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Determinants of Livelihood Diversification Amongst Rural Households in Tanzania

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Abstract

The rural economic setup in developing countries is customarily dominated by primary production activities, mostly in the agriculture sector. While rural areas have been shown to experience high poverty rates, livelihood diversification is recommended as a measure to help reduce poverty. This is can be done by bolstering household income portfolio through supplementing nonfarm income, than solely depending income from agriculture activities. This paper observes determinants of rural livelihood diversification using the extended panel data of the Tanzania National Panel Survey. Two measures represent livelihood diversity in the study: number of livelihood activities household engage in, and household share income spread. The Panel Poisson and Tobit models are used to estimate the determinants of livelihood diversity. General factors influencing diversity include household wealth, experiences to shock (drought/floods, fall in prices of crops), and household demographic characters (number of working age individuals and age of household head). An analysis of the determinants by wealth status indicates less wealthy and wealthy households diversify the most with respect to assets they possess, while access to finances gives contrasting results depending on sources of finance. Policy implication relate to promoting policies that support sustained asset accumulation, increasing access to rural financing, and establishing safety net programs that minimize risks associated with shocks.

Keywords: livelihood diversification, number of income sources; share income spread

1. Background of the Study

Rural development is experienced when economic activity diversity is realized. The ILO (2017) estimated that at least 20 to 50 percent of the population in the developing world are employed in diverse, productive activities other than agriculture. This is contrary to the reality as in Sub-Saharan Africa (SSA), 60 percent of the population lived in rural areas by 2018; of which 83.5% of the population engaged in agriculture as their primary livelihood activity (United Nations, 2019). Such economic setup in rural developing world is linked to persisting poverty explained by different socio-economic and political dimensions (Addae-korankye, 2014; Azomahoua & Yitbarek, 2014; Bhattacharyya, 2016; David, 2015; Handley et al., 2009).

A policy initiative proposed as a measure to tackle poverty in rural areas is promoting economy diversification (Alobo Loison, 2015; Asfaw et al., 2019; Martin & Lorenzen, 2016). Start (2001) explains rural diversification as economic

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development of non-agricultural activities in rural areas; while Barghouti et al. (1990) state it as the act of increasing and sustaining rural households' income sources. Kelly and Ilbery (1995) relates it to farm diversification (moving from farming to adopting nonfarm agricultural activities), and rural industrialization (shift from primary production to investing in value addition of primary products).

Several studies explain determinants of livelihood diversification using different contexts. Some studies group the determinants into push and pull factors (Barrett et al., 2001; Basant, 1994; Davis & Bezemer, 2011; Ellis, 2008; Pearce & Davis, 2000; UNCTAD, 2015). Diverse literature link rural livelihood diversification to factors influencing the adoption of nonfarm livelihood activities (Aikaeli, 2010; Diao et al., 2018; Escobal, 2001; Ghimire et al., 2014; Bongole, 2016; Ranis & Stewart, 1993). Other studies observe the role of demographic and socio-economic characteristics in influencing livelihood diversification (Ellis, 2008; Ghimire et al., 2014; Katega & Lifuliro, 2014; Zerai & Gebreegziabher, 2011). Mixed results are observed when analysing wealth group diversifying the most. For instance, Abdulai and CroleRees (2001), and Block and Webb (2001) explain rural income diversification is high amongst richer compared to poor households in Mali and Ethiopia; while Schwarze and Zeller (2005) observes the opposite in Indonesia.

While most studies present findings by citing demographic and socio-economic determinants of diversification, some fail to observe the dynamics and degree of livelihood diversification through the measure of share income spread (Dedehouanou & McPeak, 2020; Dimova & Sen, 2010). In the Tanzanian context, to a great part this paper will add literature to the few existing empirical studies on rural livelihood diversification (see, e.g., Aikaeli, 2010; Dimova et al., 2021; Bongole, 2016; Katega & Lifuliro, 2014; Ponte & Seppala, 2001).

This paper utilizes panel data from the Tanzania National Panel Survey to explain determinants of rural livelihood diversification. Livelihood diversification is analysed at household level, and measured using two approaches: discrete measure (the count number of livelihood activities (farm and off-farm)), and continuous measure (index portraying household share income spread from activities they engage). We first present general factors influencing household's diversification. While literature gives mixed findings on household diversification per household wealth status (Dimova et al., 2021; Ponte & Seppala, 2001), this paper also aims to observe determinants of diversification of a particular wealth group.

This paper offers contribution to literature and policy in different ways. While most studies on the topic use cross-section data to explain causes of livelihood diversification, the use of panel data in this study provides evidence of livelihood diversity by tracking sampled rural household over a period of time, something other studies could not provide. Also, analysing what influences livelihood diversification per household wealth group can help formulate intervention policies that promote the engagement of different wealth groups to have diverse activities.

This paper documents evidence of livelihood diversity with households engaging in at least two different livelihood activities. Agriculture (farming and livestock keeping) still contributes the largest share of household income, but non-farm activities also contribute a significant share of household income. Also, once dissected into wealth groups, the wealthier a household gets, the wider the share income contribution from nonfarm activities.

Wealth accumulated by households significantly explains livelihood diversification by rural households. Environmental and market-related shocks positively influence household livelihood diversification, with demographic characteristics of household head explaining diversification differently.

The remainder of this paper is structured as follows. Section 2 presents the data, identifies variables used, and presents descriptive statistics of the variables. Section 3 explains the empirical methodology in estimating determinants of livelihood diversification and welfare effects of diversification. Section 4 discusses the empirical findings on diversification status, its determinants and determinants of livelihood diversification per wealth status, and effects of diversification on household welfare. Section 5 presents the conclusion and policy recommendations.

2. Data, Variables and Descriptive Statistics

2.1 Data

This paper utilizes Rounds 4 and 5 of the Tanzania National Panel Survey (TZNPS), a nationally representative survey as released by the Tanzania Bureau of Statistics (NBS). Round 4 (surveyed in 2014) and Round 5 (surveyed in 2019) are the latest survey rounds, with the survey having refresh samples after resampling was done following the 2012 national census. Round 4 sample combined a sub-sample of the original NPS sample (waves 1–3), and an entirely new sample to form an extended panel to be tracked in future studies (NBS, 2017). Round 5 of the survey followed the entire round 4 sample, and added split households and households sampled but not interviewed in round 4 (NBS, 2020).

A total of 899 households were successfully observed between the two survey rounds. However, the matched observations comprised of households in urban and rural locations; and as the objectives aimed to observe households in rural locations, retaining rural households only managed to attain 458 households per wave, making this paper have a balanced panel of 916 sampled households. The survey instruments collected information on a range of topics from agriculture production, non-farm income-generating activities, household demographic characteristics and other socio-economic characteristics. The study dataset represents information at household level as a unit of analysis, with information aggregated (on average basis) to represent household's units.

2.2 Variables

Variables used in analysis are categorized as outcome variables and explanatory variables.

2.2.1 Outcome Variables

Household livelihood diversification is presented using two approaches. First, is the number of household livelihood activities (NLA), which is a raw count of income-generating activities that abled working-age household members (15–64 years) engage in. Individuals are observed to represent a household if, over the past 30 days, as household members they involved themselves in any income-generating activities. Such an approach was also adopted by Babatunde and Qaim (2009), and Barrett et al. (2001).

The second approach applies household share income spread from different sources (farm and non-farm), and is presented using the Herfindahl-Hirschman Index (HHI). Rhoades (1993) explains HHI as a measure of concentration ranging from market or income (wealth) concentration. The HHI is constructed based on the sum of squares of income share from each household income source, guided by the following formula:

$$HHI = 1 - \sum_{i=1}^{n}(Y_i)^2 \quad \text{.....(1)}$$

Where i represents a range of income sources from 1 to n, Y is the share income from different sources (i.e., $Y_i = \frac{y_i}{y_t}$; y_i is the income from i'th activity; and y_t is the total household income from all income sources).

From equation (1), the subtraction of 1 from the share income squares is to gaze at the level of diversity, whether a household is solely dependent on one income source or not. The index ranges between 0 and 1, where the closer the index is to zero, the lower the share income spread; and the closer the index is to one, the higher the share income spread.

2.2.2 Explanatory Variables

Variables influencing livelihood diversification include *household wealth,*[1] where this paper uses of wealth index constructed using factor analysis as guided by the World Food Program (WFP) (Hjelm et al., 2017) instead of using a range of assets to represent household wealth; *household shocks* that make households vulnerable to unpredictable natural or economic shocks (floods, drought, rise in price of agro-inputs, fall in price of crop harvest, and rise in price of food produce); *household access to finance* such as remittances and loans from micro-finance and bank institutions; *household size/labour units* representing composition of individuals in a house (in terms of individuals of working age and of dependent age); and household *heads demographics characters* (age, sex, education, marital status). Community identifying factors are also significant influencers of livelihood

[1] As guided by WFP, Rural Household assets applied in creating a Wealth Index for households residing in rural areas are composed of: *quality of house dwelling* (have bricked wall, strong roofing, paved floor, private water source, toilet facility, reliable electricity); and *ownership of assets* such as home furniture (chairs, tables, beds), accessories (radio, mobile phones), immovable assets (house, land), livestock (poultry, livestock), productive equipment (hoes, spraying machines) and transport equipment (motorbike, bicycle).

diversification. But given the challenges in merging community characteristics with respective households in waves 4 and 5, this paper refrains from using community characteristics. A description of variables used and their expected relation to the dependent variable is presented in Table 1.

Table 1: Variable Description and Expected Relation to Dependent Variable

Variables	Variable Description	Expected Relation
Outcome Variable		
NLA (No. of Livelihood Activities)	A count of livelihood activities	
HHI (Herfindahl Hirschman Index)	An index of HH share Income	
Explanatory Variables		
1. Household Wealth	A score value of composite assets owned by HH	+
2. Household Shock		
Drought/Floods	Dummy for HH affected by floods (Yes=1)	+
Fall in Price of Crops	Dummy if HH affected by price fall (Yes=1)	+
Rise in Price of food	Dummy if HH affected by food price rise (Yes=1)	+
Rise in Price of Inputs	Dummy if HH affected by input price rise (Yes=1)	+
3. Access to Finance		
Loan from microfinance	Average loan from microfinance Instit (log of TZS)	+
Loan from banks	Average loan from banks (log of TZS)	+
Remittances received	Average received from relatives (log of TZS)	+
5. Household Size	Dissected as:	
	# of individuals of working age	+
	# of individuals of dependent age	-
6. Household Demographics		
Sex of HH Head	A dummy presenting sex (1= Male; 0=Female)	+
Age of HH Head	# of years of age of HH Head	-
Marital Status	Dummy of HH Head marriage (1=Married; 0=Single)	+
Education	# Years spent schooling HH Head spent schooling	+

Source: Author's Summary

2.2.3 Descriptive Statistics

Table 2 presents descriptive statistics of variables in the study. Households engage in at least 2 livelihood activities over the recall period, with the share income spread declining when compared to base year share income (20.3 percent in round 4, to 15.3 percent in round 5).

Across survey periods, the average household wealth increases when compared to base year period; signifying an increase in households' ability to accumulate assets likely to improve their dwelling and livelihood conditions. Households' experience to shocks varies depending on the causes. Climatic/weather related shocks increased over the survey period, while shocks from fall in crop prices declined over the survey period, possibly due to improved marketing conditions. Shock related to rise in food prices increases when compared to base year, while shocks experienced by households related to rise in input prices declines.

Table 2: Summary Statistics of Variables in the Study

Variables	Combined Wave N=916		Wave 4 N=458		Wave 5 N=458	
	Mean	***SD***	***Mean***	***SD***	***Mean***	***SD***
Outcome Variables						
NLA (Number of Livelihood Activities)	1.629	0.803	1.747	0.851	1.511	0.734
HHI (HH Share Income Spread)	0.178	0.225	0.203	0.229	0.153	0.218
Explanatory Variables						
1. Household Wealth (Wealth Index)	0.000	0.874	-0.000	0.919	0.000	0.828
2. Migrate (1=Yes)	0.498	0.500	0.493	0.501	0.502	0.501
3. Household Experience to Shock						
Drought/Floods (1=Yes)	0.212	0.409	0.183	0.387	0.240	0.428
Fall in Price of Crops (1=Yes)	0.239	0.427	0.273	0.446	0.205	0.404
Rise in Price of food (1=Yes)	0.364	0.481	0.358	0.480	0.369	0.483
Rise in Price of Inputs (1=Yes)	0.151	0.358	0.177	0.382	0.124	0.330
4. Access to Finance						
Loan from Banking Institutions (log of TZS)	1.146	3.394	1.425	3.779	0.866	2.936
Loan from Microfinance Institutions (log of TZS)	1.160	3.438	1.445	3.836	0.875	2.965
Remittance received (log of TZS)	3.356	5.281	3.203	5.169	3.509	5.392
5. Household Size						
Household Size	5.473	3.633	5.402	3.529	5.544	3.736
# of working age individuals	2.838	1.808	2.871	1.775	2.806	1.843
# of dependent age individuals	2.634	2.481	2.531	2.384	2.738	2.572
6. HH Head Demographic Characteristics						
Sex (1=Male; 0=Female)	0.739	0.439	0.755	0.430	0.723	0.448
Age	48.543	16.717	46.836	16.825	50.249	16.450
Marital Status (1=Married; 0=Single)	0.723	0.448	0.731	0.444	0.714	0.452
Education (# Years spent in School)	5.171	3.952	5.162	4.134	5.181	3.766

Source: Own Computations

Table 2 also shows a declining trend in access to finance by households is noticed over the survey period, with households accessing finances from microfinance and banking institutions. But a rise in remittances received by households increased over the survey period.

Demographically, a household comprises of an average of 5 household members (most being of dependent age) conforming to estimates by the Tanzania National Bureau of Statistics estimates (NBS, 2017); with households having an average of 3 members of working age. About three-quarters of households are male-headed, aged 49 years, married/living with partners, and have an average of 5 years of schooling (completing at least standard 4 of primary education).

3. Empirical Methodology

This paper aims to explain factors determining household livelihood diversification from relying on agriculture to other non-farm activities. The estimation follows a generic equation given as:

$$Div_{ht} = \alpha + \beta X_{ht} + \mu_h + \varepsilon_{ht} \ldots\ldots\ldots\ldots\ldots\ldots (2)$$

Where subscript h indicates household; t indicates time period (wave); Div is the outcome variable measuring livelihood diversification; X is a list of explanatory variables determining household diversification; β is the parameter estimate; μ_h is the unobserved fixed effect relating to household; and ε_{ht} is the idiosyncratic error term.

Estimating equation (2) using OLS would lead to biased and inconsistent estimates if explanatory variables were correlated with unobserved variables, thus violating the zero means error term assumption of the classical linear regression. Instead, the paper adopted the panel fixed effect regression by detecting changes in effects from within an observation, and eliminating risks of an observation being correlated with unobserved characteristics.

Although they all reside in rural areas, sampled households had different characteristics (e.g., number of household income sources, aggregate household income earnings, wealth, demographic characteristics, etc.). To reduce skewness between individuals, we transformed data with large numeric discrepancies through log-linearizing the variables.

For outcome variables of count nature (i.e., NIS), a panel Poisson fixed effect model is applied; while for outcome variables of bound continuous nature (i.e., HHI), a panel Tobit regression will estimate equation (2) where, since there are households that did not diversify (i.e., HHI=0), censoring of observations will be done from below by first estimating overall sampled households, and then estimating households that diversified (HHI>0).

4. Research Findings

4.1 Status and Patterns of Livelihood Diversification

The status of livelihood activities is done by observing the participation and share income spread. Four livelihood activities are identified: faming, livestock keeping, wage (formal or informal activities), and self-employment activities (processing, service, and trade). Table 3 presents the average participation in different livelihood activities over the survey period.

Table 3: Mean Participation in Livelihood Activities

Livelihood Activity	2015	2019
Farming	.445 (.023)	.365 (.023)
Livestock Keeping	.293 (.021)	.275 (.021)
Wage-employment	.551 (.023)	.362 (.022)
Self-employment	.402 (.023)	.365 (.023)

Note: Standard errors in parentheses

Source: Own Computation

There is a high participation of households in different activities observed in the 2015 survey round, with wage employment activities being practiced by at least 50 percent of the sampled households, and another significant participation in farming (45

percent) and self-employment (40 percent).[2] However, we can observe an overall fall in the participation in livelihood activities in the 2019 survey round when compared to 2015. This may be attributed to the ease of switch between livelihood activities that households engage in, a result of interdependence that exists between observed activities in rural area; but also the timing[3] of the survey might have observed household participation in different activity at the time.

Table 4 presents the average share income spread from activities in which households engage.

Table 4: Mean Share Income Spread by Livelihood Activities

Livelihood Activity	2015	2019
Farming	0.274 (.018)	0.286 (.02)
Livestock Keeping	0.126 (.013)	0.158 (.015)
Wage-employment	0.366 (.02)	0.303 (.021)
Self-employment	0.234 (.018)	0.253 (.019)

Note: Standard errors in parentheses

Source: Own Computation

Table 4 indicate that, in the 2015 survey round, household share income composition is divided between agriculture and nonfarm income activities; with share income from nonfarm activities comprising approximately 60 percent of total household income (with wage employment dominating share income composition, contributing at least 37 percent). However, the share income contribution in 2019 survey round adjusts with wage income share contribution declining when compared to 2015, with other livelihood activities observing an increase in share income contribution in the survey period. This is in line with findings on participation of households in diverse livelihoods as presented in Table 5.

Table 5: Household Mean Share Income by Household Wealth Status

Livelihood Activity	Less Wealthy	Mid-Wealthy	Wealthy
Farming	0.373 (.023)	0.338 (.024)	0.12 (.017)
Livestock Keeping	0.196 (.019)	0.138 (.017)	0.085 (.015)
Wage-employment	0.292 (.023)	0.293 (.024)	0.427 (.028)
Self-employment	0.139 (.017)	0.231 (.022)	0.367 (.026)

Note: Standard errors in parentheses

Source: Own Computation

Observing the share income earning earnings per wealth status,[4] Table 5 indicates wealthier household share income is comprised more of income from

[2] The averages do not sum up to 1 (100%) as participation in diverse activities may be inclusive of other activities at the time. Table 3 shows that households engaged in at least two different livelihood practices at the time of survey.

[3] While round 4 was conducted between Oct. 2014–Oct. 2015, round 5 was between Jan. 2019–Jan. 2020, hence this different timing led to the observation of different activities.

[4] Wealth status is represented using the tertile (less wealthy, mid-wealthy and wealthy) state identified in round 4 survey.

nonfarm activities (approximately 80 percent of their income comes from wage and self-employment activities), while less and mid-wealthy households' share income is largely composed of income from farming activities (farming and livestock keeping contribute at least 40 percent of their share income). This possibly indicates the reliance of less-wealthy households in agriculture activities in earning income as they may possess assets largely linked to farming, while wealthy households use assets they amass to conduct and reap benefits by engaging in nonfarm livelihood activities.

4.2 Factors Influencing Livelihood Diversification

Table 6 presents the marginal effects of factors influencing diversification. Column (1) presents marginal effects of the number of livelihood activities estimated using the Poisson model, while column (2) presents marginal effects for the share income spread estimated using the Tobit model.

Table 6: Marginal Effect of Factors Influencing of Livelihood Diversity

VARIABLES	(1) Poisson Model NLA	(2) Tobit Model HHI
Household Wealth	0.135***	0.121***
	(0.0189)	(0.0211)
Drought/Floods (1=Yes)	0.0928**	0.0745**
	(0.0384)	(0.0377)
Fall in Price of Crops (1=Yes)	0.133***	0.115***
	(0.0443)	(0.0393)
Rise in Price of food (1=Yes)	-0.0105	-0.0248
	(0.0342)	(0.0350)
Rise in Price of Inputs (1=Yes)	-0.000879	0.000362
	(0.0495)	(0.0482)
Loan from Microfinance Institutions (log of TZS)	-0.101	-0.0835
	(0.275)	(0.225)
Loan from Banking Institutions (log of TZS)	0.116	0.0946
	(0.279)	(0.228)
Remittance received (log of TZS)	-0.00611*	-0.00732**
	(0.00313)	(0.00315)
# Years spent in School	-0.00520	-0.00724
	(0.00383)	(0.00446)
# of Working Age Individuals	0.0276***	0.0336***
	(0.00957)	(0.00989)
# of Dependent Age individuals	0.00422	-0.00438
	(0.00690)	(0.00683)
Sex (1=Male; 0=Female)	0.0150	0.0170
	(0.0535)	(0.0605)
Age of HH Head	-0.00401***	-0.00385***
	(0.000938)	(0.00110)
Marital Status (1=Married; 0=Single)	0.00892	-0.00384
	(0.0523)	(0.0582)
Observations	916	916

Note: Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

Source: Own Computation

Accumulated wealth significantly explains livelihood diversification as households allocate their assets into productive activities, prompting the addition of diverse livelihood activities in column (1), and the rise in share income spread in column (2). This conforms to the findings by Neudert et al. (2015) and Demurger et al. (2010) who find the wealth of a household influences its participation in diverse livelihood activities.

Environmental shocks are positive and significant in influencing livelihood activities a household engages in column (1). Households experiencing drought/ flooding conditions significantly increase the probability, adding more livelihood activities compared to their counterparts; while households experiencing drought/floods in column (2) increase the probability of raising their share income compared to their counterparts. This is associated with households adapting or raising their share income composition as means to sustain the purchase of food to cover loss from drought/floods. This supports the study finding by Khan (2019), Cunguara et al. (2011), Pandey et al. (2007), and Reardon et al. (2006); who all argue that unpredictable weather conditions induce households to search for alternate livelihood activities, rather than relying on agriculture in case output or income are affected by weather shocks that reduces their harvest capacity.

Risks associated with fall in prices of crop harvest increases the probability of affected households engaging in more livelihood activities than their counterparts in column (1), and increases the probability of households spreading their share income more than their counterparts in column (2). This is attributed to households supplementing income loss from farming after failing to realize profit margins due to sale at lower prices.

Contrary to expectations, financing sources from microfinance institutions or commercial banks are not significant in influencing livelihood diversification. Moreover, source of finance from remittances is significant, but negatively related with livelihood diversification, implying for all money households receive as remittance, they invest less in alternate livelihood activities. This is possibly associated with households using remittances to meet domestic needs rather than investing in diverse livelihood activities: remittance income mostly serves to meet household consumption and domestic needs. This is contrary to findings by Briones (2018), Kerime and Degefa (2016), Snyder and Chern (2009); who all note positive influences of remittances in establishing new enterprises in developing countries.

Regarding household demographic characters, the larger a household size is comprised with individuals of working age, the more significant it is in adding a household livelihood activity and raising the spread of household share income. Also, as household heads become older, the number of livelihood activities and the spread of household share income declines signifying since their contribution to households share income becomes limited as they grow older.

4.3 Factors Influencing Livelihood Diversification by Wealth Status of Household

This paper determines household livelihood diversification when analysed by wealth status. Household wealth in this paper is described as the composition of assets possessed by a household that can sustain livelihood or facilitate production (subsistence or for trade).

Assets are broadly defined as possessions that generate income or livelihoods (Brockington et al., 2019; Carter & Barrett, 2006). As assets can be grouped into productive and non-productive categories, the demarcation in distinguishing a productive from non-productive assets in rural areas is a challenge due to the ability of households to substitute non-productive assets into income-generating assets (Brockington et al., 2019). As a result, this paper considers household wealth as a composition of productive and non-productive assets used by households to sustain their livelihoods. Wealth is clustered into tertiles to identify households into less-, mid- and wealthy households.

Given the survey period, the study uses a static wealth status to analyse the outcome, assuming they maintain their wealth condition during the survey season. The study uses baseline season (round 4) as the overall status of household wealth condition to overcome the effect of households changing their wealth status.

Similar estimation techniques used in section 4.2 are applied with Tables 7, which presents the marginal effect estimation on a number of livelihood activities estimated using the Poisson model. The estimation controlled for shock from rise in price of food and the number of individuals of dependent age for wealthy households, as their incorporation causes the model estimation not to converge.[5]

The wealth households possess significantly increases the number of livelihood activities of the less wealthy and wealthy households in columns (1) and (3), respectively, as households use valuable assets possessed into production activities, hence increasing the number of livelihood activities in which they engage.

Experience to shocks affects households differently. Mid-wealthy and wealthy households experiencing drought/floods significantly increases their probability of engaging in more livelihood activities compared to their counterpart. Shocks from fall in prices of crop harvest significantly increase the probability of households having more livelihood activities for the less and mid-wealthy households, as compared to households not affected by price shock of crop harvest.

Access to finance gives contrasting outcomes to factors influencing the number of livelihood activities households engage in. Loans from microfinance institution significantly influences the number of livelihood activities of the less wealthy

[5] Model estimation failing to converge is associated with having explanatory variables that are correlated, hence it is recommended to include such variables in the estimation

households in column (1) as they are easily and quickly accessible for household to finance and establish diverse productive activities, while such source of finance significantly reduces the number of livelihood activities of mid-wealthy and wealthy households in column (2) and (3). This is possibly associated with small loans provided by microfinance institutions not being able to adequately finance investment in the establishment of more diverse livelihood activities.

Table 7: Poisson Marginal Effect of Determinants of Number of Livelihood Activities by Wealth

Variables	(1) Less Wealthy	(2) Mid Wealthy	(3) Wealthy
Household Wealth	0.112**	0.0149	0.120**
	(0.0565)	(0.121)	(0.0672)
Drought/Floods (1=Yes)	0.0573	0.134*	0.102*
	(0.0625)	(0.0788)	(0.0600)
Fall in Price of Crops (1=Yes)	0.136*	0.224***	0.0704
	(0.0786)	(0.0794)	(0.0683)
Rise in Price of food (1=Yes)	-0.0506	0.00819	
	(0.0564)	(0.0582)	
Rise in Price of Inputs (1=Yes)	-0.0545	-0.0418	0.0503
	(0.0889)	(0.0991)	(0.0700)
Loan from Microfinance Institutions (log of TZS)	0.534*	-0.788*	-0.678*
	(0.309)	(0.439)	(0.378)
Loan from Banking Institutions (log of TZS)	-0.531*	0.801*	0.705*
	(0.314)	(0.446)	(0.382)
Remittance received (log of TZS)	-0.00636	-0.00337	-0.00692
	(0.00482)	(0.00610)	(0.00482)
# Years spent in School	0.00482	-0.0103	-0.00994
	(0.00672)	(0.00711)	(0.00654)
# of Working Age Individuals	0.0375**	0.0158	0.0376**
	(0.0168)	(0.0151)	(0.0150)
# of Dependent Age Individuals	-0.00119	0.00393	
	(0.0162)	(0.0179)	
Sex (1=Male; 0=Female)	0.108	-0.0285	-0.0840
	(0.0859)	(0.0729)	(0.156)
Age of HH Head	-0.00195	-0.00333**	-0.00636***
	(0.00147)	(0.00151)	(0.00193)
Marital Status (1=Married; 0=Single)	-0.0124	0.0341	0.0823
	(0.0834)	(0.0756)	(0.148)
Observations	289	298	329

Notes: Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1
Source: Own Computations

However, an inverse relation in financing is observed when accessing loans from formal banking institutions as it significantly reduces engagement of the less wealthy households in column (1) in diverse livelihood activities. This is associated with the high cost in accessing and managing debt during servicing period, unlike the case with mid-wealthy and wealthy households in columns (2) and (3), respectively, who significantly increase the number of activities by accessing loans from banks. These households can access large loans that can manage to finance the establishment of livelihood activities and the management of the loans acquired.

Household size comprised of a large number of individuals of working age significantly influences the number of livelihood activities of the less wealthy and wealthy households in columns (1) and (3), respectively; indicating the contribution of members either individually or collectively in engaging in different activities. With age, the number of livelihood activities of the mid-wealthy and wealthy households in columns (2) and (3), respectively, decline as a result of the decline in the ability of one to actively engage in the management of diverse activities.

Table 8 presents the marginal effect of factors influencing household share income spread per wealth, and shows that the determinants do not significantly differ from those influencing the number of livelihood activities. Wealth accumulated significantly spreads household share income of the less wealthy in column (1), and wealthy households in column (3); with the effect having greater impact on the less wealthy.

Table 8: Tobit Marginal Effect of Determinants of Share Income Spread by Wealth Status

Variables	(1) Less Wealthy	(2) Mid Wealthy	(3) Wealthy
Household Wealth	0.146**	-0.00853	0.112**
	(0.0735)	(0.0837)	(0.0516)
Drought/Floods (1=Yes)	0.0890	0.106	0.0557
	(0.0842)	(0.0813)	(0.0479)
Fall in Price of Crops (1=Yes)	0.146	0.173**	0.0466
	(0.0951)	(0.0778)	(0.0506)
Rise in Price of food (1=Yes)	-0.0830	-0.0231	0.00438
	(0.0797)	(0.0706)	(0.0471)
Rise in Price of Inputs (1=Yes)	-0.0226	-0.0282	0.0464
	(0.120)	(0.0989)	(0.0597)
Loan from Microfinance Institutions (log of TZS)	0.331	-0.687	-0.384
	(0.378)	(0.707)	(0.329)
Loan from Banking Institutions (log of TZS)	-0.326	0.700	0.401
	(0.385)	(0.712)	(0.333)
Remittance received (log of TZS)	-0.00984	-0.00742	-0.00521
	(0.00710)	(0.00639)	(0.00411)
# Years spent in School	0.00282	-0.0147	-0.0101*
	(0.0106)	(0.00904)	(0.00609)
# of Working Age Individuals	0.0644**	0.0289	0.0291**
	(0.0250)	(0.0197)	(0.0126)
# of Dependent Age Individuals	-0.0135	-0.00280	-0.000937
	(0.0219)	(0.0167)	(0.00735)
Sex (1=Male; 0=Female)	0.137	-0.0280	-0.102
	(0.116)	(0.106)	(0.117)
Age of HH Head	-0.00228	-0.00336*	-0.00515***
	(0.00232)	(0.00204)	(0.00174)
Marital Status (1=Married; 0=Single)	-0.0162	-0.00267	0.0629
	(0.110)	(0.103)	(0.113)
Observations	306	305	305

Notes: Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

Source: Own Computations

Likewise, risks associated with a fall in prices of crop harvest raises the probability of household share income spread of the mid-wealthy households to raise more than their counterparts in column (2), with such a decline in prices inducing households to invest more time in alternate livelihood activities; thus earning more from nonfarm activities when prices of food produce decline.

Demographically, the addition of a household member of working age significantly raises the spread of household share income of the less-wealthy and wealthy households in columns (1) and (3), respectively; indicating their ability to reap more income from diverse activities household members engage in. On the other hand, as household head ages, the share income spread of household declines.

5. Conclusion and Policy Implication

Rural economy diversification is a phenomenon that has increasingly been experienced with the level of economic development. Studies show that promoting rural livelihood diversification helps address socio-economic struggles related to poverty, hunger, and unemployment (D.Start, 2001; ILO, 2017; Proctor, 2014). Livelihood diversification entails shifting the dependence of households/ individual's on a single to diverse livelihood activities. Such attempts are observed using the number of livelihood activities individual/household engage in, or the share income contribution that individuals/households earns from different incomes sources.

The paper examined factors influencing livelihood diversification by rural households. Two indicators represent livelihood diversity measures, the number of livelihood activities from which household earns income (NLA), and the share income contribution from different income sources measured using the Herfindahl Hirschman Index (HHI). This paper notices a decline in engagement and share income spread from diverse livelihood activities over the survey period. An analysis of diversification attempts per household wealth status indicates that wealthy households accrue more share income from nonfarm activities (wage and self-employment activities), while less- and mid-wealthy households reap large income share from agriculture activities (farming and livestock keeping).

Also, the paper observes that household wealth influence livelihood diversification over time, with the effect experienced more amongst less wealthy households. In addition, shocks experienced, access to loans and demographic characteristics differently influence households' livelihood diversification measures. When the determinants are analysed by household wealth status, contrasting results are observed; with wealth, environmental shocks and fall in harvest prices significantly influencing livelihood diversity.

The policy implications relate to the promotion of wealth-creation policies (increasing supply and accessibility of productive assets in rural areas, offering equipment and machineries on credit, etc.), which will induce households possess valuable and productive assets allocated for production purposes in diverse

activities. Creating resilience amongst households to overcome environmental and economic shocks will induce households to minimize loss of income from dependent livelihood activities, and help boot household share income growth arising from participation in diverse livelihood activities.

Moreover, policies focusing on extending financial access to rural households should consider household wealth status, as while less wealthy households rely on microfinance institutions for financing, wealthy households depend much on commercial banks.

References

Abdulai, A. & CroleRees, A. (2001). Determinants of income diversification amongst rural households in Southern Mali. *Food Policy*. https: //doi.org/10.1016/S0306-9192(01)00013–6.

Addae-korankye, A. (2014). Causes of poverty in Africa : A review of literature. *American International Journal of Social Science*.

Aikaeli, J. (2010). Determinants of rural income in Tanzania: An empirical approach. In *Research Report* 10/4, Dar es Salaam, REPOA.

Alobo Loison, S. (2015). Rural livelihood diversification in Sub-Saharan Africa: A literature review. *Journal of Development Studies*. https: //doi.org/10.1080/ 00220388. 2015.1046445.

Asfaw, S., Scognamillo, A., Caprera, G. Di, Sitko, N. & Ignaciuk, A. (2019). Heterogeneous impact of livelihood diversification on household welfare: Cross-country evidence from Sub-Saharan Africa. *World Development*. https: //doi.org/10.1016/j.worlddev.2019.01.017.

Azomahoua, T. & Yitbarek, E. A. (2014). Poverty persistence and informal risk management : Micro evidence from urban Ethiopia. *Maastricht: Maastricht Economic and Social Research Institute on Innovation and Technology (UNU-MERIT) & Maastricht Graduate School of Governance (MGSoG). (20*15–006.

Babatunde, R. O. & Qaim, M. (2009). Patterns of income diversification in rural Nigeria: Determinants and impacts. *Quarterly Journal of International Agriculture*.

Barghouti, S., Timmer, C. & Siegel, P. (1990). *Rural diversification : Lessons from East Asia* (Issue World Bank technical paper; WTP 117). The World Bank. Http: //documents. world bank. org/curated/en/481341468772148088/Rural-diversification-lessons-from-East-Asia.

Barrett, C. B., Reardon, T. & Webb, P. (2001). Nonfarm income diversification and household livelihood strategies in rural Africa: Concepts, dynamics, and policy implications. *Food Policy*. https: //doi.org/10.1016/S0306–9192(01)00014–8.

Basant, R. (1994). Economic diversification in rural areas: Review of processes with special reference to Gujarat. *Economic and Political Weekly*, 29(39): A107–A116.

Bhattacharyya, S. (2016). The historical origins of poverty in developing countries. *The Oxford Handbook of the Social Science of Poverty*. https: //doi.org/10.1093/ oxfordhb/ 9780199914050.013.13.

Block, S. & Webb, P. (2001). The dynamics of livelihood diversification in post-famine Ethiopia. *Food Policy,* 26: 333–350. doi: 10.1016/S0306–9192(01)00015–XThe dynamics of livelihood diversification in post-famine Ethiopia.

Bongole, A. J. (2016). Determinants of farm and non-farm activities as sources of income amongst rural households: Evidence from Kahama District in Tanzania.

Briones, R. M. (2018). Transformation and diversification of the rural economy in Asia. In *IFAD Research Series*.

Brockington, D., Howland, O., Loiske, V.-M., Mnzava, M. & Noe, C. (2019). Assets and poverty dynamics: The methodological challenges of constructing longitudinal surveys in Tanzania. In: *Tanzanian Development*. https: //doi.org/10.1017/9781787444294.005.

Carter, M. R. & Barrett, C. B. (2006). The economics of poverty traps and persistent poverty: An asset-based approach. *Journal of Development Studies*. https: //doi.org/10.1080/ 00220 380500405261.

Cunguara, B., Langyintuo, A. & Darnhofer, I. (2011). The role of nonfarm income in coping with the effects of drought in southern Mozambique. *Agricultural Economics*. https: // doi.org/10.1111/j.1574–0862.2011.00542.x.

D. Start. (2001). *Rural Diversification: What hope for the poor?* (ODI (ed.)). ODI Working and Discussion Papers. https: //www.odi.org/sites/odi.org.uk/files/odi-assets/publications-opinion-files/5900.pdf.

David, S. (2015). Overview: Rural poverty in developing countries: Issues, policies and challenges. *IFAD Investing in Rural People*, 1–7.

Davis, J. R. & Bezemer, D. J. J. (2011). The development of the rural non-farm economy in developing countries and transition economies: Key emerging and conceptual issues. *SSRN Electronic Journal*. https: //doi.org/10.2139/ssrn.693061.

Dedehouanou, S. F. A. & McPeak, J. (2020). Diversify more or less? Household income generation strategies and food security in rural Nigeria. *Journal of Development Studies*. https: //doi.org/10.1080/00220388.2019.1585814.

Démurger, S., Fournier, M. & Yang, W. (2010). Rural households' decisions towards income diversification: Evidence from a township in northern China. *China Economic Review*. https: //doi.org/10.1016/j.chieco.2010.05.007.

Diao, X., Magalhaes, E. & Mcmillan, M. (2018). Understanding the role of rural non-farm enterprises in africa's economic transformation: Evidence from Tanzania. *Journal of Development Studies*. https: //doi.org/10.1080/00220388.2018.1430766.

Dimova, R., Halvorsen, S. K., Nyyssölä, M. & Sen, K. (2021). Long-run rural livelihood diversification in Kagera, Tanzania. 2021. https: //doi.org/https: //doi.org/10.35188/UNU-WIDER/2021/943–3.

Dimova, R. & Sen, K. (2010). Is household income diversification a means of survival or a means of accumulation? Panel data evidence from Tanzania. *BWPI Working Paper*.

Ellis, F. (2008). The determinants of rural livelihood diversification in developing countries. *Journal of Agricultural Economics*, 51(2): 289–302. https: //doi.org/10.1111/j.1477–9552.2000.tb01229.x.

Escobal, J. (2001). The determinants of nonfarm income diversification in rural Peru. *World Development*. https: //doi.org/10.1016/S0305–750X(00)00104–2.

Ghimire, R., Huang, W.-C. & Shrestha, R. B. (2014). Factors affecting nonfarm income diversification among rural farm households in Central Nepal. In *International Journal of Agricultural Management and Development (IJAMAD),* 4, Issue 2.

Handley, G., Higgins, K., Sharma, B. & Cammack, D. (2009). Poverty and poverty reduction in Sub-Saharan Africa: An overview of the issues. *ODI Working Paper*.

Hjelm, L., Mathiassen, A., Miller, D. & Wadhwa, A. (2017). Creation of a wealth index. *WFP - VAM Guidance Paper*, 1–26. https: //docs.wfp.org/api/documents/WFP-0000022418/ download/.

ILO. (2017). *Economic diversification of the rural economy*. 12. https: //www.ilo.org/ wcmsp5/ groups/public/---ed_emp/---emp_policy/documents/publication/wcms_437176.pdf.

Katega, I. & Lifuliro, C. (2014). Rural non-farm activities and poverty alleviation in Sub-Saharan Africa. In *REPOA*.

Kelly, C. E. & Ilbery, B. W. (1995). Defining and examining rural diversification: a framework for analysis. *Tijdschrift Voor Economische En Sociale Geografie*. https: //doi.org/10.1111/j.1467–9663.1995.tb01356.x.

Kerime, M. & Degefa, T. (2016). Contribution of remittance to the improvement of rural households livelihoods: The case of Tehuledere Woreda, Northeastern Ethiopia. *Journal of Development and Agricultural Economics*. https: //doi.org/ 10.5897/ jdae2016–0738.

Khan, W., Jamshed, M., Fatima, S. & Dhamija, A. (2019). Determinants of income diversification of farm households' in Uttar Pradesh, India. *Forum for Social Economics*. https: //doi.org/10.1080/07360932.2019.1666728.

Martin, S. M. & Lorenzen, K. (2016). livelihood diversification in rural Laos. *World Development*. https: //doi.org/10.1016/j.worlddev.2016.01.018.

NBS. (2017). *National Panel Survey Wave* 4*,* 2014 – 2015. *February*, 1–104. https: //www. nbs.go.tz/nbs/takwimu/nps/NPS_Wave_4_2017.pdf.

NBS. (2020). *Basic information document - national panel survey 2019/2020.*

Neudert, R., Goetter, J. F., Andriamparany, J. N. & Rakotoarisoa, M. (2015). Income diversification, wealth, education and well-being in rural south-western Madagascar: Results from the Mahafaly region. *Development Southern Africa*. https: //doi.org/10.1080/ 0376835X.2015.1063982.

Pandey, S., Bhandari, H., Ding, S., Prapertchob, P., Sharan, R., Naik, D., Taunk, S. K. & Sastri, A. (2007). Coping with drought in rice farming in Asia: Insights from a cross-country comparative study. *Agricultural Economics*. https: //doi.org/10.1111/j.1574–0862.2007.00246.x.

Pearce, D. & Davis, J. (2000). The role of the non-farm rural sector in the reconstruction of the Balkans. *Most*. https: //doi.org/10.1023/A: 1026720424725.

Ponte, S. & Seppala: (2001). Diversification and accumulation in rural Tanzania: Anthropological perspectives on village economics. *Africa: Journal of the International African Institute*. https: //doi.org/10.2307/1161538.

Proctor, F. J. (2014). *Rural economic diversification in sub-Saharan Africa*. September, 24. http: //pubs.iied.org/14632IIED.

Ranis, G. & Stewart, F. (1993). Rural nonagricultural activities in development. Theory and application. *Journal of Development Economics*, 40(1): 75–101. https: //doi.org/ 10.1016/ 0304–3878(93)90105–V.

Reardon, T., Berdegué, J., Barrett, C. B. & Stamoulis, K. (2006). Household income diversification into rural nonfarm activities. In *Transforming the Rural Nonfarm Economy*.

Rhoades, S. A. (1993). *The Herfindahl-Hirschman Index. March*, 188–189.

Schwarze, S. & Zeller, M. (2005). Income diversification of rural households in Central Sulawesi, Indonesia. *Quarterly Journal of International Agriculture*.

Snyder, S. & Chern, W. S. (2009). The impact of remittance income on rural households in China. *China Agricultural Economic Review*. https: //doi.org/10.1108/ 17561370910915357.

UNCTAD. (2015). *Economic diversification, non-farm activities and rural transformation*. 77–111. https: //doi.org/10.18356/832cc4f9–en.

United Nations. (2019). World urbanization prospects: The 2018 revision. In P. D. Department of Economic and Social Affairs (Ed.). *World Urbanization Prospects: The* 2018 *Revision*. https: //doi.org/10.18356/b9e995fe-en.

Zerai, B. & Gebreegziabher, Z. (2011). Effect of nonfarm income on household food security in Eastern Tigrai, Ethiopia: An entitlement approach. *Food Science and Quality Management*, 1, 22.