poorest countries in the world are found in Africa (Development Initiatives, 2021; World Bank, 2021). It is further shown that whereas the number of persons living in abject poverty in the rest of the world fell from 708 million to 240 million between 2010 and 2021, in sub-Saharan Africa the number shot up by 41 million persons (i.e., from 417 to 458 million persons). Globally, it was estimated that 698 million people (9% of the global population) were still living in extreme poverty, based on $1.9 a day per person, despite specific poverty reduction initiative efforts (Development initiatives, 2021). This has stimulated renewed interest in and debate about the success of the micro-foundations of economic growth (Barrett, et al., 2018).

The aim of this study is to provide new evidence on the existence of poverty trap among households in Uganda, using the asset accumulation approach. The debate on poverty traps is of great interest among policy makers because of the theoretically comprehensible explanation it provides on persistence of poverty. This guides policy makers to craft measures that can enable households escape the poverty trap. Poverty trap can be experienced at individual, household, community and country levels. At the country level, the idea that countries might be stuck in an underdevelopment trap was widely used by development economists in the 1950s (Nelson, 1956; Liebenstein, 1957). In the 1970s, more attention was given to the existence of poverty traps within countries, but specifically shifting focus to questioning why poor people stay poor in countries experiencing sustained economic growth. This has led to renewed belief that a reasonable number of households in poor countries are stuck in the poverty trap. Two sources have been advanced to explain this: first, divergence in global economy which explains long-term growth failure in the poorest countries (see, for example, Acemoglu, 2005; Acemoglu, 2001); and secondly new growth theories that are increasingly interested in the existence of multiple equilibria (Mohapatra 2021, Matsuyama, 2018). The second reason provides new literature which when analyzed at household level generates evidence of low level equilibria among such households in some of the developing countries. This is interpreted as evidence of poverty trap among such households. Thus, providing the basis for policy in terms of designing new development strategies for poverty reduction to pull households out of poverty traps in those poor countries (Azariadis, 2005; Carter et al., 2018).

However, though the drive to end chronic poverty globally has been greatest in the last two and a half decades of the MDGs (2000-2015) and the SDGs, (2015-2030), extreme poverty still persists. In Uganda, while poverty rate reduced to a remarkable low level of 19.7 percent by 2013 from 56 percent in 1993, 14.7 million individuals (2.94 million households) remained vulnerable to poverty in the same period. Poverty rates actually increased to 21.4 percent (using $1.04 national poverty lines) and 41.7 percent (using $1.9 per day per capita poverty line) in the subsequent years. This converts to 1.78 and 3.3 million households (at 1.04 & $1.90 respectively) considered potentially living in poverty trap by 2016, (World Bank, 2016). Notwithstanding numerous poverty reduction interventions over the years, this situation suggests existence of unexplored binding structural constraints. In addition, it brings to question the micro-foundation of Uganda's poverty reduction endeavors. Covid-19 pandemic shock and its associated lockdown containment measure exacerbated the situation, and has provided a critical clue about the negative effect of shocks on poverty chronicity. To provide a coherent narrative about poverty chronicity (traps), an understanding of the growth of various productive assets households' own is vital. This facilitates the identification of equilibria points, which define household as trapped or potentially out of trap and the use of panel data which Uganda now has, is handy. The increase in poverty rates notwithstanding, there is no prove that poverty trap necessarily exists as a result of lack of asset accumulation. Besides, only a few `researches (Campenhout et al., 2016; USAID's report on poverty, (2016); McKay and Perge, 2013; and Kavuta and Edriss, 2015; studied poverty trap dynamics in Uganda in the last decade. Even then, the first two studies focused on food trap and transitory Poverty. While Mckay and Perge's study tested the existence of poverty trap, it was based on old UNHS data of 1992 and 1999 each collected at one point in time, but not necessarily tracking the same households. Kavuta and Edriss, (2015)' study focused on livelihood, but again based on household survey data from only two districts (Masindi and Masaka-hence not nationally representative). None of these studies have linked poverty traps to in-depth asset-poverty trap analysis as a factor perpetuating poverty trap, which is the gap this study fills. The existence of seven complete panel data waves, gives impetus for the examination of existence of poverty traps among households in Uganda, over the years.

2. Materials and Methods

2.1 Research design

A quantitative research design is adopted to conduct a parametric assets accumulation test for evidence of existence of the poverty trap. Prior to the asset accumulation test, basic descriptive statistics of the socio-economic and demographic attributes of the households were obtained. Households' asset accumulation and poverty profiles were disaggregated by urban-rural and regional settings.

2.2 Data and data sources

Uganda National Panel Surveys (UNPS) data collected by Uganda Bureau of Statistics (UBoS), comprising 7 waves (2009/2010, 2010/2011, 2011/2012, 2013/2014, 2015/2016, 2017/2018, 2019/2020) was used. The data is part of the Living Standards Measurement Survey and Integrated Survey on Agriculture (LSMS-ISA). It was split into two sub-waves, i.e., the wave of 2009/2010-2011/2012 (with 8,122 households) and that of 2013/2014-2019/2020 (with 12,199 households). The split was to cater for households who rotated out of the panel during the subsequent waves. This is a rich nationally representative data source which provides detailed information on several socio-economic and demographic indicators such as education, health, labour force, food security, household expenditure and poverty, shocks, financial inclusion, Information and communication Technology, and crop and non-crop farm household enterprises and asset ownership. The data source covered all 15 sub-regions of Uganda, tracked and collected data for particular households over a period of 10 years and is considered excellent for testing the existence of poverty trap.

2.3 Data management

Data cleaning preceded analysis to ensure that no inconsistencies in terms of outliers and missing values exist. Different sections of each panel and panels for the various years were, merged and appended. Mandatory diagnostic tests (Chow test for poolability, Hausman test for fixed or random effects, autocorrelation test and the Langragian Multiplier random effects test) were conducted. Thereafter, we tested for evidence of existence of poverty trap under the null hypothesis that there is no evidence of existence of poverty traps among households i.e.

$H_0: Y_{it} = Pov_{Tit} = 0$……..…..(1)

While the alternative hypothesis was that there is evidence of existence of poverty trap among households i.e. $H_{\boldsymbol{a}}: Y_{it} = Pov_{Tit} \neq 0$……..…..(2)

Where, H_0 and $H_{\boldsymbol{a}}$ are the null and alternative hypotheses, Y_{it} is household i's assets accumulation status at time t and Pov_{Tit} is the poverty trap status of household i over the study period. Testing for the existence of poverty traps among households using asset accumulation approach requires the construction of an asset index. Two asset accumulation models were run to establish existence of lack of asset accumulation or evidence of existence of the trap. The first model was an asset index constructed using Principal Component Analysis (PCA) method and based on Eigen values, as it was in Naschold, (2005)' case. The assets index was lagged once and transformed into a 4th order polynomial equation. In the second model, we used the change in total assets value as defined in variable definition in AppendixII. Accordingly and following' Naschold, (2005)'; Carter and Barrett (2006)' models of regressing the current asset index against its lagged value, the following parametric, polynomial model was specified:

$A_{i,t} = \alpha_0 + \sum_{m=1}^{M} \beta_m A^m{}_{i,t-1} + \gamma H_{i,t} + \theta Z_{i,t} + T_i + \varepsilon_{i,t}$.....(3)

Where $A_{i,t}$ are asset holdings of household i at time t with t=1-T, $H_{i,t}$ are household socio-demographic characteristics (age of household head, sex of household head, household size, education of household head, residence (rural/urban), region and occupation), $\theta Z_{i,t}$ community level characteristics and T_i are household time specific factors. To identify and prove the existence of poverty trap, evidence of some non-linearities in the asset accumulation process must be found. As Naschold (2005) stated, identifying an unstable threshold with a parametric specification requires a large sample which our panel data points satisfy. Specifically, and following studies by Mckay and Lawson, (2003), Naschold, (2005), Naschold, (2012) and Barrett et al., (2006), this study adopted and applied a fourth degree polynomial regression to estimate the relationship between the change in asset holdings and the asset holdings in the previous period. Using the change in asset index instead of its current value is supported by the idea that there could be some over/underestimations in asset index values, which would bias the model. It allows for the elimination of some individual effects potentially correlated with the lagged values (Jalan and Ravaillon, 2001). For robustness check however, the assets value was also used for both the 2009/10-2011/12 and 2013/14-2019/20 waves. The empirical fourth degree polynomial model for the asset accumulation specified in equation iv is used:

$\Delta A_{i,t} = [\beta_0 + \beta_1 A_{i,t-1} + \beta_2 A^2{}_{i,t-1} + \beta_3 A^3{}_{i,t-1} + \beta_4 A^4{}_{i,t-1}] + \gamma H_{i,t} + \theta Z_{i,t} + T_i + \varepsilon_{i,t}$(4)

With $\varepsilon_{i,t} \sim N(0;\ \sigma^2{}_{\varepsilon}) and\ i = 1. \ldots N\ and\ t = 1. \ldots 7$ waves

The change in asset holdings over time is a function of a fourth order polynomial of its lagged value $A_{i,t-1}$ and of household characteristic $H_{i,t;}$ community level factors $Z_{i,t}$ and time dummies, T_i . $[\beta_0 + \beta_1 A_{it-1} + \beta_2 A^2{}_{it-1} + \beta_3 A^3{}_{it-1} + \beta_4 A^4{}_{it-1}]$, denotes asset accumulation over the study period and the sign of the coefficient of the fourth polynomial (β_4,) enables us to conclude whether there is asset accumulation (β_4 >0 i.e. +), lack of accumulation (β_4<0 i.e. -) or inconclusive (β_4=0). The second part of the equation ($\gamma H_{i,t} + \theta Z_{i,t} + T_i + \varepsilon_{i,t}$), defines the determinants of lack of asset accumulation. This permits a two stage analysis as follows:

i) Analysis of asset accumulation status i.e. $\Delta A_{i,t}$ for households.
ii) Analysis of determinants of asset accumulation ($H_{i,t} + Z_{i,t}$).

The age of the household head and its squared value were used to capture life-cycle effects in the analysis. Also, the square of the household size was used to capture household structural and behavioural effects on decisions about asset accumulation or dilution. Only a single lag was included in the asset index due to the short time of the survey period.

3. Results

3.1 Diagnostic tests and descriptive statistics of household characteristics

Chow Panel poolability test results (see Appendix I) show that the poolability of overtime and across households is not possible. The Langragian Multiplier (LM) random effects tests could not be rejected against the common effects as well as the Hausman test for random effects could not be rejected against the fixed effects. While there was presence of heteroscedasticity and autocorrelation, Newey west standard errors were reported for correction. Random effects model was applied to the run the model on determinants of asset accumulation. Households' socio-demographic characteristics were analyzed at uni-variate level and included the following: sex, marital status, and household size, age of household head, education level completed by head of household, place of residence or location (rural-urban), occupation and region. In addition to household specific characteristics, community level characteristics such as access to electricity and markets (financial markets, agricultural markets and non-agricultural) were analyzed. Ownership of functioning assets, test of evidence of asset accumulation and examination of determinants of asset accumulation were analyzed both at bi-variate and multi-variate level.

3.2 Socio-demographic characteristics of households

In terms of sex of household head for the last four waves, data were collected from a total of 12,199 households. 37.8 percent of the household heads were women while 62.2 percent were male. Women headed households increased by 4 percentage points (from 31% in the 2013/2014 wave to 35% in 2019/20 wave) during the study period. The results are presented in Table 1. On the other hand, for the wave 2009/2010-2011/2012 with sample size of 8,122, 70.9 and 29.1 percent of the household heads were male and female respectively. A closer scrutiny of the two sets of data waves suggests that women headed household increased by about 4.6 percentage points. In terms of marital status, 54.5 percent of the household heads were in monogamous marriage relationship while 17.2 percent in polygamous relationship for the last four waves. 15 percent of the household heads are either widows or widowers and 10 percent were divorced or separated from their marriages while 3.2 percent of the household heads never married. In the earlier three waves, the married (monogamous or polygamous combined) were 82.5 percent, while the separated or divorced were 5.6 percent, the widowed were 11 percent and those never married were only about 1 percent. Further synthesis shows that the number of unmarried heads increased by 2.3 percent, the windowed by 4.1 percent and the divorced by 4.4 percent in the later waves.

Table 1: Household Socio-demographic characteristics

Variable	2009/2010-2011/2012 (%)	2013/2014-2019/2020 (%)
Sex of head of household		
Male	70.90	66.23
Female	29.10	33.77
Marital status		
Monogamous/Polygamous	82.47	54.52
Polygamous		17.16
Divorced/Separated	5.57	10.00
Widowed	11.06	15.12
Never married	0.89	3.19
Household size		
Mean	4.90	4.91
Standard deviation	3.35	2.67
Age of head of household		
Mean	46.10	46.50
Standard deviation	15.15	15.86
Education of head of household		
No formal education	18.64	24.48
Some primary education	39.25	33.31
Completed Primary education	14.01	12.03
Some secondary education	14.37	2.85
Completed secondary education	5.59	21.76
Postsecondary education plus training	8.15	5.78
Primary source of income/occupation		
Location (urban/rural)		
Rural	80.92	74.87
Urban	19.08	25.13
Household distribution by region		
Central (excluding Kampala)	26.05	26.80
Eastern	22.63	23.63
Northern	26.85	26.99
Western	22.00	22.57

Source: *Author's computation*

Household size is another important household characteristic that influences welfare. For the last seven waves, household size averaged at 4.9 persons with a minimum of 1 member and a maximum of 26 members and a standard deviation of 2.6 persons. The average household head age for the 2013/14-2019/20 waves was 46.5 years while for the 2009/10-2011/12 waves was 46.1 years. The minimum age of the household head for the last 4 waves was 15 years and the maximum was 107 recorded in the 2015/2016 wave while the

first three waves recorded a minimum of 12 years and a maximum of 100 years. It is clear that the minimum household head age rose as well as the maximum implying that people are beginning to delay taking up parenting responsibilities and living longer. In terms of age categorization, majority (24%) of the household heads were in the 35-44 age bracket as would be expected. During this period, 0.07 percent of the household heads were minors (at age below 18 years) and 4.8 percent of the households were headed by young people aged 18-24 years. Households headed by senior citizens (aged 65 years and above) was recorded at 15 percent. This suggests a growing number of aging populations, but with responsibility.

Education of household head is considered a key variable that can change a household's socio-economic status. Analysis of the education variable shows that 24.5 percent of the household heads had no formal education for 2013/14-2019/20 wave while 18.64 percent of the household heads did not have formal education during the 2009-2012 wave. 45.3 percent had some or completed primary education for the last 4 waves. 53.26 percent had some or completed primary education for the first 3 waves. 24.5 percent of the household heads had some or completed secondary education while only 5.78 percent and 8.2 percent had a postsecondary school education level plus training (other than Bachelors) for the two sets of waves (2009/12 and 2013/2020.

Considering place of residence, 75 percent of the households were rural residents while 25 percent urban residents. Regionally, 27 percent of the households were from northern and central, while 24 percent from eastern and 23 percent from western for the second set of waves. This is similar to results observed from the first set of waves. Community level variables such as access to electricity (rural electrification) and markets are equally important in this study. 15.6 percent of the households were able to access electricity. Generally, households were able to access some agricultural, non-agricultural and financial markets. Access to those community level services implies that the community has some level of the needed infrastructure. How this facilitates assets accumulation was shown in the multivariable analysis.

3.3 Do households own functioning assets?

Prior to testing for evidence of poverty trap using the assets accumulation model, we establish the proportion of households owning functioning assets as a core requirement. The focus was on the role ownership of such assets play in household poverty reduction. Table 2 clearly indicates that only 20.1 percent of the households owned functioning assets overall, over the study period 2013/2014-2019/2020. The proportion of households owning functioning asset remained fairly stable for the waves 2013/2014 and 2015/2016 and dropped drastically for the waves 2018/19 and 2019/20. Over the study period, the proportion of households who owned functioning assets dropped by 10.4 percentage points (from 25.2 percent to 14.8 percent).

Table 2: Household Ownership of Functioning Assets

Variable	Wave	Percentage
Functioning Assets owned	2013/14	25.06
	2015/16	25.19
	2018/19	14.80
	2019/20	15.46
Overall (all waves)		***20.10***
Functioning Assets owned 2 or4 years Prior survey		
Yes		38.92
No		61.08

Source: *Author's computation*

In addition, households were asked if they owned such assets 2 or 4 years ago. Results in panel 2 of table 3 shows that 38.92 percent of the households owned functioning assets. By simple comparison, it can be seen that the proportion of households who owned functioning assets dropped by 18.82 percentage points 2 or 4 years later. This is in line with poverty levels and could suggest that poverty is driven by among others ownership of functioning assets.

3.4 Mean asset value

Evaluating household asset value over the study period, the researcher finds that the mean household asset value was UGX 5, 217,665 ($1,449.35 equivalent at the rate of $1: UGX 3,600). The minimum asset value is UGX 2,000 and maximum of UGX 150,000,000 ($41,666.67). It is noted that the mean asset value reduced drastically during the study period from UGX 6,785,615 ($1,884.89) during the 2013/14 wave to UGX 2,462,957 ($684.15) during the 2019/20 wave. This was already an indication of asset accumulation challenges among households.

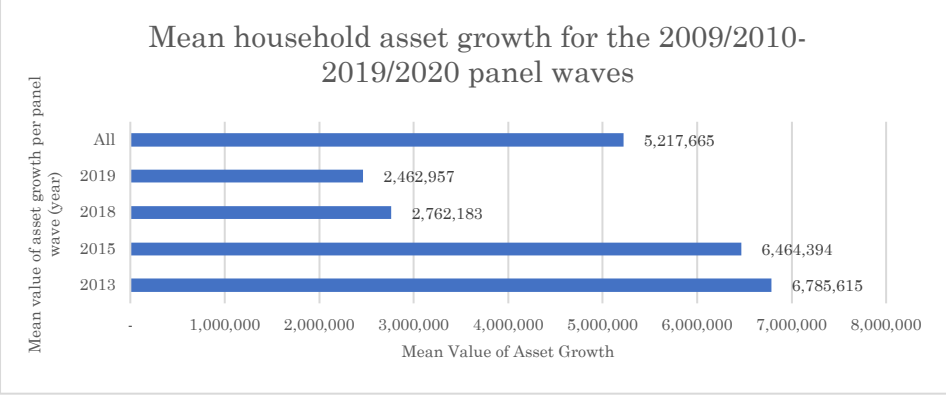

Figure 1: Mean asset value growth for 2013/14-2019/20

Source: *Authors computation based on UBOS panel data*

Similar trend in asset value was registered in the earlier 3 waves of 2009/10-2011/12. Though not directly comparable due to household rotation and split offs, there is a general trend of reduction in assets values recorded over the study period.

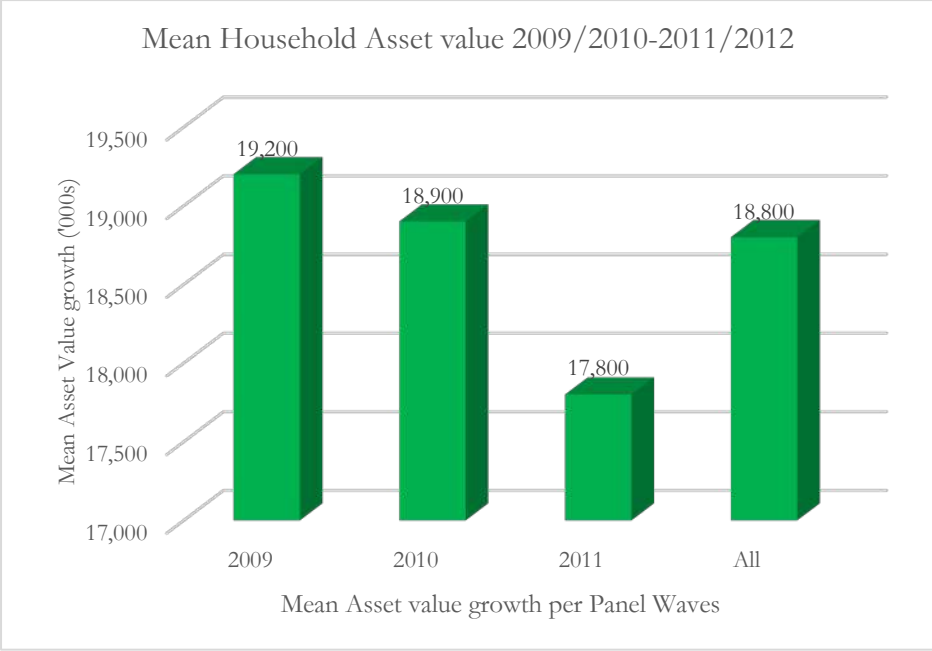

Figure 2: Mean asset value growth for 2009/2010-2011/2012

Source: *Authors computation based on UBOS panel data*

Generally speaking, mean assets value seem to be higher for the earlier 3 waves compared to the last 4. This may be in line with the growing poverty trends recorded in the last years of the waves when poverty rates reportedly rose from 19.7 percent in 2013 to 21.7 percent in 2019; World Bank, (2019).

3.5 Evidence of poverty trap (asset accumulation approach)

Two approaches/methods were used to define asset accumulation or lack of it. The first approach was based on an index of asset constructed using the PCA method. The second approach was based on change in the total value of asset during the study period. Using the first approach, a single index each for all assets (20 assets for the last 4 waves and 19 assets for the first 3 waves) was constructed as in the case of Carter and Barrett (2006). The index was constructed using eigenvalues generated after running the PCA. The eigenvalues were standardized before generating the final asset index value for the regression. Scree plots (see Figure 2) were generated to determine the number of components to be chosen for each set of assets variables. The scree

plot suggested that only one component was feasible for the construction of the asset index. Asset accumulation testing model specification based on asset index approach require that the generated index be lagged once. Thereafter, a polynomial to the fourth degree of the lagged asset index was created to test the existence of lack of asset accumulation or poverty trap. A polynomial regression was run to determine the value and sign of the coefficient of the fourth degree polynomial of the asset index. The second approach focused on change in total assets values households owned during the study period. Change in total asset value was calculated as the difference between total asset value registered in 2019/20 wave and total asset value in 2013/2014 for the last 4 waves and the difference between the value of assets in 2011/2012 and 2009/2010 for the first 3 waves. A negative value resulting from the difference indicates loss in asset value while a positive value indicates an increase in asset value over the period, and a zero difference signifies neither increase nor decrease in asset value over the period. The values generated were raised to a polynomial of the fourth degree, whose regression results provided evidence of assets accumulation or lack of it. A negative sign of the coefficient of the fourth degree polynomial for both approaches indicate evidence of lack of asset accumulation and a sign of poverty trap for the households. Using both the constructed asset index and change in total asset value, there is evidence of lack of asset accumulation among households for the study period. Test results are presented in table 3.

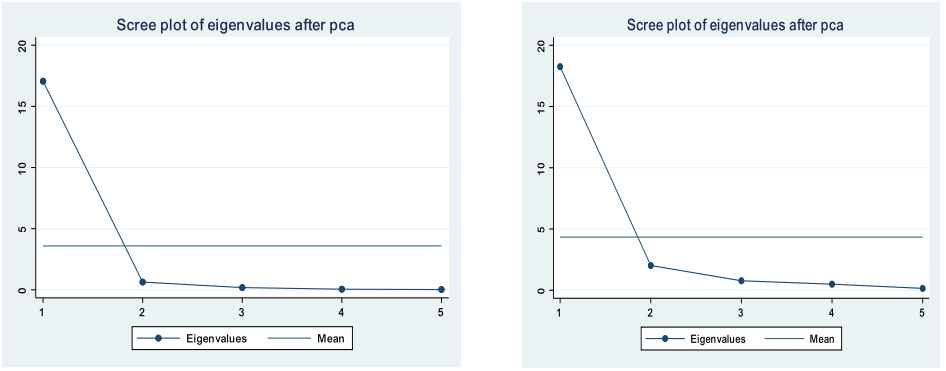

Figure 3: Scree plot of Eigenvalues after PCA

Panel a: 2013/2014-2019/2020 Panel b: 2009/2010-2011/2012

Source: *Authors computation based on Panel data*

The coefficients of the fourth degree polynomial of asset indices (**-0.004****) and (**-0.010***) for both 2013/14-2019/20 and 2009/10- 2011/12 waves bears the negative signs at the 0.05 and 0.01 level of statistical significance. The negative sign is proof of lack of asset accumulation among households over

the study period. This empirical evidence of lack of asset accumulation is also considered as a proxy sign of poverty trap among the affected households.

Table3: Test of poverty trap using PCA constructed asset index at lag1

Variable	Model1	Model	Model3
Asset Index	0.991***	-0.020	
Asset Index^2	0.032***	0.103***	
Asset Index^3	0.001*		0.077***
$Asset\ Index^4$	*-0.004***	*-0.010****	
$\Delta Total\ assetvalue^4$			-0.523
Constant	-0.410***	-0.733***	-3.554***
Observations	907	888	2,458

Source: *Authors computation based on UBoS panel data.*

*** p<0.01, ** p<0.05, * p<0.1

Model1: *Poverty trap test based on 2013/2014-2019/2020 waves;* ***Model2:*** *Poverty trap test based on 2009/2010-2011/2012 waves;* ***Model3:*** *Poverty trap test based on change in total asset value.*

This finding suggests existence of nonlinearity in asset accumulation which is in line with theory and the findings of Lybbert et al., (2004) who investigated poverty trap among pastoralist in southern Ethiopia. The findings also agree with those of Barrett et al., (2006) whose study focused on asset accumulation and poverty trap among pastoralist communities in northern Kenya and Madagascar. Results are also in agreement with other studies such as those of Yong et al., (2021), Kraay & McKenzie, (2014) and Adato et al., (2006), which is important for generalizability. To provide robustness check, similar test was carried out using change in total asset value and the coefficient of the fourth polynomial of the change in total asset value variable produced a consistently negative sign similar to the one for asset index approach. Whereas, the coefficient of the change in total asset value was not statistically significant for this test, the coefficient bears the same sign. The difference may be attributed to the manner in which the test data was generated. As noted earlier on the asset index was PCA generated based on eigenvalues while change in total asset values were based on reported values.

3.6 Drivers of lack of asset accumulation among households

Regression results from both the asset index and change in total asset values models in Table 2 are in agreement that assets accumulation is influenced by the age of the household head. However, unlike in the 2013-2020 waves, younger household heads are 0.0114 and 0.0807 times less likely to accumulate assets compared to their older counterparts. Chances of assets accumulation increases with age, so that when the age of the head of household is squared, there is a decimal 0.00989 and 0.0465 more likelihood

of asset accumulation in both models. Also compared to household heads with no formal education, household heads who completed post-secondary school education with some training (excluding university degrees) and those with some primary and secondary education level were more likely to accumulate assets. In both models household heads with post-secondary education were 0.0789 (7.89%) and 0.066 (6.6%) times more likely to accumulate assets. These results resonate well with the theoretical underpinning of human capital accumulation reckoning that knowledge and skills acquisition lead to higher productivity and hence wealth accumulation. While marital status seem not to so much influence asset accumulation, women heads in divorced marriages were 0.119 times more likely to accumulate assets than those never married. This may be due to the fact that divorces lead to split of assets upon which separated parties build to make more assets. These results are consistent with the 2013/14-2019/20 waves for the same variables.

Table 4: Determinants of assets accumulation

VARIABLES	Model1	Model2
Sex of household head (female base)	0.0447	0.954
Age of household head	-0.0114***	-0.0807***
Age2 of household head	0.0010***	0.0465*
Some primary educ_level (No formal educ base)	-0.0123	0.229
Completed primary educ_level	0.0518**	-0.0968
Some Secondary educ_level	0.0708***	0.0117
Completed Secondary educ_level	0.0928***	-0.367
Post secondaryeduc_level & training	0.0789***	0.066**
Married female (Never married base)	0.109	0.767
Divorced Marriage	0.119*	1.176
Widowed	0.0979	1.248
Hsize1	0.0440***	0.0268
Hsize2	-0.00212***	-0.0026
Eastern region	0.0218	
Northern region	-0.0482***	
Western region	0.014	
AgricMKT	0.0182	-0.591
NONagricMKT	-0.0994**	0.587
FinMKT	0.0148	0.397
Climatic Shocks (Economic shock base)	0.0118	-0.460**
Health shocks	-0.0377**	0.251
Urban (Rural base)	-0.0133	0.0552
Constant	0.319***	0.130***
Observations	2,826	859

Asset accumulation is also influenced by the size of the household. Results from the Change in value of asset model shows that households that are smaller in sizes were 0.044 times more likely to accumulate assets compared to those which are larger in sizes. As the household size got larger, they were 0.0021 (0.21%) less likely to accumulate assets. In addition to household size,

households living in the northern region were 0.0482 (4.82%) less likely to accumulate assets compared to households in the central region. This result is consistent for all waves (2009/10-2019/20) and could be attributed to the fact that the low level of economic opportunities in the region, besides the spill over (war effect) of the turbulent political history in the region. At community level, access to non-agricultural markets compared to agricultural markets is associated with less likelihood of asset accumulation. Using economic shocks as the base category among the shocks, climatic and health shocks both have negative effect on asset accumulation. In model1 (Change in asset value), households who experienced health shocks during the study period were 0.0377 (3.8%) less likely to accumulate assets compared to those who suffered economic shocks. Also those who experienced climatic shocks during the study period were 0.460 (46%) times less likely to accumulate assets compared to those who experienced economic shocks. For climatic shocks, it is expected that such shocks like drought or floods destroy economic livelihood of the household and along with other shocks could lead to destitution.

4.0 Conclusion and Policy implication

There is empirical evidence of poverty trap among households in Uganda, as evidenced by the lack of accumulation of asset holdings. Socio-demographic, location and community level factors were found to make a significant negative contribution to poverty trap. A minimum level of education is critical for the household head to accumulate assets. The likelihood of accumulating assets and escaping the poverty trap increased with the level of education attained for the earlier waves. This suggests that household heads who attained higher levels of education should accumulate more assets. In this case, higher level of education emphasizing skills impartation should be made more vigorous and prioritized. Emphasis on smaller size households could increase the likelihood of asset accumulation. A comprehensive, well-structured and targeted asset accumulation and poverty reduction strategy need to be implemented for households trapped in poverty. Households need to be provided social protection against shocks to cushion them from devastating loss of assets during bad times.

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Appendix I: Diagnostic Test Results

Name of test	Statistic	Probability	Verdict
Heteroscedasticity			
MWTGH in FE regression	Chi2 (1,923) =<0.0001	<0.0001	The null hypothesis of homoscedasticity was rejected in all 3 tests. It was concluded that there is presence of heteroscedasticity in data, thus, Newey west robust results are reported for correction
Breusch-Pagan/Cook Weisberg	Chi2 (1) =165.24	<0.0001	
Cameron &Trevedi's decomposition of IM test	Chi2 (84) =217.43	<0.0001	
Autocorrelation (Cumby-Huizinga)			
Lag1	Chi2 (19251.38)	0.0587	H_0 of no autocorrelation was rejected
Lag2	Chi2 (19251.38)	0.1659	H_0 of no autocorrelation could not be rejected
Rho_ar		0.0210	H_0 of no autocorrelation was rejected. There is presence of autocorrelation, hence, Newey west robust standard errors are reported
Poolability			
Joint time/cross-section test	F (374, 215) =34.30	<0.0001	H_0 of poolability was rejected
Hausmann's Test for FE/RE			
Asset index (2009/2010-2011/2012)	Chi2 (10) =5.52	0.8537	H_0 of FE was rejected, hence RE
Asset index (2013/2014-2019/2020)	Chi2 (10) =11.37	0.3292	H_0 of FE was rejected, hence RE

Where MWTGH =Modified Wald test for groupwise heteroscedasticity

Appendix II: Variable Definition

Variable	Description
Poverty trap (Dependent variable)	A dummy variable =1 if trapped in poverty or 0 otherwise. A household is trapped in poverty if recorded as =1 for at least 3 of 4 waves or 2 of 3 waves in this study
Asset index	An index of assets constructed using PCA model. A 4th order polynomial regression with negative (-) sign indicates lack of asset accumulation
Asset value	This is the total household asset monetary value overtime during the study period. It was used as a confirmatory test for asset accumulation or lack of it
Economic shocks	Death of an important cash earner or member, loss of job, unemployment, high input prices, low output prices, outbreak of fire destroying property, theft and burglary. Each is a binary count variable=1 if the particular shock was experienced 12 months prior to the data collection and 0 otherwise over the study period
Health shocks	Illness, injury and hospitalization (1=experience the shock, 0= did not experience it 12 months prior to data collection
Climatic shocks	Drought, floods, and diseases affecting crops and animals. (1=experience the shock, 0= did not experience it 12 months prior to data collection
Sex	This is sex of household head, and a binary count; 1=Male; 2=Female
Age	This is age of household head in complete years
Education	This is the highest education level attained by household head. It is categorical: 1=No formal education, 2=some primary education, 3=completed primary education, 4=some secondary education, 5=completed secondary education, 6=post-secondary education with training
Marital status	Marital status of household head is categorized as: 1=Monogamous, 2=polygamous, 3=divorced or separated, 4=widow or widower, 5=never married
Household size	Defined as a continuous variable for the usual household member present

Variable	Description
Residence	This variable defines household residence as 1=urban dweller 2=rural dweller
Region	Defined as 1=Central; 2=Eastern,3=Northern; 4= Western
Market access	1=Access to agricultural, 0 otherwise; 1=access to non-agricultural, 0 otherwise; 1=access to financial markets, 0 otherwise.