



ENHANCING HOUSEHOLD WELFARE: THE ROLE OF INCOME DIVERSITY

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Abstract

Embracing income diversity by households is considered a major pathway in disentangling the venomous poverty cycle. This study investigates the empirical linkage between income diversity and household welfare. The paper addresses the effects of the potential endogeneity arising from the selection bias with the aid of the instrumental variable static panel model regression. The study used waves of Uganda National Panel Survey. Results indicate that diverse income has a significant positive impact on household welfare. Further findings showed that education of household head significantly predicts household welfare while region of residing in the eastern or northern regions negatively affected welfare compared to residing in the central region. The research paradigm used was insufficient to fully explain the subjective nature of welfare. Future studies might think about adopting a pragmatic viewpoint. This might lead to using primary and secondary data for that purpose. The current study enriches the literature on welfare by establishing the influence of income diversity on the multifaceted household welfare

as measured by poverty status and consumption expenditure since previous studies have been directed to consumption expenditure as the only proxy to welfare. The study further expounds on the welfare theory by establishing how income diversity enhances welfare of households using a sample drawn from Ugandan households; an emerging economy.

Keywords: Household Welfare, Income Diversity, Instrumental Variables, UNPS, Uganda

INTRODUCTION

Embracing income diversity by households is considered a major pathway in disentangling the venomous poverty cycle. Income diversity adoption should, other factors constant, provide additional income to the household (Amfo *et al.*, 2021). The additional income will in turn be used by the household to purchase both consumptive and non – consumptive commodities for the household, thereby reducing the poverty incidence and enabling the household to attain higher welfare. Whether income diversity has such incredible impact on household welfare is contentious but there is general agreement to the fact that it is gaining reliability as an effective apparatus of augmenting welfare in many developing countries (Omotesho *et al.*, 2020).

Household welfare is the general condition of life of the household members as measured by the consumption expenditure, food and non – food expenditure and degree of poverty incidence (Arouri *et al.*, 2015; Unnikrishnan & Imai, 2020). Relatedly, Asmah & Avenue (2011) defines household welfare as the household’s command over market goods and services at the household level.

Income diversity, on the other hand, is the process through which households build progressively varied source of revenue by combining increasingly different resources as well as properties to meet the necessities (Wan *et al.*, 2016). Further, income diversity means increasing the income sources of the household (Wan *et al.*, 2016). Different types of agriculture (for example, grains, perennials, livestock, horticulture, etc.) can be used to diversify income, as can participation in both production and value addition, as well as on-farm and off-farm activities (Johny *et al.*, 2017). This study defines income diversity as a situation where a household generates income from others sources other than the main household activity (Hanh & Boonstra, 2018; Leng *et al.*, 2020; Minkoff & Lyons, 2017; Porter, 2012; Wan *et al.*, 2016).

On the global scene, welfare of households has remained low as manifested by the poverty rate which has consistently remained high at 8.6 percent (656 million people) in 2022 (Aguilar *et al.*, 2022) with Middle East and North Africa posting the highest increase. In addition UNICEF report indicated that 16 million people in Middle East and North Africa lacked food in

the year 2021 (Mostafa, 2021). Additionally, 68 percent of homesteads in selected countries of Latin America, Asia and Africa have experienced a drop in their incomes since March 2020 resulting into declining living standards (Egger *et al.*, 2020). Further still, Sub Saharan Africa has registered an increase in the poverty level from 420 million people in 2018 to 424 million people in 2019 with poverty rate of 40.0 percent in 2021 (Aguilar *et al.*, 2022).

On the Africa continent, the welfare situation is even worse. For example 28 million people in South Africa are welfare beneficiaries due to deepening poverty levels in the country and reports suggest that the number of beneficiaries has surpassed the number of tax payers that makes it unsustainable (Naidoo, 2022). East African region has not been spared either with 29 million people facing hunger in the region as reported by The East African (2021). Also consumption expenditure decreased by 30 percent as 66 percent of households in Uganda experienced income shocks in 2020 (Kansiime *et al.*, 2021). Furthermore, according to a UBOS report, there was a 5.5 percent decline in consumption expenditure among households in Uganda in a 2019/2020 survey (UBOS, 2021).

Theoretically, income diversity and welfare are deeply rooted in the social choices made by human beings (individuals or households) such that the more diversified income is, the higher the utility and wellbeing of the individual as well as the household (Pressman & Summerfield, 2000). In particular, the theory posits that increasing income for individuals and households enhances their utility and wellbeing (Arrow, 1999). Further still, any change in income diversity decisions significantly affect the welfare of the household. Families must make judgments on a regular basis about how to diversify their incomes. Such judgments are not important for wealthier families, but they might be life or death for poor families. As a result of the household's diversifying decisions, those who do not obtain enough food will perish, just as those who do not receive proper medical attention when they are sick would perish (Sen, 1991).

Mohammed (2018) in their study to establish the influence of income diversification on welfare among the staff of Kaduna State University found that income diversification had significant relationship with the staff wellbeing in the study area. Similarly, Zhao & Barry (2014) looked at different farm-level diversity and how it affects the income levels of rural households in China and found that diversity gives low-income rural families a monetary premium while giving high-income rural families a monetary discount. Furthermore, in a study to evaluate the effect of income diversity on household welfare, Kidane & Zegeye (2019) discovered that income diversification had a positive impact on income and reduced the inclination to poverty. Khan and Morrissey (2019) looked at household income diversity and discovered that families with more diverse income sources had lower consumption welfare. For instance households can increase

their welfare by eradicate poverty when the use part of the house hold income to invest in more income generating venture (Martinson *et al.*, 2022).

The empirical assessments of household welfare have measured household welfare using only one component of wellbeing (consumption expenditure), which is a flaw in the plethora of literature on income diversity and household welfare (Arouri *et al.*, 2015; Asmah & Avenue, 2011; Seng, 2017; Tambo & Wünscher, 2017). In addition, most of the empirical studies (Asfaw *et al.*, 2019; Danso-abbeam *et al.*, 2020; Hong *et al.*, 2018; Rahut *et al.*, 2017; Stifel, 2010; Xu, 2017; Zakaria *et al.*, 2019) have adopted cross sectional approaches which do not reveal the changes in welfare over a period of time. Furthermore previous studies have shown mixed results. On the one hand, empirical research have demonstrated a robust link between household welfare and income diversity (Amfo *et al.*, 2021; Asfaw *et al.*, 2019; Hong *et al.*, 2018; Rahut *et al.*, 2017; Stifel, 2010; Tesfaye & Tirivayi, 2020); Xu, 2017; Zakaria *et al.*, 2019).

On the other hand, other literature has established either little or no influence of income diversity on welfare of the households (Ebenezer & Abbyssinia, 2018; Gautam & Andersen, 2016; Khan & Morrissey, 2019; Mendoza, 2018; Omotesho *et al.*, 2020). Most studies have established the link between income diversity and welfare using data from primarily developed countries (Gautam & Andersen, 2016; Kidane & Zegeye, 2019; Salam *et al.*, 2019; Zhao & Barry, 2014), but research by Asfaw *et al.* (2019) indicated that the effect of diversity on household income varies by country. Using two measures of welfare (consumption spending and poverty incidence) as well as nationally representative panel data from a developing country (Uganda) to generalize the results more broadly, this study intends to fill these gaps and enrich the existing knowledge.

The study adds to the literature on income diversity and household welfare in both practical and theoretical ways. In practice, the findings of our study could provide policymakers and development partners with important information on the benefits of income diversity in boosting household welfare in Uganda. Theoretically, the study enriches income diversity and welfare literature by incorporating more measures of welfare and how each one of them are associated with income diversity. The research also provides empirical evidence of the impact of income diversity on household welfare, putting the welfare theory to the test in Uganda, a developing country with welfare issues.

The remainder of the paper is divided into three parts. The theoretical foundation and literature on income diversity and household wellbeing are presented in the first section. The study's methodologies and data are described in the second section. The last section details the study findings, discussions, conclusion and policy implications.

THEORETICAL AND EMPIRICAL LITERATURE

Social Choice Theory

The theory was advanced by an Indian economists, Sen (1986) to explain how the choices made by individuals and households affect their welfare. In particular, the theory posits that increasing income for individuals and households enhances their utility and wellbeing (Arrow, 1999; Atkinson, 1999). Sen noted that individuals willingly form themselves into families and households and as such their wellbeing is dependent on the aggregate income of the household (Pressman & Summerfield, 2000). Thus, the higher the income of the household, the greater will be the welfare attained by the household though how this income is divided among the household members will determine the welfare of the individual household members. The outcome of this distribution may not be optimal whenever one family member controls most resources and or controls the division of family resources (Sen, 1990).

Household income diversity results into increased income of the household thereby contributing to poverty reduction and improved welfare of the household. A higher level of income diversity can significantly minimize the household's income fluctuation (Kasperski & Holland, 2013). Furthermore, income diversity reduces livelihood vulnerability by reducing household income fluctuation, external production shocks, and household consumption patterns. Additionally, Wan *et al.* (2016) intimated the increasingly important role of income diversity as a means through which households enhance their income and ensure against risks. The more diversified the income of the household is, the more it is likely to improve the welfare of the household by relaxing the consumption constraints. In other words, households with a more diversified income will almost certainly have higher incomes and will, for example, increase their spending on food and other consumptive commodities, thereby improving their welfare, whereas households with a less diversified income will face food and other consumption constraints.

Income Diversity and Household Welfare

As a strategy, income diversity entails a series of attempts by households to find alternative means of generating cash in order to reduce shocks to which they are exposed, and as a result, households diversify their sources of income in order to escape extreme poverty and improve their welfare (Zakaria *et al.*, 2019). Income diversity is a term used to describe the importance of various income-generating activities to a household's overall well-being at any given period (Kidane & Zegeye, 2019). As a result, the additional income is predicted to have a good impact on consumption spending and nutrition (Tesfaye & Tirivayi, 2020). Engaging in alternative income-generating activities, according to Adepoju & Obayelu (2013), helps to reduce income uncertainty,

provide a source of cash for the household, and increase agriculture production by providing the finances needed for investment in sophisticated agricultural technologies. Diversity is motivated by households' desire to strengthen their livelihoods, battle poverty, hunger, and improve their well-being (Danso-abbeam *et al.*, 2020; Gautam & Andersen, 2016).

Income diversity leads to higher profits, which are then used to purchase productive investments and raise the household's asset worth (Hong *et al.*, 2018; Mendoza, 2018; Zakaria *et al.*, 2019). The number of livelihood activities enhances the household's revenue from various income-generating activities, reducing the risk of low income production from a single investment in the event of adverse conditions (Amfo *et al.*, 2021; Danso-abbeam *et al.*, 2020; Oyimbo & Olaleye, 2016). Diversified households are better off than non-diversified households. In other words, diversified households receive more income at the end of the year/period than non-diversified households, and are thus more likely to spend more on consumption and asset accumulation (Akaakohol & Aye, 2015; Oyimbo & Olaleye, 2016). Furthermore, diversified income generates a significant monetary advantage for low-income households, which is expanding (Zhao & Barry, 2014).

This argument is in congruence with empirical studies that have revealed a significant relationship between income diversification and household welfare. Diversified income can be used to alleviate a household's financial limitation (Hong *et al.*, 2018). By lowering income instability, income diversity might also boost household consumption. In other words, when households' incomes rise as a result of income diversity, they spend more (Xu, 2017). Higher household income leads to increased savings, which are then invested in household durables, boosting the household's asset worth (Hong *et al.*, 2018). Income diversity minimizes a household's reliance on a single source of income, resulting in an increase in welfare (Amfo *et al.*, 2021; Xu, 2017). Households diversify not only to mitigate risk, but also to boost income and eliminate poverty (Rahut *et al.*, 2017). The additional income-generating activities help to protect against downward demand and price shifts (Amfo *et al.*, 2021). To summarize, if households diversify their sources of income, their welfare will improve (Zakaria *et al.*, 2019). This suggests that households who diversify their income sources are better off than those who do not.

Numerous studies have been conducted on the influence of income diversity on household welfare. For example in Ghana, Zakaria *et al.* (2019) employed a multistage sampling approach, a probit model, and a propensity score matching technique to investigate the impact of livelihood diversification on farm household welfare. Farmers who were older, had access to extension services, were male, and thought rainfall was erratic and temperatures were high were more likely to diversify, according to the study. In addition, they discovered that varied farm households fared better than non-diversified farm households. Similarly, using

provincial level panel data from 1998 to 2015, Xu (2017) discovered that income diversification enhances consumption of Chinese peasants in rural areas. Peasant consumption in the low and high income subsamples of provinces is more susceptible to income diversification, while peasant consumption in the intermediate income provinces is less responsive to income diversification, according to the study.

Stifel (2010) investigated the relationship between rural non-farm employment and household welfare using nationally representative data from Madagascar. Using multinomial logit models, the study indicated that high-return non-farm activities provide a vital path out of poverty. Rahut *et al.* (2017) evaluated rural livelihood diversification approaches and their impact on household welfare using the Bhutan Living Standard Survey 2012. For parameter estimation, they used propensity score matching. According to their findings, education, asset endowment, labor availability, and the sex of the household head all had a role in livelihood diversification into non-agricultural sectors. They also discovered that rural households who diversify their livelihoods outside of agriculture have higher income and lower poverty levels than those who just farm for a living, and that diversifying livelihoods into non-farm businesses could help greatly reduce poverty levels. Using unique survey data from China, Hong *et al.* (2018) explored the link between income diversification and household welfare. They also discovered that farm households who adopt income diversification strategies had greater forestry income, agricultural revenue, off-farm income, consumption, savings, and are less likely to be in relative poverty than their counterparts who do not.

Ebenezer & Abbyssinia (2018), on the other hand, used data from South Africa to study the impact of livelihood diversification on welfare. They discovered that the province's households were not diverse using a modified Multidimensional Poverty Index and the Tobit regression model. Gender, education, and employment status, as well as access to electricity, agricultural engagement, total income, asset score, and geographic location, have all been proven to have an impact on household poverty in the Province. Furthermore, Gautam and Andersen (2016) used data from household surveys to create a composite household well-being score, which they used to assess the impact of livelihood diversification on Nepalese wellbeing. Their findings demonstrated a steady trend of diversification in terms of the number of activities undertaken for a living, but a wide variety of household levels of well-being. They also discovered that happiness was unaffected by diversity. Diversification of livelihoods has also been found to have a skewed effect, resulting in income and well-being disparities. Omotesho *et al.* (2020) also used primary data to assess the number of revenue sources available to rural families, as well as the contribution of different income sources to total income and welfare. The study found that the number of revenue sources was negatively related to the household's

livelihood status, with the study finding that the lower the livelihood status, the more diverse the household's income. While in a panel study by Mendoza (2018), a two-stage pooled and fixed effects models were estimated to explore the income diversification behavior of Filipino households. The study found out that risk aversion and wealth accumulation were the main motives for income diversification. The study further concluded that diversification helps well-off families mitigate future income and consumption fluctuations with no particular evidence pointing to the effect diversification for rural households whose diversification strategy is primarily subsistence-driven. Basing upon these arguments, we hypothesize:

H₁. Income diversification significantly influences household welfare.

RESEARCH METHODS

Data

The study adopted a quantitative panel data design using secondary data collected from Uganda Bureau of Statistics (UBOS) to arrive at the conclusions. We tested the research hypothesis using data from four waves of Uganda National Panel Survey (UNPS) collected over a period of 8 years (2013 – 2020). Specifically, UNPS 2013/2014, 2015/2016, 2017/2018 and 2019/2020 data waves were used in this study. The study includes thorough data on a variety of socioeconomic characteristics, asset holdings, and poverty indices, among other things. Since the focus is on household welfare impact of income diversification, we employed consumption expenditure, asset value and poverty incidence as a measure of welfare.

Measures

There is no one-size-fits-all metric for measuring household welfare (Regasa *et al.*, 2020). This study employs two measures of household welfare (consumption expenditure and poverty incidence). Because it is less prone to seasonal volatility and other mistakes than other measures of welfare, consumption spending is frequently favored (Tambo & Wünscher, 2017). Consumption expenditure of the household was aggregated for each year and measured in Uganda shilling. Poverty incidence has also been preferred because the household's poverty status strongly depicts the quality of living of the household (Nguyen *et al.*, 2019). Poverty incidence refers to the probability that the household which had the ability to meet its basic needs were considered to be non – poor and it was measured as a binary variable such that POV=1 if a household's income was above the poverty line and POV=0 otherwise. Income diversity refers to a household having other sources of income rather than the main household activity. Income diversity in this study constitutes of passive income sources. The variable was measured in Uganda shillings as a continuous variable.

Econometric Analysis

With regard to Newman *et al.* (2008), the connection between income diversification and household welfare was investigated using the conventional panel model. Accordingly, the econometric forms of the empirical panel models in this study were dictated by how the proxy variables of the household welfare was measured. For instance, household consumption expenditure (CONSEXP) was measured as a continuous variable. For this proxy of household welfare, two static panel models were specified, namely the Fixed Effects (FE) and the Random Effects (RE) model respectively. More specifically the Fixed Effect (FE) empirical model when consumption expenditure (CONSEXP) was used as a proxy measure for household welfare is specified as:

$$LN(CONSEXP)_{it} = \beta_{0i} + \beta_1 INCDIV_{it} + \beta_2 edul_{it} + \beta_3 age_{it} + \beta_4 age_sq_{it} + \beta_5 gender_{it} + \beta_6 marital_{it} + \beta_7 hhsz_{it} + \beta_8 resid_{it} + \beta_9 religion_{it} + \beta_{10} asocc_{it} + u_{it} \dots \dots \dots (1)$$

We correspondingly specify Random Effects (RE) empirical panel model when the consumption expenditure (CONSEXP) is used as a proxy measure for household's welfare is specified as:

$$LN(CONSEXP)_{it} = \beta_0 + \beta_1 INCDIV_{it} + \beta_2 edul_{it} + \beta_3 age_{it} + \beta_4 age_sq_{it} + \beta_5 gender_{it} + \beta_6 marital_{it} + \beta_7 hhsz_{it} + \beta_8 resid_{it} + \beta_9 religion_{it} + \beta_{10} asocc_{it} + \alpha_i + u_{it} \dots \dots \dots (2)$$

The econometric form of the empirical panel model in which household welfare takes a qualitative proxy of poverty incidence (POV) was specified in using the probit regression model as;

$$P_i = E(POV = 1) = \varphi(\beta_0 + \beta_1 INCDIV_{it} + \beta_2 edul_{it} + \beta_3 age_{it} + \beta_4 age_sq_{it} + \beta_5 gender_{it} + \beta_6 marital_{it} + \beta_7 hhsz_{it} + \beta_7 resid_{it} + \beta_8 religion_{it} + \beta_9 asocc_{it} + u_{it}) \dots \dots \dots (3)$$

FINDINGS AND DISCUSSION

Summary Statistics

Table 1: Summary Statistics Consumption Expenditure

Wave	Mean	Minimum	Maximum	Std.dev.
2013/2014	5,323,503	368,501	9.66e+07	5,162,845
2015/2016	351,725	22,786	1.03e+07	391,208
2017/2018	4,412,815	234,177	3.62e+08	9,137,697
2019/2020	5,290,936	492,775	6.87e+07	5,084,346
Overall	3,775,661	22,786	3.62e+08	6,144,725
Total number of observations: 9,943				

According to Table 1's descriptive statistics on household annual consumption expenditure (CONSEXP), the average annual household consumption expenditure for all households over the four waves was roughly three million seven hundred and seventy-five

thousand Ugandan Shillings. The largest standard deviation in the mean annual household consumption expenditure was roughly nine million one hundred and thirty seven thousand Ugandan Shillings for the 2017/2018 wave. This shows that, when compared to the previous waves under study, the 2017/2018 wave of UNPS had the greatest differences in yearly consumption expenditures among households. The descriptor statistics in Table 1 also show that the mean annual household consumption expenditure had a standard deviation of about Ug.Shs. 390,000 and was recorded in the wave 2015/2016, indicating that this was the wave of UNPS with the lowest annual consumption expenditure disparities among households.

Table 2: Summary Statistics on household poverty status (POV)

Wave	Non-Poor	Poor
2013/2014	1,898 (19.09%)	551 (5.54%)
2015/2016	2,171 (21.83%)	461 (4.64%)
2017/2018	1,974 (19.85%)	470 (4.83%)
2019/2020	2,192 (22.05%)	226 (2.27%)
Overall	8,235 (82.82%)	1,708 (17.18%)
Pearson Chi-sq. = 160.4228*** Pr. = 0.000		
Total number of observations: 9,943		

Eighty thousand two hundred and thirty-five families were classified as non-poor over the four waves analyzed, constituting the majority of the households at 82.82 percent, according to the descriptive statistics on poverty status of households reported in Table 2. On the other hand, Table 2's descriptive statistics show that, over the course of the four waves under consideration, 1,738 households (17.18 percent of all households) were classified as poor. Therefore, Table 2's descriptive data show that the average poverty rate for households across the four waves under study was almost 17%.

Table 3: Summary Statistics on Income Diversity (Values in Ug. Shs)

Wave	Variable: Income Diversification (DIVINC)			
	Mean	Minimum	Maximum	Std.dev.
2013/2014	173,363	0	1.90e+07	1,034,524
2015/2016	137,261	0	1.61e+07	875,384
2017/2018	290,270	0	2.12e+07	1,324,084
2019/2020	1,730,068	0	1.81e+07	2,880,101
Sub-Total	271,678	0	2.12e+07	1,278,128

According to the descriptive statistics in Table 3, the mean annual household income diversity across the four waves under study was roughly Ug. Shs 271,700, with the 2019/2020 UNPS wave recording the highest mean annual household diversified income at roughly 1,000,000,730,000, and the 2015/2016 wave recording the lowest mean annual household diversified income. The descriptive data on diversified mean annual household income reveal large discrepancies in the household's diversified incomes in the four waves of the UNPS, with an overall standard deviation of Ug. Shs 1,278,128 in the household's diversified income throughout the four waves.

Diagnostic Tests

Table 4: Panel unit root test results on all model variables

Variable	Statistic	Estimated Statistic	p-value	Order of integration
Logarithm of consumption expenditure (<i>LOGCONSEXP</i>)	Inverse chi-sq.	288.3492	0.0000	I (0)
	Inverse normal	-16.2518	0.0000	I (0)
	Inverse logit, t	-40.6370	0.0000	I (0)
	Modified inv. chi-sq.	70.0873	0.0000	I (0)
Logarithm of Income diversity (<i>LOGDIVINC</i>)	Inverse chi-sq.	217.1982	0.0000	I (0)
	Inverse normal	-12.0280	0.0000	I (0)
	Inverse logit, t	-30.3324	0.0000	I (0)
	Modified inv. chi-sq.	52.2995	0.0000	I (0)
Education level of the HH head (<i>hheducl</i>)	Modified inv. chi-sq.	63.5733	0.0000	I (0)
	Inverse chi-sq.	288.3492	0.0000	I (0)
	Inverse normal	-16.2518	0.0000	I (0)
	Inverse logit, t	-40.6370	0.0000	I (0)
Age of the HH head(years) (<i>age</i>)	Modified inv. chi-sq.	70.0873	0.0000	I (0)
	Inverse chi-sq.	288.3492	0.0000	I (0)
	Inverse normal	-16.2518	0.0000	I (0)
	Inverse logit, t	-40.6370	0.0000	I (0)
Age square of the HH head(years) (<i>agesq.</i>)	Modified inv. chi-sq.	70.0873	0.0000	I (0)
	Inverse chi-sq.	288.3492	0.0000	I (0)
	Inverse normal	-16.2518	0.0000	I (0)
	Inverse logit, t	-40.6370	0.0000	I (0)
Size of the household (<i>HHsize</i>)	Modified inv. chi-sq.	70.0873	0.0000	I (0)
	Inverse chi-sq.	288.3492	0.0000	I (0)
	Inverse normal	-16.2518	0.0000	I (0)
	Inverse logit, t	-40.6370	0.0000	I (0)
Categorical variables	Modified inv. chi-sq.	70.0873	0.0000	I (0)
	-	-	-	I (0)
	Poverty status of the household (<i>POV</i>)	-	-	I (0)
	Marital status of the HH head (<i>Marital</i>)	-	-	I (0)
	Residence of the household (<i>residence</i>)	-	-	I (0)
Region of the household (<i>region</i>)	-	-	I (0)	
Employment sector (<i>employsec</i>)	-	-	I (0)	

According to Table 4's unit root test results, all estimated Fisher-type statistics (Choi, 2001) that account for all of the non-categorical variables that are part of the empirical model reject the null hypothesis that all panels have a unit root. For the categorical variables, their level-stationarity is known a priori. This implies that all model variables are level-stationary, and are consequently integrated with order zero (0).

Table 5: Pairwise correlation matrix for all model variables

	LOGCONSEXP	POV	LOGDIVINC	HHEDUCL	AGE	AGESQ	GENDER	MARITAL	HHSIZE	RESIDENCE	EMPLOYSEC
LOGCONSEXP	1.0000										
POV	-0.3707 (0.0000)	1.0000									
LOGDIVINC	0.2125 (0.0000)	-0.0876 (0.0183)	1.0000								
HHEDUCL	0.1699 (0.0000)	-0.1383 (0.0002)	0.4337 (0.0291)	1.0000							
AGE	0.0588 (0.1132)	0.0365 (0.3258)	0.1541 (0.0000)	-0.1474 (0.0001)	1.0000						
AGESQ	0.0429 (0.2477)	0.0345 (0.3530)	0.1456 (0.0001)	-0.1434 (0.0001)	0.9856 (0.0000)	1.0000					
GENDER	0.0289 (0.4366)	-0.0130 (0.7263)	-0.0019 (0.9589)	0.1325 (0.0003)	-0.1167 (0.0016)	-0.1139 (0.0021)	1.0000				
MARITAL	0.0713 (0.0547)	0.0348 (0.3485)	-0.0411 (0.2688)	0.0637 (0.0865)	-0.1104 (0.0029)	-0.1355 (0.0003)	0.5384 (0.0000)	1.0000			
HHSIZE	0.2424 (0.0000)	0.1715 (0.0000)	0.1821 (0.0000)	-0.0121 (0.7436)	0.3678 (0.0000)	0.3180 (0.000)	-0.0241 (0.5158)	0.1770 (0.000)	1.0000		
RESIDENCE	0.3222 (0.0000)	-0.1553 (0.000)	0.1337 (0.0003)	0.2117 (0.0000)	-0.0829 (0.0255)	-0.0767 (0.0389)	-0.0117 (0.753)	-0.1066 (0.0041)	-0.0751 (0.0431)	1.0000	
EMPLOYSEC	0.0255 (0.4919)	-0.1296 (0.0005)	0.0014 (0.9688)	0.0464 (0.2117)	-0.0817 (0.0278)	-0.0843 (0.0232)	0.1502 (0.0000)	0.0163 (0.6599)	-0.0554 (0.1356)	0.1637 (0.000)	1.0000

Age and age squared control variables are significantly associated, according to the pairwise correlation matrix in Table 5 ($r = 0.9856$; $p = 0.0000$). If both control variables are included in the model at the same time, a correlation coefficient level that is greater than 0.8 warns of the risk of severe multicollinearity. Age is kept in the final model but age squared is excluded by the study.

Table 6: Normality test results on “LOGCONSEXP”

Jarque-Bera test for normality	Estimated statistic value	p-value
Chi-square statistic	0.6179	0.7675
Null hypothesis: LOGCONSEXP is normally distributed.		

The results of the Jarque-Bera normality test are shown in Table 6, and the chi-square statistic and corresponding p-value are statistically insignificant. Therefore, the test results do not disprove the premise that "LOGCONSEXP" has a normal distribution.

Diversity of Income on Consumption Expenditure

The study uses two estimators in the panel regression with the dependent variable being quantitative in order to address the endogeneity concerns of the independent variables (income diversity) as a result of measurement errors: the two-stage least-squares within estimator for fixed effects and the two-stage least-squares random-effects estimator for random effects. Instrumental variable (IV) estimators are what both of these estimators are. In order to account for any heteroscedasticity as well as the within-panel serial correlation in the idiosyncratic error term, we also estimate the models using robust standard errors. The logarithm of household consumption spending has been employed as a measure of household wellbeing, and Table 7 displays the summary regression estimates for models 1 and 2.

Table 7: Summary of the regression estimates from the 2SLS Fixed effects IV and 2SLS random IV estimation: Dependent variable is: “LOGCONSEXP”

Independent Variables:	Model 1 2SLS Fixed-Effects IV regression (robust SEs in parentheses)	Model 2 2SLS Random- Effects IV regression (robust SEs in parentheses)
Logarithm of income diversification	0.044596*** (0.0023885)	0.044567*** (0.0030487)
Control Variables:		
Education level of household head	0.020965*** (0.0013274)	0.020284*** (0.0013756)
Age of household head (years)	0.007573*** (0.0007973)	0.007972*** (0.0008439)
Household Size	0.066105*** (0.0027557)	0.066184*** (0.0018116)
Gender of the household head ^(Ref=female) <i>Male headed households</i>	-0.189144*** (0.027181)	-0.2116315*** (0.0289119)
Marital status of the HH head ^(Ref=Married monogamously) <i>Married polygamously</i>	-0.049820*** (0.0211079)	-0.031007*** (0.0215304)

<i>Divorced / Separated</i>	-0.305840*** (0.012413)	-0.286799*** (0.0153445)	Table 7...
<i>Widow/Widower</i>	-0.328258*** (0.0927267)	-0.364366*** (0.1089528)	
<i>Never married</i>	-0.272722*** (0.0203014)	-0.2904761*** (0.0225242)	
Residence of the HH ^(Ref=Rural)			
<i>Urban</i>	0.182872*** (0.0562591)	0.186406*** (0.0517209)	
Region of the country ^(Ref=Central)			
<i>Eastern</i>	-0.439855*** (0.0345648)	-0.454574*** (0.0370236)	
<i>Northern</i>	-0.295362*** (0.0188643)	-0.310717*** (0.0227051)	
<i>Western</i>	-0.096532*** (0.0179553)	-0.1169261*** (0.0260403)	
Sector of employment of the main job of the HH head ^(Ref= Agriculture)			
<i>Industry</i>	-0.087186*** (0.0247887)	-0.085696*** (0.0274196)	
<i>Services</i>	0.126081*** (0.0179551)	0.135138*** (0.0224466)	
<i>Other</i>	-0.035238*** (0.1827915)	-0.041089*** (0.1709887)	
	Wald=8150.15*** Wald prob. > chi-sq.= 0.0000	Wald= 11.47*** Wald prob. > chi- sq.= 0.0032	
Hausman chi-sq. = 856.48*** (p=0.000) Ho: RE is appropriate			

*, **, *** represent significance at 10%, 5% and 1% levels respectively.

The computed Hausman chi-square statistic, when applied to the null hypothesis that the random effects estimator is the preferred model, overwhelmingly rejects the null hypothesis in favor of the alternative hypothesis at the 5% level of significance (Hausman chi-sq. = 856.48; p = 0.0000). The Hausman test results consequently indicate that a fixed-effects model is an appropriate fit for the individual-level effects for this investigation. As a result, the fixed effects model's estimates are the main consideration in the interpretation and discussion of the findings.

The regression estimates in Table 7 for models 1 and 2 both show that the estimate for income diversity is favorable and statistically significant at the 5% level. Results show that when consumer spending is used as a proxy for household welfare, a one percent increase in the household's varied incomes improves the household's welfare by about 4.5 percent while holding other parameters constant (coef. = 0.044596; SE= 0.0023885).

Table 7 indicates that Education level of household head (coef. = 0.020965; SE=0.0013274), age of household head (coef. = 0.007573; SE=0.0007973), household size (coef. = 0.066105; SE=0.0027557), residing in urban rather than in rural (coef. = 0.182872;

SE=0.0562591) and having main job in the services sector rather than in the agricultural sector (coef. = 0.126081; SE=0.0179551) all have a positive effect on welfare

Table 7 shows that having a household head with a higher education (coef. = 0.020965; SE=0.0013274), an older household head (coef. = 0.007573; SE=0.0007973), a larger household (coef. = 0.066105; SE=0.0027557), living in an urban rather than a rural area (coef. = 0.182872; SE=0.0562591), and having a main job in the services sector enhance the welfare of the household. Control variables including; households headed by men rather than women (coef. = -0.189144; SE=0.027181), households with polygamous families rather than monogamous families (coef. = -0.189144; SE=0.0211079), households with divorced or separated parents rather than monogamous parents (coef. = -0.305840; SE=0.012413), households with widowed or widowed members (coef. = -0.328; SE=0.0927267), households being in *never married* family rather than in monogamous family (coef. = -0.272722; SE=0.0203014) and household's main job being in the industrial sector rather than in the agricultural sector (coef.= -0.087186, SE = 0.0247887) had a negative effect on welfare.

Diversity of Income on Poverty Incidence

The panel probit model is used in the study for the panel model with a binary outcome variable (see Table 8). In order to address the endogeneity of the explanatory variable, the probit model has been evaluated as an instrumental variable model. The summary regression estimates for model 3's use of the household head's poverty status as a proxy for household welfare are displayed in Table 8.

Table 8: Regression estimates from the PROBIT estimation:

Dependent variable is: "POV" (POV=0 if HH is non-poor, 1 otherwise)

Independent Variables:	Model 3 IV-Probit regression: Coefficient are predicted probabilities (robust SEs in parentheses)
Logarithm of diversified income	-0.194482*** (0.0618165)
Control Variables:	
Education level of household head	-0.058188*** (0.020434)
Age of household head (years)	-0.003531 (0.0055482)
Household Size	0.144226*** (0.0316118)
Gender of the household head ^{Ref=female)} <i>Male headed households</i>	-0.0077896 (0.1881247)

Marital status of the HH head ^(Ref=Married monogamously)			Table 8...
	<i>Married polygamously</i>	-0.1279087 (0.1623867)	
	<i>Divorced / Separated</i>	-0.1316387 (0.290109)	
	<i>Widow/Widower</i>	0.301699 (0.2552421)	
	<i>Never married</i>	0.3455987 (0.2814941)	
Residence of the HH ^(Ref=Rural)			
	<i>Urban</i>	0.3153564** (0.1547534)	
Region of the country ^(Ref=Central)			
	<i>Eastern</i>	0.220177*** (0.3686561)	
	<i>Northern</i>	0.723080*** (0.2564647)	
	<i>Western</i>	0.315877* (0.184812)	
Sector of employment of the main job of the HH head ^(Ref= Agriculture)			
	<i>Industry</i>	0.1445626 (0.222526)	
	<i>Services</i>	-0.128083 (0.1494169)	
	<i>Other</i>	-0.756370 * (0.4232741)	
		Wald=290.09***	
		Wald prob. > chi-sq.= 0.0000	
		Wald test of no endogeneity:	
		Ho: No endogeneity	
		Prob > chi-sq. = 0.0000	
		Hausman test of exogeneity	
		Ho: Instrumented variables are	
		exogenous	
		Prob > chi-sq. = 0.0005	

* , ** , *** represent significance at 10%, 5% and 1% levels respectively.

A p-value of the chi-square statistic that is lower than the significance level of 5% is reported by the Wald exogeneity test results (Prob > chi-sq. = 0.0000). By virtue of this finding, the null hypothesis of no endogeneity is disproved at the 5% level of significance. As a result, the Wald exogeneity test implies that IV-probit is suitable for usage. This means that instruments were required for estimate, which again raises the possibility that the instrumented regressors were endogenous. The instrumented variables are exogenous, which is the null hypothesis of the Hausman's exogeneity test. The associated chi-square statistic has a smaller p-value less than the significance level of 5%, according to the summary estimates of this test in Table 8, which results in the rejection of the null hypothesis. The findings of the Hausman's test consequently imply that the instrumented variables are endogenous. The findings of the Hausman's test concur with the Wald exogeneity test, indicating that endogenous regressors

are present in the model being estimated and supporting the use of instruments in probit estimation.

The IV-probit model's summary estimates in Table 8 show that the income diversity coefficient is negative and statistically significant at the 5% level (coef. = -0.194482; SE= 0.0618165), suggesting that income diversity is a strong predictor of household wellbeing. In particular, estimations reveal that for every one percent increase in the household's diversified income, the estimated probability of being poor decreases by almost 19 percent. According to the summary estimates in Table 8, the only control variable with a negative and statistically significant coefficient at the 5-percent level is the education level of the household head (coef. = -0.058188; SE=0.020434). This finding demonstrates that, when all other factors are held constant, a one-year increase in the household head's education level reduces the anticipated risk of the head being impoverished by about 6%. According to the calculations, a home's welfare is greatly increased by the household head having a higher level of education.

Table 8's estimates show that household size (coef. = 0.144226; SE = 0.0316118), urban rather than rural residence (coef. = 0.3153564; SE= 0.1547534), households living in the Eastern region (coef. = 0.220177; SE = 0.3686561), and households living in the Northern region (coef. = 0.220177; SE = 0.3686561) are the control variables that significantly increase expected probability on household welfare. The estimates provided in Table 8 further demonstrate that the variables thought to have no influence on the predicted probability of household poverty are those with statistically insignificant coefficients at the 5% level. The household head's gender, his or her current marital status, the sector in which the primary work is held, and the fact that the household is located in the Western as opposed to the Central region are among the control variables.

According to estimation techniques, income diversity is a significant factor in determining the welfare of households. Additionally, the estimates from IV-fixed effects and IV-probit demonstrate that income diversity can improve household welfare. Having varied income and shifting income portfolios can improve the well-being of a household. This study used information on diverse household incomes, which is income that comes from sources other than formal agricultural revenue or formal non-farm income. The study's findings did, in fact, show that the predicted coefficient for the variable of diversified income was positive and statistically significant at the 5% level. The estimate on the diversified income variable was therefore found to be both theoretically valid and statistically dependable because it was compatible with the study's a priori expectations. This outcome resulted in the study's hypothesis being rejected (H0: income diversity has no significant influence on welfare among households in Uganda).

Instead, estimations from the regressions in this study showed that households' welfare is significantly improved by diversifying their income.

The portfolio diversification of household incomes, which again indicates society's structural transformation, is represented by the diversified household income. Indeed, some empirical research have shown that income diversity increases income, reduces poverty, and ultimately improves welfare (for instance Dzanku 2018; Loison 2019 and Maertens 2020, among others). Our study's estimates match quite nicely with these research' conclusions. The results of this analysis concur with those of Kakungulu *et al.* (2021), which used secondary data from the Uganda National Household surveys to demonstrate the disparate welfare effects of rural income portfolios in Eastern Uganda. Their research revealed that income diversification increased household income, decreased vulnerability, and decreased poverty.

The household head's educational attainment was expressed in full years of education. Higher education level of the household head was associated with higher welfare level of the household, according to a positive and statistically significant coefficient on the education variable in the IV-fixed effects model and a negative and statistically significant coefficient on the education variable in the IV-probit model, which was consistent with our theoretical a priori expectations. Higher education levels of household heads are positively associated with better employment, better welfare planning abilities, higher capabilities to provide for the household's basic needs, and better opportunities for sustainable support to the household, all of which increase the likelihood that the household will experience better welfare standards. This could explain why there is a positive relationship between the education level of household heads and the welfare of households.

Two of the three included categories had a substantial impact on household welfare, according to the categorical variable "region" that was included in the empirical model. This variable had four categories, with the category "central region" serving as a reference category. For instance, according to the estimations from this study, households that resided in the eastern and northern regions as opposed to the central region had a considerable decline in their welfare. This might be explained by the fact that the northern and eastern parts of Uganda have been shown to have greater rates of poverty. For instance, according to UBOS, regional variations in poverty levels between the Uganda national household survey periods of 2015/16 and 2019/20 revealed that the households with the highest levels of chronic poverty were located in the northern region (15.1%), followed by the eastern region (7.1%), and the lowest levels were found in the central region (0.4%) (UBOS, 2021). Additionally, the central area of Uganda is home to Kampala, the country's capital, where household heads have more access

to better work prospects, amenities, and opportunity to engage in productive economic activities.

CONCLUSION AND IMPLICATIONS

This study looked at the impact of household welfare on income diversity in Uganda using panel data from the four most recent waves of the Uganda National Panel surveys. In the study, household consumption spending and household poverty status were utilized as two proxies for measuring household welfare. The instrumental variables fixed effects (IV-FE), the instrumental variables random effects (IV-RE), and the instrumental variables were used as three estimators to calculate the empirical panel models. The recommended IV-FE and IV-logit regressions, however, have formed the foundation for the final model estimations.

Regression analysis revealed that diverse income has a significant impact on household welfare. Thus, it is possible for fluctuations in household welfare to be explained by variations in the household's varied income. Further findings showed that households' welfare might be significantly impacted positively or negatively depending on the education level of household heads as well as whether they resided in the central region or the eastern or northern regions.

The study's findings suggest that increasing household involvement can improve household welfare by increasing their income variety. This suggests that households who engage in economic activities that generate passive income may be more prosperous than those whose primary source of income is active economic activity. Additionally, a structural change away from households primarily engaged in primary economic activities like subsistence farming and toward secondary economic activity like manufacturing and services could improve family welfare.

LIMITATIONS AND FURTHER RESEARCH

Despite the contributions made by the current study, there are still gaps that must be filled by subsequent research. The research paradigm used was insufficient to fully explain the subjective nature of welfare. Future studies might think about adopting a pragmatic viewpoint. This might lead to using primary and secondary data for that purpose.

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