ANALYSIS OF THE IMPACT OF MIGRATIONS AND REMITTANCES ON INCOME DIVERSIFICATION IN RURAL AFRICA: A CASE STUDY OF KENYA

Sam Kaninda Tshikala
Associate Professor
Department of Applied Economics and Management
Universite Pedagogique Nationale
312 Route De Matadi
Kinshasa
Democratic Republic of Congo
Tel: +243826639816
Email: samkaninda@live.com

Esendugue Greg Fonsah
Professor
Department of Agricultural & Applied Economics
University of Georgia
15 RDC RD, P.O. Box 1209
Tifton, Georgia, 31793, USA
Tel: 229-386-3512; Fax: 229-386-3440
Email: gfonsah@uga.edu

Selected Paper prepared for presentation at the Southern Agricultural Economics Association Annual Meeting, Jacksonville, Florida, February 2-6, 2018

ABSTRACT

Income diversification constitutes an important livelihood strategy for rural households in developing countries in general and Sub-Saharan Africa in particular.

Using data collected by the World Bank in rural Kenya, the estimated results from the bivariate and 2SLS models show that the average partial effects of remittances on activity choices indicate that household propensity to seek non-cropping income was higher for households with external remittances than those with internal remittances. In addition, poor households diversified less than better-off households, implying that diversification is viewed more as a means of wealth accumulation than a survival strategy in this part of Kenya.

Key Words: Migration, Remittances, Income diversification, Kenya

1.1 INTRODUCTION

Income diversification is an important livelihood strategy for rural households in developing countries in general and Africa in particular (Wouterse and Taylor, 2008). Rural households no longer rely on one source of income or hold all their wealth in the form of one single asset or use their assets in one activity (Barret and Reardon, 2000). On the contrary, they tend to diversify their sources of income by voluntarily exchanging their assets and allocating them across various activities in order to achieve an optimal balance between expected returns and risk exposure (Barret at al., 2005).

Rural households diversify their sources of income for many reasons or motives. The different motives can be expressed in term of "Push and Pull" factors (Wouterse and Taylor 2008; Dimova and Sen, 2010). The push factors include; risk reduction, response to diminishing factor returns in any given use, reaction to crisis and liquidity constraints. The pull factors are related to improved infrastructure, better markets, and the realization of strategic complementarities between

activities such as crop-livestock integration, proximity to urban areas that create opportunities for income diversification.

Given the degree of poverty, the risk levels of households (risks related to climate, pests, prices or market access) are a major issue and major determinants of their livelihood strategies. Households facing high level of risk in their agricultural activities often seek off farm income. Through diversification, rural households may expand their activities by investing in nonfarm sectors, increase income or reduce its variability. In addition, diversification of sources of income is used by many rural households as a risk management strategy (Losch, Freguigresh, and White, 2011; Senadza, 2011).

Income diversification can be made possible with the increase of total household income which helps households overcome liquidity constraints and invest in nonfarm activity. However, in many rural households in developing countries, mostly in Africa, liquidity constraints are a major problem (Winter-Nelson and Temu, 2005). (Diagne, Zeller and Sharma, 2000). In addition, poor households have fewer opportunities in non-cropping activities due to their lack of capital which makes it difficult for them to diversify away from subsistence agriculture.

For decades, rural households have been relying on migration and remittances as a strategy to overcome liquidity constraints. (Black et al., 2006; Babatunde, 2008; Shaw, 2010) In their study of remittances and income diversification in rural Bolivia, Lazarte-Alcala et al. (2011) found that households with remittances tend to diversify more than those without. Their results confirm the hypothesis that remittances can relax credit constraint usually faced by rural farmers (Vergas et al., 2008; Lucas, 2007).

Through migration and remittances, rural family labor is no longer limited to farming activities. Studies on the relation between remittances and rural development suggest that

remittances can be used as insurance in case of adverse income shock (Wouterse, 2010). households with remittances can invest in more risky and productive activities (De Haas, 2006). Households with remittances may invest in agricultural as well as non-agricultural activities. Rural household that invest in agricultural activities may choose to invest in staple as well as non-staple production. The relation between migration, remittances and new technologies in Africa has been analyzed by Wouterse and Taylor (2008) using data from Burkina Faso. Their study tested the risk hypothesis by examining the impact of migration on income diversification. This study tests the risk as well as the liquidity constraints by analyzing the impact of migration and remittances on income diversification in Kenya.

1.2 LITERATURE REVIEW

Income diversification can be defined as the process of switching from low value crop production to a higher value crop, livestock, and nonfarm activities such as trade, commerce and small manufacturing (Ibrahim et al., 2009). In addition, diversification refers to the allocation of production assets among different income-generating activities, both on-farm and off-farm (Abdulai and CroleRees, 2001). Furthermore, rural livelihood diversification is seen as a process of constructing a diverse portfolio of activities and social support capabilities for survival (Mutenje et al., 2010).

The development and the trend in rural income diversification in developing countries have been the focus of many researchers over the past decades. Many studies have analyzed the different motives for rural households to diversify their sources of income (Lucas, 1997; Wouterse and Taylor, 2008; Demurger, Fournier and Yang, 2009). Lucas (1997) pointed out that rural households diversify away from agriculture because of the lack of crop insurance and shortage of liquidity. According to Demurger, Fournier and Yang (2009), rural households adjust their

activities to exploit new opportunities created by market liberalization or to cope with livelihood risks.

For Wouterse and Taylor (2008), “the motives for diversification can be explained in term of push and pull factors”. Push factors are related to risk reduction while pull factors are associated with the rural households’ effort to exploit strategic complementarities between activities, such as crop-livestock integration. In addition, Barrett and Reardon (2000) indicate that risk reduction, realization of economies of scope, response to crisis and liquidity constraints are amongst the motives of diversification. Furthermore, rural households diversify their activities because their resources allocated to agricultural production decrease in relation to the returns from using them in non-agricultural activities (Schwarze and Zeller, 2005). Rural household also diversify their activities, particularly nonfarm, to cope with the risk of crop failure (Demissie and Legese, 2013).

Other studies have focused on the relation between diversification, households’ assets and rural development. Ibrahim et al. (2009) found that income and crop diversification can raise income and reduce poverty among rural households. In their study on income diversification in Nigeria, Babatunde and Qaim (2009) argued that the majority of households were fairly diversified and 50% of total rural households’ income was from off-farm sources. In addition, richer households were more diversified than poorer ones.

Furthermore, in their study on Indonesia, Shwarze and Zeller (2005) found that there is a link between non-farm income and total household income. Therefore, poor households have less access to non-farm activities than better-off households. These findings confirm the fact that liquidity constraints constitute a major obstacle for poor rural household to diversify their activities and invest in more productive activities.

For many decades, rural households have been relying on migration and remittances as source of income and a way to overcome liquidity constraints (Taylor, Rozelle, and Brauw 2003). Migration constitutes by its self a way to diversify income in rural areas. Seasonal migration off-farm to engage in wage employment and provision of agriculture services is an important source of off-farm income for rural households (Asmah, 2011). According to Giesbert (2007), and Sana and Massey (2005), migration and remittances are generally viewed as an important component of diversification strategies that intends to cope with risky environments in developing countries.

Lazarte-Alacal et al. (2012) indicate that remittances play an important role through the provision of liquidity that helps rural households invest in more productive activities and nonfarm sectors. In addition, migration and remittances have been used to maximize and diversify income, minimize risks and loosen liquidity constraints and reduce poverty (Vargas et al., 2008; Marchetta, 2013; Azzari et al., 2006; Escobal, 2001; Senadza, 2011).

Studies on income diversifications in Africa have shown that rural households have been investing in nonfarm activities in order to sustain their livelihood (Losch, Freguigresh, and White, 2011; Barrett, Reardon, and Webb, 2001; Ellis, 2000). Haggblade et al., (2010) argue that in rural Sub-Saharan African countries, income from nonfarm activities represents 35% to 50% of the total household income. Many studies have highlighted the role that migration and remittances can play in reducing risk and credit constraints faced by rural households in developing countries (Black et al., 2006; Lazarte-Alcala et al., 2011; Wouterse and Taylor, 2008; Taylor, Rozelle, and Brauw, 2003). According to these studies, households with migrants and remittances can invest in more risky and profitable activities, particularly in non-farm sector, in order to diversify their sources of income.

1.3 METHODOLOGY

1.3.1 THE CONCEPTUAL FRAMEWORK

The conceptual framework for this study is based on the new economics of labor migration (NELM) and the Sustainable Livelihoods Frameworks (SLF). According to the SLF, in different contexts, sustainable livelihoods are achieved through access to a variety of assets which are combined in the pursuit of different livelihood strategies to achieve certain outcomes such as increased incomes (Ellis, 1998). Access to physical, natural, economic, human and social capital assets can encourage and help rural households engage in farm or nonfarm activities or both (Scoones, 1998).

On the other hand, the NELM theory assumes that migration can reduce the push to diversify for risk reasons. In addition, if households perceive new activities as risky and they cannot invest in these activities due to liquidity constraints, migration through remittances can help rural households overcome these constraints and stimulate income diversification (Wouterse and Taylor, 2008).

Base on the above theories, we expect that households with migrants and remittances will invest in more risky and diversified activities. Therefore, migration, remittances and public transfers will have a positive impact on income from non-cropping production.

As far as income diversification is concerned, if diversification is motivated or viewed as a survival strategy by households, the relation between household income diversification and household's income will be negative. Poor households will be likely to diversify more than richer. However, if diversification is seen as a wealth accumulation strategy, the opposite will occur (Dimova and Sen, 2010).

1.3.2 DATA AND SOURCE

The data used for this study is from the household survey conducted by the World Bank in partnership with the French Cooperation and the International Fund for Agricultural Development (IFAD). The survey was conducted through the RuraLStruc Program between 2007 and 2008 in seven countries (Mali, Senegal, Kenya, Morocco, Madagascar, Nicaragua, and Mexico). This study focuses on Kenya.

The main objective of the RuraLStruc Program was to provide a better understanding of the implication of liberalization and economic integration for agriculture and rural development in developing countries. It also illustrates the situation of rural economies in terms of income, diversification and overall transformation (Losch, Freguingresh, and White, 2011).

The sampling process for the surveyed households followed a multistage systematic random sampling procedure.

The first was the selection of regions or districts for the survey. From the regions selected, a multi-stage random sample of farm households was selected with a number of random localities to be surveyed selected first. From the selected regions, a number of random households were selected, targeting a sufficient number of households per locality allowing for representativeness at local level. The choice of these regions was based on the importance of agricultural activities, market access, the size and population density and the ability to illustrate different rural household situations (Kirimi et al., 2010).

The regions selected in Kenya were Nakuru North, Nyando and Bungoma. From these regions, 904 households randomly selected were surveyed in 27 villages (Kirimi et al., 2010). In Nakuru North, 300 households were surveyed, 301 in Nyando and 301 in Bungoma.

The surveyed regions are presented in Figure 4.1. The Nyando region is part of the Kisumu district.

After data cleaning, a sample of 873 households was presented in the RuraLstruc report. However, due to missing information, the sample used in this study consists of 782 households.

The data set contains information on household characteristics and composition, quality of housing, household main and secondary economic activities, agricultural equipment, labor force, diversification index, on and off-farm activities, crop production, livestock, marketing contract for crop and livestock, expenditures, evolution of food security, migrations, remittances, public subsidies, use of new technologies (fertilizer and improved seeds), income from farm and non-farm activities, staple and non-staple production, social capital, assets and agricultural production factors. Table 4.1 contains the descriptive statistics of the key variables used in the empirical model.

Table 4.1: Descriptive statistics of variables used in estimation

Variables	Mean	Std. Dev.
Gender of the household head (1= male, 0 = female)	.807	.394
Off-farm activities (1= yes,0= no)	.758	.342
Livestock activity (1= yes,0 = no)	.525	.329
Number of internal migrants	1.04	1.59
Number of external migrants	.412	.325
Household with internal remittances (1= yes,0 = no)	.256	.423
Household with international remittances (1= yes,0 = no)	.071	.130
Household size - number of persons	7.04	2.80
Total number of adults	5.05	2.39
Total number of Children < 15 years old	2.61	2.16
Age of household head	48.1	13.8
Household head has completed primary education	.144	.351
Household head has secondary education	.087	.282
Land owned (in hectares)	.708	1.30
Number of cattle head	3.01	3.54
Area of land irrigated (in hectares)	.069	.482
Household received public transfers (1= yes, 0 = no)*	.040	.089
Household is poor [a] (1= yes,0 = no)	.581	.493
Observations	782	

Source: Author's computation from RuraLStruc data

* Public transfers are monetary or cash transfers to rural households

From Table 4.1, 80 percent of household heads were males. Fourteen percent of household heads had completed or some primary education and 8.7% had completed or some secondary education. The average age of the household head was 48 years and 71% owned land. In addition, 4% of household received public transfers and 58% were extremely poor. Almost 75 percent of the households surveyed had non-farm income and 52.5 invested in livestock production. The average size of the household was seven people and the average number of adults in the household was five.

Furthermore, 25.6% and 7.1% received internal and external remittances respectively. Internal remittances in this study are defined as remittances sent by migrants from the capital and other big cities within the country. External remittances are remittances sent by migrants who are outside the country. In addition, 4% received public transfers. Public transfers are subsidies to very poor households. The majority of these households depend on subsistence agriculture. In addition, they do not or have limited access to financial, labor, input and output markets. The purpose of these transfers is to help rural households with liquidity constraints invest more in income-generating investments (Davis, 2014).

In this study, public transfers refer to cash transfers provided by the central or local government to support rural households and their economic activities in Kenya. (Losh, Freguin-Gresh and White, 2011)

1.3.3 DATA ANALYSIS

This study uses a bivariate probit model to determine the impact of remittances and migration on non-cropping activities. The choice of this model is based on the binary nature of the dependent variable, which is whether or not households invested in non-crop income generating

activities. In addition, the variable remittance, which is also a binary variable, may be endogenous: Therefore, a bivariate probit model is appropriate in this case. In addition to the bivariate probit model, a two-stage least squared model was estimated in order to compare the results and assess the validity of the instruments.

Following Wouterse and Taylor (2008), household preferences are represented by the following utility function:

$$U = Eu(G, L_e, X) \quad (1)$$

where *G* represents the vector of goods consumed by the household L_e is leisure and X is a vector of household characteristics. Household utility is maximized subject to the income constraint expressed as:

$$C = \sum_i Y_i + R_E\,(M_E) + R_I(M_I) + P_T \quad (2)$$

Where Y_i represents the net income from cropping (c) and non-cropping (nc) activities. Non-cropping activities production include; livestock, nonfarm activities such as trade, commerce, and manufacturing. R_E and R_I denote external and internal remittances, respectively. These remittances are function of M_E and M_I which are the stock of external and internal migrants per family. The net income received by the household from crop production can be expressed as:

$$y_c = P_c g_c(L_c; A) + \eta_c \quad (3)$$

Where $\mathrm{L_c}$ represents the labor used by the household in cropping production, *A* is a vector of household assets, $\mathrm{P_c}$ is the price of crop output and, $\eta_c \sim N(0, \sigma_c^2)$ represents the stochastic term of cropping production. Households may gain income from non-cropping production only if they overcome the entry constraint denoted by K_{nc} such that:

$$y_{nc} = [P_{nc} g_{nc}(L_{nc}; A) + v_{nc}(L_{nc}; A)\eta_{nc}]|K_{nc} \quad (4)$$

Where y_{nc} is the net income from non-cropping production, P_{nc} the price of non-cropping output production, L_{nc} represents the labor used in non-cropping production, and K_{nc} the entry constraints which include the initial capital in the production of non-cropping goods. η_{nc} is the stochastic component of non-cropping production $\left(\eta_{nc} \sim N(0, \sigma_{nc}^2)\right)$; and $v_{nc}(L_{nc})$ is the effect of the intensity of labor investment on production risk.

It is assumed that $K_i = 0$, otherwise the entry constraint can be expressed as a function of the different household assets as well as M_E and M_I which represent the number of internal and external migrants. The available liquidity the household posses as investment is a function of household wealth. The available maximum wealth, W^{max}, that households have, is a function of the assets related to migration and non-migration assets Z_k :

$$\sum_{nc} K_i \leq W^{max}, W^{max} = g_w(M_E, M_I, Z_k) \quad (5)$$

In case of perfect labor market, labor lost due to migration can be replaced by hired workers. In addition, labor available will not constitute a constraint on household production activities. On the contrary, labor availability for production and migration will be constrained by the household labor supply in case of imperfect labor market as:

$$\sum_i L_i \leq T - M_E - M_I - L_e \quad (6)$$

The opportunity cost of labor in production in this case will be represented by a household specific shadow wage. Other things being equal, this shadow wage will increase with the labor allocated to migration by the household which may create a trade-off between migration and household production (Wouterse and Taylor, 2008).

Both activity choice and activity income can be influenced by migration. Therefore, if we ignore the endogeneity of activity choice, the estimates of coefficients in the activity income regression may be biased. Following Abdulai and Crolerees (2001), a household will invest in

an activity if the expected utility from this activity is greater than not engaging in any activity, subject to a capital constraint. In case of liquidity constraints, only households that are able to overcome the entry constraints (K_{nc}) may allocate labor to non-cropping production. However, in case of non binding capital constraint, households will allot a marginal unit of labor to non-cropping production if: $E\left[u_c \frac{dC}{dl_{nc}}\right] | \frac{W^{max}}{K_{nc}} \geq E\left[u_c \frac{dC}{dL_c}\right]$ (7)

Where u_c is marginal utility, l_{nc} and l_c represent labor allocated to non-cropping and cropping activities, respectively.

1.3.3.1: THE BIVARIATE PROBIT MODEL

Following Lazarte-Alacal et al., (2012), let Y_1^* and Y_2^* be the surplus associated with diversification and the value of an intended remittance respectively. Then,

$$y_1 = \begin{cases} 1 & if \quad y_1^* > 0 \\ 0 & otherwise \end{cases} \quad (8)$$

y_1^* is not observable, y_1 which is the observable variable denotes the presence of income from non-cropping activities in the household. Similarly,

$$y_2 = \begin{cases} 1 & if \quad y_2^* > 0 \\ 0 & otherwise \end{cases} \quad (9)$$

We observe y_2 only if the consumer surplus of remitting is positive.

The equation for diversification can be expressed as:

$$y_1^* = y_2^* \lambda_1 + x_1 \beta_1 + \mu_1 \quad (10)$$

Equation (10) shows that the decision to invest in non-cropping activities may be determined by the decision to send remittances. In addition, y_2^* may be endogenous. Therefore, the following binary endogenous variable model can be used:

$$y_1 = 1[x_1 \beta_1 + \lambda_1 y_2 + \mu_1 > 0] \quad (11)$$

$$y_2 = 1[x\beta_2 + \mu_2 > 0] \quad (12)$$

Where 1[ ] represents the indicator function that takes the value of 1 if a household invested in non-cropping activity in equation (11) and if remittances are received by a household in equation (12), respectively. X is the vector of exogenous variables, it includes all the variables that affect the diversification decision (x_1) as well as factors that affect the decision to remit (x_2). In addition, (μ_1 μ_2), which represents the error vector, is not correlated with all the exogenous variables and it is distributed as bivariate normal with mean zero, each with unit variances, and correlation $\rho =$ Corr (μ_1 μ_2). In case of endogeneity that may arise from using y_2 as regressor, estimating equation (11) alone will produce biased results. Therefore, it is necessary to estimate equation (11) together with equation (12) using a bivariate probit model.

1.4 RESULTS

Equations (11) and (12) were estimated via maximum likelihood and two-stage least squared (2SLS). In the bivariate probit model the number of migrants per household and the dependency ratio were included as regressors in the remittances equation but excluded from the activity choice equation. In addition, the two variables were used as instruments in the linear probability model. The two activities analyzed in this study are livestock and nonfarm activities.

The results from the bivariate model are presented in tables 4.2 and 4.3.

The results in table 4.2 show that households with internal and/or external remittances were more likely to invest in non-farm activities. In addition, households with more members as well as more adults were more likely to seek income from non-farm activities. In fact, income diversification may have a negative impact on farming activities due to the loss of labor and other sources. This situation may impact more small families than big families or households with more productive

adults. Therefore, it would be easier for households with more potential family labor to seek income outside of farming activities.

Table 4.2: Bivariate probit estimation of the impact of remittances on non-farm activity in rural Kenya

Dependent variable: household has nonfarm activities (1 = yes,0 = no)				
Activity choice equation	Coef	Robust Std. Err	Coef	Robust Std. Err
Household received Internal remittances (1= yes,0 = no)	1.178*	.104		
Household received External remittances (1= yes,0 = no)			1.221*	.246
Household Size	.693**	.284	.541**	.223
Number of Adults	.108**	.042	.075**	.036
Number of children	-.046	.045	-.041	.040
Age household head	-.015**	.007	-.006	.005
Household head with primary education(1=yes,0=no)	-.041	.187	-.079	.1716
Household head with secondary education(1=yes,0=no)	.043**	.008	.527***	.236
Land (hectares)	-.214**	.063	-.122**	.047
Number of Cattle	.061**	.020	.048**	.018
Irrigated land (Hectare)	.633	.449	.543	.409
Household with public transfer (1= yes, 0 = no)	.905*	.213	.704**	.280
Household is extremely Poor (1=yes,0=no)	-.990*	.165	-.830*	.146
Constant	1.990*	.350	1.6992*	.301
Remittances equation	HH received Internal remittances(1=yes, 0=no)		HH received external remittances (1=yes, o=no)	
Household Size	.108**	.035	.175**	.053
Number of Adults	.017	.037	.184	.131
Number of children	-.034	.051	-.222	.255
Age household head	.011**	.005	.047***	.027
Household head with primary education(1=yes,0=no)	-.100	.166	.768***	.272
Household head with secondary education(1=yes,0=no)	.672**	.268	1.583***	.710
Land (hectares)	.0691	.046	.225	.152
Number of Cattle	.033**	.015	.062**	.030
Irrigated land (Hectare)	.086	.094	.051	.159
Dependency Ratio	.057**	.019	.154**	.038
Number of migrants	.426*	.049	1.738*	.662
Constant	-2.06*	.293	-1.823*	.232
Number of observations	*782*		*782*	
Log likelihood	*-545.39*		*-486.44*	
ρ *and* $p-$ *value of* $H_0 = 0$	-.2760 (0.4524)		*-.698(0.000)*	

*,**,*** denotes significance at 1%, 5% and 10%, respectively ; HH: Households

Furthermore, household heads with higher levels of education were more likely to invest in non-farm production. According to Lazarte-Alacal et al. (2012), households with higher level of

education have better chances for nonfarm employment and earn higher wages. In addition, they are more likely to be successful in their businesses and tend to be more productive farmers.

The positive coefficient of the public transfers variable shows that households with public transfers were more likely to seek income out of farming activities. In addition, the positive correlation between the number of cattle and households with non-farm activity reveals that households with more cattle were more likely to invest in non-farm activities.

In contrast, the negative coefficient of the variable land indicates that households with more land were less likely to diversify or seek income outside of farming activities. In addition, very poor households diversified less than better-off households. This result is consistent with that of Babatunde and Qaim (2009) as well as Shwarze and Zeller (2005) who found in their respective studies on Nigeria and Indonesia that poor households have less access to non-farm activities than better-off households. Therefore, wealthier households were more diversified than poor ones. Furthermore, this result indicates that diversification is viewed more as a means of improving their well-being than a survival strategy by households in this part of Kenya.

4.3: Bivariate probit estimation of the impact of remittances on Livestock activity in Kenya

Dependent variable: household has livestock activities (1= yes,0 = no)				
Activity choice equation	Coef	Robust Std. Err	Coef	Robust Std. Err
Household received Internal remittances(1=yes,0=no)	.037	.275		
Household received External remittances(1=yes,0=no)			.188**	.052
Household size	.079***	0.037	0.053**	0.014
Number of adults	.070**	.030	.070**	.029
Number of children	-.027	.031	-.028	.031
Age household head	.017*	.004	.017*	.004
Household head with primary education(1=yes,0=no)	.086	.193	.315**	.152
Household head with secondary education(1=yes,0=no)	.325**	.154	.101	.192
Land (hectares)	-.007	.045	-.005	.044
Cattle	.027***	.016	.028***	.016
Irrigated land (Hectare)	.003	.098	.003	.095
Household with public transfer(1=yes, 0=no)	-.221	.465	-.238	.462
Household is extremely Poor(1=yes,0=no)	-.566*	.108	-.562*	.107
Constant	-.410*	.246	-.421***	.244
Remittances equation	HH received Internal remittances(1=yes, 0=no)		HH received External remittances(1=yes, o=no)	
Household Size	.037**	0.016	0.025**	0.02
Number of Adults	.013	.037	.181***	.104
Number of children	-.028	.051	-.240	.216
Age household head	.012**	.005	.034	.022
Household head with primary education(1=yes,0=no)	-.102	.166	1.748*	.790
Household head with secondary education(1=yes,0=no)	.673**	.266	1.517*	.767
Land (hectares)	.070	.046	.1421***	.076
Cattle	.033**	.015	.063***	.036
Irrigated land (Hectare)	.085	.094	.109	.121
Dependency Ratio	.089**	.020	.212**	.051
Number of migrants	.427*	.048	2.510*	.625
Constant	-2.057*	.291	-2.510*	.832
Number of observations	*782*		*782*	
Log likelihood	-547.442		-456.598	
$\boldsymbol{\rho and\ p-value\ of\ H_0 = 0}$	-.04823 (0.576)		-.2987 (0.051)	

*,**,*** denotes significance at 1%, 5% and 10%, respectively

Based on the estimated results for livestock activity, which are presented in table 4.3, only households with external remittances were more likely to invest in livestock activity. The size of the household and the number of adults in the household were also positively correlated with the household propensity to invest in livestock activity. In addition, household heads with higher level

of education and households with more cattle were more likely to invest in livestock activity. In contrast, very poor households diversified less compared to better-off households.

Tables 4.4 and 4.5 contain the results from two stage least squares (2SLS) and the average partial effects of remittances on non-farm and livestock activities.

The estimated results from the linear probability model in table 4.4 are the same as those from the bivariate probit model. Households with internal and/or external remittances were more likely to invest in non-farm activities. However, only households with external remittances were more likely to invest in livestock activities. In addition, the number of adults in the household and the age of household head were positively correlated with household propensity to invest in livestock activities. Furthermore, household heads with higher education level and those with more cattle were more likely to invest in livestock activity. Conversely, very poor households were less likely to invest in livestock activity (Table 4.4)

Table 4.4: Impact of Remittances on Livestock and Non-farm Activities (2SLS estimation) in Kenya

	Nonfarm Activities		Livestock	
Variables	Coef	Robust Std. Err	Coef	Robust Std. Err
Household received Internal remittances(1=yes,0=no)	.222**	.072	.061	.101
Household received External remittances(1=yes,0=no)	.290**	.022	.118**	.040
Household size	-.032	.022	.061***	.032
Number of adults	.045***	.021	.041**	.013
Number of children	-.036***	.016	.030	.027
Age household head	.003**	.001	.006*	.002
Household head with primary education(1=yes,0=no)	.080	.195	-.200	.273
Household head with secondary education(1=yes,0=no)	.040***	.019	.157***	.077
Land (hectares)	-.032**	.011	-.0006	.015
Number of cattle	.008**	.004	.011**	.005
Irrigated land (Hectare)	.037	.025	.018	.035
Household with public transfer(1=yes, 0=no)	.057	.137	.034	.192
Household is extremely Poor(1=yes,0=no)	-.720*	.202	-.199*	.035
Constant	1.020*	.202	.386	.284
Number of observations	782		782	

Table 4.4 (Continued)

	Internal remittances			
Tests	Statistics	P-value	Statistics	P-value
Hausman	4.623***	0.078	.117	0.736
Sergan	.243	0.622	1.911	0.166
Weak instruments(F-statistic)	54.02		52.87	
	External remittances			
Hausman	9.761*	0.0008	10.087*	0.0002
Sergan	.085	0.769	1.359	0.243
Weak instruments	32.95		39.66	

*, **, *** denotes significance at 1%, 5% and 10%, respectively

Table 4.4 also presents the results from the different tests for the validity of the instruments used to address remittances endogeneity. Except for internal remittances in livestock equation, based on the Hausman test for endogeneity, the p-value indicates that both internal and international remittance variables are endogenous. In addition, the F-statistic from all the first stage regressions is very high (greater than 10), implying that our instruments are not weak. The validity of the instruments is also confirmed by the Hansen's overidentification test.

The average partial effects of remittances on non-farm and livestock activities presented in table 4.5 show that, except for the effect of internal remittances on non-farm activities, the effects of remittances on the different activities from 2SLS model were greater that the effects from the bivariate probit model. Based on the bivariate probit model, the probability of investing in non-farm activities was 18.16% and 23.8% higher for households with internal and external remittances, respectively, compared to households without remittances. The corresponding probabilities from 2SLS model were 22.2% and 29.0%, respectively. Furthermore, the probability of investing in livestock activity was 6.85% and 11.85% higher for households with external remittances than that of households without remittances in the probit model and 2SLS model respectively. The difference in the average marginal effects between the bivariate and the linear probability models can be attributed to the small proportion of households receiving remittances,

which is 25.6% for internal remittances and 7, 1% for external remittances in the case of this study. These households are located at the tail of the probability distribution (Lazarte-Alcala et al., 2012)

Table 4.5: Average marginal effect of remittances on activity choice

	Nonfarm activities		Livestock	
	Internal Remittances	External remittances	Internal Remittances	External remittances
Bivariate Probit	.1816* (.0296)	.238* (.016)	.01063 (.195)	.0685** (.0198)
2SLS	.2227** (.0722)	.29** (.02286)	.0619 (.1014)	.1185** (.0405)

*, **, *** denotes significance at 1%, 5% and 10%, respectively
Standard errors are in parentheses

1.5 CONCLUSION

Income diversification constitutes an important livelihood strategy for rural households in developing countries in general and Sub-Saharan Africa in particular. Many rural households diversify their sources of income by investing in nonagricultural activities. In addition, diversification is used by rural households as a risk management strategy

The purpose of this study was to examine the effect of remittances and migration on the propensity of rural households to diversify their income through non-cropping production or activities. Using data collected by the World Bank in rural Kenya, the estimated results from the bivariate and 2SLS models show that households with internal and/or external remittances were more likely to seek income from nonfarm activities. However, only households with external remittances were more likely to invest in livestock activities.

The average partial effects of remittances on activity choices indicate that household propensity to seek non-cropping income was higher for households with external remittances than those with internal remittances. In addition, poor households diversified less than better-off households,

implying that diversification is viewed more as a means of wealth accumulation than a survival strategy in this part of Kenya.

REFERENCES

Abdulai, A., and A. CroleRees. 2001. "Determinants of income diversification amongst rural households in Southern Mali." *Food Policy* 26: 437–452.

Asmah, K. E. 2011. "Rural livelihood diversification and agricultural household welfare in Ghana." *Journal of Development and Agricultural Economics* 3(7):325-334.

Azzari,C., G. Carellto, B. Davis, and A. Zezza. 2006. "Choosing to migrate or migrating to choose: Migration and Labor Choice in Albania." Working paper No. 06-06. Agricultural and development Economic Division, The Food and Agricultural Organization of the United Nations.

Babatunde, R.O. 2008. "Income portfolio in rural Nigeria: composition and determinants. *Trends in Agriculture economics*1 (1): 35- 41.

Babatunnde, R. O. and M. Qaim. 2009. "Patterns of income diversification in rural Nigeria: determinants and impacts." *Quarterly Journal of International Agriculture* 48(4):305-320.

Barret, B.C. and T. Reardon. 2000. Asset, Activity, and income diversification among African agriculturalists: Some practical issues. Project report to USAID BASIS CRSP, University of Wisconsin Madison Land tenure center.

Barret ,B.C., M. Bezuneh, C.D. Clay, and T. Reardon. 2005. "Heterogeneous constraints, incentives and income diversification strategies in rural Africa." *Quarterly Journal of International Agriculture* 44(1):37-60.

Barrett, B.C., T. Reardon, and P. Webb. 2001. "Non-agricultural income diversification and Household livelihood strategies in rural Africa: Concepts, Dynamics and Policy Implications." *Food Policy* 26(4): 315-331.

Black, R., J. Crush, S. Peberdy, S. Ammassar, M.L. Hilker, S. Mouillesseaux, C. Pooly, and R. Rojkotia. 2006. Migration and development in Africa: An overview. Southern African migration project, IDASA, Captown, South Africa.

Davis, B. (2014). "From Protection to Production: The Role of Cash Transfer Programs in Fostering Broad-Based Economic Development in sub-Saharan Africa." http://www.fao.org/fileadmin/user_upload/p2p/Documents/PtoP_short_description_11feb14.pdf (Accessed April 14, 2014)

De Haas, H. 2006. Remittances, Migration and Social development: A conceptual Review of the literature. Social policy development paper No 34, United Nations Research institute for Social Development.

Demissie, A., and B. Legese. 2013. "Determinants of income diversification among rural households: the case of smallholder farmers in Fedis district, Eastern haraghe zone, Ethiopia." *Journal of Development and Agricultural Economics* 5(3):120-128.

Demurger, S., M. Fournier, and W. Yang. 2009. "Rural households decisions towards income diversification: Evidence from a township in northern China." Working paper No 09-23, Groupe d' Analyse et de Theorie Economique(GATE). Centre nationale de Recherche Scientifique, Ecully Cesex, France.

Diagne, A., M. Zeller, and M. Sharma. 2000. "Empirical measurements of households'access to credit and credit constraints in developing countries: methodological issues and evidence." Discussion paper, food consumption and nutrition division, IFPRI, Washington, DC.

Dimova, R., and K. Sen. 2010. "Is household income diversification a means of survival or a means of accumulation? Panel data evidence from Tanzania." Working paper No 122, Brooks World Poverty Institute, University of Manchester.

Escobal, J. 2001. "The determinants of nonfarm income diversification in rural Peru." *World Development* 29(3):497-508.

Ellis, F. 2000. Rural Livelihoods and Diversity in Developing Countries. Oxford: Oxford University Press.

Ellis, F. 1998 ."Household strategies and rural livelihood diversification." *Journal of Development Studies* 35 (1): 1-38.

Giesbert, L. 2007. "Seeking opportunities: migration as an income diversification strategy of households in Kakamega District in Kenya." Working paper No.58, German institute of Global and area Studies.

Haggblade, S., P. Hazell and T. Reardon. 2010. "The Rural Non-farm Economy: Prospects for Growth and Poverty Reduction." *World Development* 38(10):1429–1441.

Ibrahim, H., S.A. Rahman, E. Envulus, and S.O. Oyewole . 2009. "Income and Diversification among farming households in rural area of northern central Nigeria." *Journal of Tropical Agriculture, Food, Environment and Extension* 8(2):84-89.

Kimiri, L., M. Mathenge, J. Olwande, P. Gamba, S.Onnyuma, and J. Lagat. 2010. Globalization and structural change in rural economies, RuralStuc program-Phase II report, Egerton University, Kenya.

Lazarte-Alcala, N., C.L. Adkins, B. Lahiri, and A. Savvides. 2012. "Remittances and income diversification in Bolivia's rural sector"
http://www.learneconometrics.com/pdf/remittances_8_14_12.pdf. (Accessed: Jan 10, 2013)

Losch, B., S. Freguingresh , and E. White. 2011. Rural Transformation and Late Developing Countries in a Globalizing World: A Comparative Analysis of Rural Change. Final Report of the RuralStruc Program, Revised Version, World Bank Washington, DC.

Lucas, E. R.(1997). "International migration in developing countries." Handbook of population and Family Econoics, 1(Part B): 721-798.

Lucas, R. E. 2007. "Migration and rural development." *Electronic Journal of Agricultural and Development Economics* 4(1): 99-122.

Marchetta, F. 2013. "Migration and nonfarm activities as income diversification strategies: the case of Northern Ghana." *Canadian Journal of Development Studies* 34(1): 1-21.

Muntenje, M. J., G.F. Ortman, S.R.D. Ferre, and M.A.G. Darroch. 2010. "Rural livelihood diversity to manage economic shocks: Evidence from South-East Zimbabwe." *Agrekon* 49(3):338-357.

Rubenstein, H. 1992. "Migration, development and remittances in rural Mexico." *International Migration* 30(2): 127-153

Sana, M., and S.D. Massey. 2005. "Household composition, family migration, and community context: migrant remittances in four countries." *Social Science Quarterly* 86(2), 509-528.

Schwarze, S., and M. Zeller. 2005. "Income diversification of rural households in Central Sulawesi, Indonesia." *Quarterly Journal of International Agriculture* 44(1): 61-73.

Senadza, B. 2011. "Does nonfarm income improve or worsen income inequality? Evidence from rural Ghana." *African Review of Economics and Finance* 2(2): 104-121.

Shaw, J. 2010. "From Kuwait to Korea: the diversification of Sri Lankan labor migration." *Journal of the Asia Pacific* 15(1):59-70.

Scoones, I. 1998. "Sustainable Rural Livelihoods: A Framework for Analysis." Working Paper No.72, Institute for Development Studies, Brighton, United Kingdom.

Taylor, J. E., S. Rozelle, and A. Brauw. 2003. "Migration and incomes in source communities: a new economics of migration perspective from China." *Economic Development and Cultural Change* 52(1): 75-101.

Vargas-Lundius, R., G. Lany, M.Villarreal, and M. Osorio. 2008. "International migration, remittances and rural development." Policy division, International fund for Agricultural development(IFAD).

Winter-Nelson, A., and A. Temu. 2005. "Liquidity constraints, access to credit and pro-poor growth in rural Tanzania." *Journal of International Development* 17:867-882.

Wouterse , F. 2010. "Migration and technical efficiency in cereal production: evidence from Burkina Faso." *Agricultural Economics* 41(5):385-395.

Wouterse , F. and J.E.Taylor. 2008. “Migration and income diversification: Evidence from Burkinafaso.” *World Development* 36(4):625-640.