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Determinants of Rural Household Food Consumption Expenditure in Lesotho: Impact of Off-farm Income

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Abstract: Most smallholder farmers in Sub-Saharan African need to diversify into nonfarm/off-farm income generating activities in order to ensure household food security through optimum consumption expenditure. The aim of this study was to investigate the effect of off-farm income on rural household food consumption expenditure in Lesotho, using secondary data from a comprehensive and representative Household Budget Survey of 2017. The survey design for data collection adopted a two stage stratified sampling procedure. The analysis used two econometric models. The OLS regressions were employed to identify important determinants of household food consumption expenditure and Instrumental Variable (IV) approach was employed to account for endogeneity issues. The results revealed a consistent positive and significant effect of off-farm income on household food consumption expenditure across all models. Household size, transfers and remittances were found to increase household food consumption expenditure significantly and positively. Government is advised to encourage and improve conditions under which rural smallholder farmers could participate in off-farm income generating activities.

Keywords: *Off-farm, rural households, food consumption expenditure, Lesotho.*

1. Introduction

Lesotho is a small landlocked mountainous country that is completely bordered by the Republic of South Africa. Three-quarters of the land is made up of rocky highlands and the remaining one-quarter are lowlands which are home to 55% of the population of about 2.2 million people. Only about 10% of the country's total land area is classified as arable, hence the agricultural sector accounts for about 17% of the GDP (National Institute of Statistics, 2015). In Lesotho, agriculture has been on the decline in recent years, despite being the major source of the rural people's livelihood. In a normal year the country produces 30% of the total food requirements and 60% of the annual cereal requirement has to be imported (World Bank, 2018). Therefore, in the face of the declining contribution of farming income to household welfare, most rural households engage in a variety of non-farm income generating activities to ensure, primarily, household food security. In the past, the major source of off-farm income has been remittances from mine workers in South Africa (Plath et al., 1987). Such remittances were expended on agricultural inputs, household assets and housing. However, remittances have declined steadily over the past years and mine workers repatriated to engage in farm and non-farm activities. So, the declining cereal and animal production, loss of non-farm income from remittances and reduced employment have reduced the purchasing power of the rural residents.

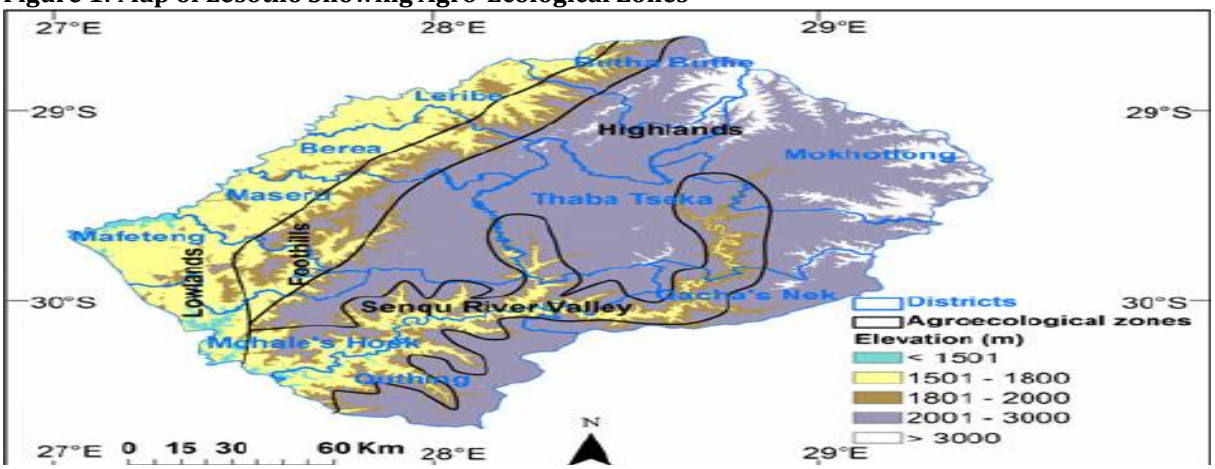
This has been further exacerbated by higher prices of imported food and agricultural inputs which have increased poverty and household food insecurity. In Sub-Saharan Africa, very few rural households derive their entire income from agriculture. Most of them diversify into non-farm livelihoods as a survival strategy in order to maintain improved household welfare (Ellis, 1999). Ellis (1998, 1999, 2000) posits that income generated from off-farm activities play a major role in poverty alleviation as it smooth rural household income and consequently improves food security among rural dwellers. Recent studies have focused on the increasing engagement of rural dwellers in non-farm activities. In Sub-Saharan Africa, a range of 30% - 50% reliance on non-farm income sources is common, but it could attain 80% - 90% in South Africa (OECD/FAO, 2018). Babatunde & Qaim (2010) found that in Nigeria, 65% of smallholder farmers' households participated in off-farm activities realizing at least 50% of their total income therefrom. Similarly, Idowu et al. (2011) found that off-farm income accounted for 67.1% of total rural household income in some parts of Nigeria. Mishra et al. (2015) found that off-farm business income contributes 30% of total household income in rural Bangladesh. Furthermore, they noted that rural dwellers engage in off-farm business in order to stabilize their income and ensure food security.

In Ghana, the importance of non-farm/off-farm income on household food expenditure has been highlighted by Owusu et al. (2011) and Osarfo et al. (2016). Seng (2015) confirmed through a study in Cambodia that income from off-farm activities increases household food consumption. Few studies have highlighted the role of non-farm sector in Lesotho but none has specifically studied the effect of off-farm income on food consumption expenditure (Rantšo, 2016; Rantšo & Seboka, 2019). Such a specific study is germane, more so with the declining income from agriculture and rising cost of household food consumption. This study therefore investigates the effects of off-farm income on rural household food consumption expenditure in Lesotho. The main off-farm income activities in Lesotho include casual labor on others' farms, sales of fuel wood, hay, cow dung, chicken manure, among others. Our results contribute to the literature that documents the effect of off-farm income on household food expenditure of rural farming households. A better understanding of this relationship can help inform the discussion on appropriate policies that will further improve rural household welfare in Lesotho.

2. Methodology

Data Source and Collection: Data for this study is obtained from the 2017 Household Budget Survey in Lesotho. It is a nation-wide survey conducted by Bureau of Statistics (BOS) in Lesotho. The purpose of the survey was to enrich the System of National Accounts (SNA) in terms of household consumption expenditure and income. The data was collected through multi-purpose questionnaires encompassing aspects on demography, education, economic activities, agriculture, health, food expenditure and consumption. The data is comprehensive and covers the 4 diverse ecological zones in Lesotho (Lowlands, Foothills, Mountains and Senqu River Valley. See Figure 1). According to Household Budget Survey (2017) Report, a two stage stratified sampling procedure was employed in the survey design. The enumerated areas (EAs) in the districts made up the primary sampling units (PSUs) while households within the districts comprised the secondary sampling units (SSUs). Districts were also subdivided in two strata constituted of urban and rural residences. A cluster of two or more EAs formed a PSU in rural areas whereas in urban areas, a single segment of an EA was used as a PSU. A list of households was compiled for each village within the study area. A random sampling technique was used to select both male and female-headed households from which data were collected. Therefore, the study uses secondary data for 2825 rural households in Lesotho.

Figure 1: Map of Lesotho Showing Agro-Ecological Zones



Source: National Institute of Statistics (2015)

Empirical Model and Variables: There is an established positive correlation between off-farm participation and household food consumption expenditure. This study used the Sustainable Livelihood Framework (SLF) for the empirical model and variables selection in the regression analysis. Based on the framework, the following empirical model was employed to estimate the effect of off-farm participation on household food consumption expenditure:

$$hh\exp_i = f(offinc, hhgen, hhage, hhedu, hhsize, child5, child14, zone, hhtrans) \ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Where $hh\exp_i$ is the household food consumption expenditure in Maloti (M). It is food expenditure given as the amount of money allocated to food purchased within the household over a period of 30 days. $offinc$ is the household off-farm income from off-farm activities.

Most of the off-farm activities include casual labor on others' farms, sales of fuel wood, hay, cow dung, chicken manure, among others. $hhgen$ depicts the gender of the household head. It is a binary variable which takes the value of 1 for male headed households and 0 otherwise. $hhage$ is a categorical variable for the household heads age groups, and has four categories (15-29, 30-44, 45-59, 60^+). $hhedu$ captures the educational attainment of household heads which is classified into None (no formal education), Primary, Secondary, Non-graduates and Graduates. $hhsize$ refers to the total number of persons living permanently within the household. $child5$ represents children below 5 years old, and $child14$ represents children between 5 and 14 years old. Children below the age 5 years may not usually form part of the household labor supply but require attention in terms of care and diet. They may influence the decision of the household in participating in off-farm activities and also types of food purchased, hence food expenditure. Concerning children between 5 and 14 years, they usually require expenses in terms of school requirements such as school fees, uniform, stationery, etc., which add to the household expenses. $zone$ is a categorical variable capturing the 4 ecological zones in Lesotho (1=Lowlands, 2=Foothills, 3=Mountains and 4=Senqu River Valley). $hhtrans$ are cash transfers from within the country or remittances from abroad the household received within the past 30 days.

Estimation Procedure and Validation Techniques: Multiple regression analyses are widely employed in econometrics, and follow the OLS assumptions. Equation (1) is estimated using the OLS technique to determine the effect of off-farm income on household food consumption expenditure among other factors. However, OLS may not address the issues of endogeneity which arises when household food consumption expenditure is jointly determined with one of the dependent variable (household off-farm income) included in the analysis. Therefore, the OLS estimates would be biased and inconsistent. We address this issue by employing Instrumental Variable (IV) estimation technique. However, the main challenge of the IV approach lies in the identification of a suitable instrument within the dataset which satisfies the exclusion restriction. Taking into consideration this challenge and the inability of obtaining suitable instruments for this study, we employed an identification method proposed by Lewbel (2012). The method utilizes a heteroscedastic covariance restriction to construct an internal IV that can be employed to obtain estimates of household off-farm income. The approach rests on certain assumptions, but the only non-standard assumption is that there is heteroscedasticity in ξ_j, which can be tested using the Breusch and Pagan test.

The model is specified as follows:

$$Y_1 = X_i\beta_1 + Y_2\gamma_i + \xi_1 \qquad \xi_1 = \alpha_1 U + V_1 \qquad (2)$$

$$Y_2 = X_i\beta_2 + \xi_2 \qquad \xi_2 = \alpha_2 U + V_2 \qquad (3)$$

Where Y_1 is household consumption expenditure, Y_2 is household off-farm income, X_i are exogenous explanatory variables, U is the observed ability, V_1 and V_2 are idiosyncratic errors. Lewbel (2012) suggests that one can take a vector Z of observed exogenous variables and use $[Z - E(Z)]\xi_2$ as an instrument if:

$$E(X\xi_1) = 0,\ E(X\xi_2) = 0,\ \text{cov}(Z, \xi_1, \xi_2) = 0 \qquad (4)$$

There is some heteroscedasticity in ξj. According to Mishra & Smyth (2015) the rationale for employing $[Z - E(Z)]\xi_2$ as an instrument is that identification is realized by having regressors that are not correlated with the product of the heteroscedastic errors. Z could either be a subset of X or equal to X. Using the instrument specified above, we apply the 2SLS in our regression analysis to estimate the IV coefficients. The analysis follows the same approach as the case with conventional IVs.

3. Results and Discussion

Socio-Economic Characteristics of the Households: Table 1 presents the descriptive statistics for socio-economic variables of households participating in off-farm activities in rural areas in Lesotho.

Table 1: Descriptive Statistics

Variable	Description	Obs (%)	Mean	SD	Min	Max
Y_i	Food consumption expenditure	1,842	1835.3	1640.5	104.5	17609.1
Offinc	Household off-farm Income	1,688	2019.5	2746.3	60	17833.3
Hhtrans	Transfers and remittances	755	595.9	839.8	50	8083.3
Hhgen	**Gender of household head**					
	male	1,202 (65.1)	0.651	.477	0	1
	female	644 (34.9)	0.348	0.477	0	1
hhage	**Age of household head**					
	15-29	116 (6.3)	0.063	0.243	0	1
	30-44	644 (34.9)	0.349	0.477	0	1
	45-59	736 (39.9)	0.399	0.489	0	1
	60+	350 (18.9)	0.189	0.392	0	1
hhedu	**Educational attainment of household head**					
	None	347 (18.9)	0.188	0.391	0	1
	Primary	1,119 (60.3)	0.606	0.489	0	1
	Secondary	326 (17.8)	0.176	0.381	0	1
	Graduates	36 (2.0)	0.019	0.138	0	1
	Non graduates and others	18 (1.0)	0.009	0.098	0	1
hhsize	Total number of household members	1,835	4.570	2.402	1	12
child5	Number of children 5 years and below	1,846	0.586	0.779	0	4
child14	Children between 5 and 14 years	1,843	1.616	1.448	0	7
zone	**Ecological zones in Lesotho**					
	Lowlands	827 (44.8)	0.448	0.497	0	1
	Foothills	212 (11.5)	0.115	0.319	0	1
	Mountains	559 (30.3)	0.303	0.459	0	1
	Senqu River Valley	248 (13.4)	0.134	0.341	0	1

The statistics show that the average off-farm income received by a household participating in off-farm activities is around M 2019.5 within a period of 30 days, whereas the average household food consumption expenditure is M 1835.3. Households receive on average M595.9 as transfers and remittances from abroad. Most of the households are male-headed (65.1%) with a majority of the household heads having completed primary education (60.3%). Concerning the age group, most of the household heads are between the ages of 30 – 64. In other words, farmers are mature and should be able to make rational decisions about the off-farm activities to be involved in. The low percentage of the younger age group can be linked to the fact that most of the educated youths have higher mobility out of the rural areas (where agriculture is the main activity) to seek for employment in urban areas.

Concerning the older age group (65+), as household heads grow older, it is expected that the probability of participation in the off-farm activities decreases, because productivity decreases with increasing age. Most of the rural households participating in off-farm activities are in the lowlands (44.8%). According to Silici (2010), lowlands in Lesotho have higher sales of agricultural products than any other zone. Therefore, the zone variable will possibly affect off-farm participation especially for households that obtain lower incomes from agricultural activities. On the average, there are 4 persons per household, with most families not having children of less than 5 years old. For children aged between 5 and 14, there are, on average 2 children per household. This implies that most of the households have at least one member between the ages 5 and 14.

The Determinants of Household Food Consumption Expenditure: To analyse the determinants of households' food consumption expenditure in Lesotho, the heteroscedasticity-based instrumental variable approach was employed in order to address endogeneity issues in the variables. For the econometric analysis, we first estimated the OLS regression, while disregarding endogeneity problem. Next we estimated the IV regression to account for possible endogeneity. The results from the regression analysis are reported in Table 2 while the results of the first stage IV regression are presented in the appendix. The first stage IV results confirm the relevance of the heteroscedasticity-based instrumental approach in this study. The application of the heteroscedasticity-based instrumental approach does not rest on certain assumptions like the standard 2SLS model.

The only non-standard assumption for the application of the model is that there should be no heteroscedasticity. This assumption was verified using the Breusch-Pagan test. It tests the null hypothesis that the variances of the error terms are constant (homoscedasticity) against the alternative hypothesis that the variances are none constant (heteroscedasticity). The results of the Breusch-Pagan test for both models are not significant. This implies that we accept the null hypothesis of homoscedasticity. The results in Table 2 show that there is a consistent positive effect of off-farm income on household food consumption expenditure. The OLS estimates indicate that a 1% increase in household off-farm income, ceteris paribus, will increase household food consumption expenditure by 11.2%. However, as these estimates suffer from endogeneity bias, the coefficients estimated from the 2SLS (IV) model offer a more accurate prediction. As evident in Table 2, a 1% increase in off-farm income leads to a 22.7% increase in the household food consumption expenditure.

These findings agree with those of Jacobson et al. (2010) and Mishra et al. (2015). The results further indicate that transfers and remittances positively and significantly increase household food consumption expenditure. Using the IV estimates, a 1% increase in the transferred amounts received by household has a 3.2% increase in food expenditure. This can be explained using the concept of rural-urban migration (Wang et al., 2000). In this case, migration of young people from rural households to the cities or abroad has been identified as a survival strategy for the household. Remittances from the migrating youths form a significant part of the food consumption expenditure of the rural households left behind. Households that receive these remittances tend to use the proceeds primarily for current consumption (food, clothing) as well as investments in children's education, health care, improvement in household food and security, and water and sanitation (Ajaero & Onokala, 2013).

Table 2: OLS and IV Estimates

Variable	OLS Regression	IV Regression
Log off-farm income	0.112***	-
	(0.021)	-
Instrument for off-farm income (*y2hat*)	-	0.227***
	-	(0.322)
Log of transfers and remittances	0.066**	0.032***
	(0.026)	(0.082)
Household size	0.188***	0.174**
	(0.018)	(0.069)
Infants less than 5 years	0.045*	0.035*
	(0.041)	(0.042)
Children between 5 and 14 years	0.130***	0.110
	(0.031)	(0.081)
Gender of Household Head		
Male	0.099*	0.065**
	(0.058)	(0.120)
Age (Group) of household head		
30 - 44	0.100	0.139
	(0.137)	(0.150)
45 - 59	-0.048	0.019
	(0.139)	(0.133)

60+	0.174**	0.105*
	(0.145)	(0.142)
Educational Attainment of Household head		
None	0.057*	0.020**
	(0.078)	(0.143)
Primary	0.044	-0.044
	(0.103)	(0.289)
Graduates	-0.212	-0.019*
	(0.266)	(0.625)
Non Graduates and others	-0.335	-0.481
	(0.240)	(0.663)
Ecological zone		
Foothill	-0.014	-0.024
	(0.088)	(0.085)
Mountains	-0.051	0.041*
	(0.066)	(0.074)
Senqu River Valley	-0.057	-0.045
	(0.078)	(0.057)
Constant	5.456***	4.886***
	(0.238)	(1.290)
Observations	677	742
Breusch-Pagan test		
chi2	0.27	0.66
Prob>chi2	0.605	0.750

Note: ***, **, and * denote a 1%, 5% and 10% level of significance, respectively.

Concerning household size, the positive and significant relationships indicate that household size critically affects the amount of money required for household food consumption expenditure. This implies that as household size increases by one member, the household food consumption expenditure increases by M17.4, ceteris paribus. This can be explained by the fact that most rural households depend on subsistence farming, and any addition of a member in the household will constrain the limited resources. Similar results were reported by Gazuma (2018) and Mitiku et al. (2012). In addition, households with large family sizes, having children of non-productive ages could increase the food consumption expenditure because of high dependency ratio than households with small family sizes (Beyene & Muche, 2010). Furthermore, socio-economic and demographic factors such as; no formal educated household heads, male-headed households, being above 65 years old and living in mountainous areas, are also important determinants of household food consumption expenditure in Lesotho. These variables increase the household food consumption expenditure. These findings are consistent with those of Akpan (2013) and Paul et al. (2014).

4. Conclusion and Policy Implications

This study investigated the effects of off-farm income on rural household food consumption expenditure in Lesotho among other determinants. Using a comprehensive and representative Household Budget Survey of 2017, we employed two econometric models in the regression analysis. First, the OLS regressions were employed to identify important determinants of household food consumption expenditure while disregarding the endogeneity issue. Second, the Instrumental Variable (IV) method (heteroscedasticity-based instrument) was applied out to account for endogeneity issues. Our empirical results reveal the following: First, off-farm income had a positive and significant effect on household food consumption expenditure across all models. The effect was higher when we controlled for the endogeneity issues in the model. These results were consistent with previous studies. Second, the results also indicated that transfers and remittances positively and significantly increased household food consumption expenditure.

Third, households that are male-headed and earn off-farm income tend to have higher food consumption expenditures. Lastly, socio-economic factors such as household size, household heads without formal education, being above 65 years old and living in mountainous areas, are also important determinants of

household food consumption expenditure. Based on the findings of this study, the following recommendations are suggested. Rural households who are mostly engaged in smallholder farming should diversify into off-farm activities in order to earn extra income for improvement of household food consumption expenditure. To reduce rural poverty, government policies should aim at encouraging off-farm activities, especially value addition to crops, and training on farm related income generating activities. This will further improve rural household income and subsequently, household welfare.

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Appendix: First Stage Estimates of 2SLS: After performing the IV estimates (using a 2SLS), the table below shows the first stage estimates of the 2SLS. The results on the table confirm the relevance of the heteroscedasticity-based instrumental approach in this study.

Variable	OLS Regression
Log of transfers and remittances	0.238***
	(0.048)
Household size	0.210***
	(0.033)
Infants less than 5 years	-0.030
	(0.077)
Children between 5 and 14 years	-0.227***
	(0.058)
Gender of Household Head	
Male	0.323***
	(0.108)
Age (Group) of household head	
30 - 44	0.194
	(0.257)
45 – 59	0.008
	(0.260)
60+	-0.130
	(0.271)
Educational Attainment of Household head	
None	0.352**
	(0.146)
Primary	0.793***
	(0.191)
Graduates	1.729***
	(0.493)
Non Graduates and others	1.868***
	(0.443)
Ecological zone	
Foothill	-0.091

	(0.164)
Mountains	-0.202*
	(0.123)
Senqu River Valley	-0.240
	(0.146)
Constant	4.094***
	(0.416)
Breusch-Pagan	
Chi2(11)	7.66
Prob>chi2	0.006

Note: ***, **, and * denote a 1%, 5% and 10% level of significance, respectively.