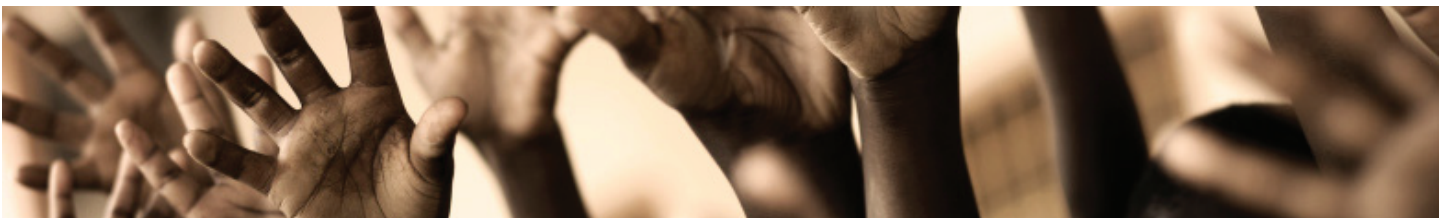


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# **Analysis of impact of remittance on poverty in Nigeria**

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## Abstract

*This study analyzes the impact of remittances on poverty in Nigeria, using data from the 2004 Nigerian National Living Standard Survey (NNLSS). The paper used a multinomial logit model with instrumental variables and the propensity score matching (PSM) method to estimate the impact of remittances on poverty. The use of these methods was based on two reasons. The first is to control for the problems of selectivity and endogeneity. The second is the fact that the implicit hypothesis of estimating the expenditures of the counterfactual group, as done in some previous studies, is in similarity between the group that receives remittances (treated) and the other that does not (untreated). The study finds that both internal and international remittances reduce the incidence, depth and severity of poverty. The statistical tests show a significant Average Treatment Effect on the Treated (ATT), due to internal and external remittances. The receipt of internal remittances reduces the poverty headcount by 11.14% and poverty gap by 9.7% while the receipt of international remittances makes poverty indices almost nil.*

**Keywords:** Remittances, Poverty, Instrumental Variable, Propensity Score Matching, Nigeria

**JEL Classification:** D63, I31, I32, O15, P46.

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## I. Introduction

Remittances are financial resource flows arising from the cross border movement of nationals of a country (Kapur, 2004). Remittances come in form of money, assets or informal or non-monetary forms. Non-monetary forms may include clothing, medicine, gifts, dowries, tools and equipment. In recent years, remittance flows rank behind foreign direct investment (FDI) as source of external funding for developing countries. Global flows of migrant worker remittances were estimated at US\$182 billion in 2004, up 5.7 percent from their level in 2003 and 34.5 per cent compared to 2001 (World Bank, 2004). It is estimated that migrant remittance flows to developing countries now surpass official development aid receipts in many developing countries (Ratha, 2005). Migrants' remittances are currently ranked as the second largest source of external inflows to developing countries after foreign direct investment. Over the last decade, Nigeria is the single largest recipient of remittance in Sub-Saharan Africa (Maimbo and Ratha, 2005). Nigeria receives between 30 percent and 60 percent of remittance to the region (Orozco, 2003). Remittance from Nigerians in various parts of the world was USD 2.8 billion in 2004 (International Monetary Fund (IMF), 2004), ranking second only to oil exports as a source of foreign exchange earnings. Nigeria was among the top 20 developing countries recipients of remittance in 2003 (Ratha, 2005). Commercial bank executives report that in 2006 the recorded flows were estimated at US\$4.2 billion dollars, representing 700,000 transactions and a 30 percent increase from 2005 (Orozco and Millis, 2007). In 2009, Nigeria received \$10 billion in remittances from citizens living in the diaspora and she is currently ranked first among the top 10 remittance recipients in 2010 in sub Saharan Africa, (World Bank, 2011).

The overwhelming majority of remittances in Nigeria are person-to-person flows mainly from the United States, the United Kingdom, Italy, and other Western European countries. Most transfers are through Money Transfer Organizations (MTO's). Informal sources include relatives and town unions and individuals entering Nigeria from their domicile foreign countries among others. Estimate of internal remittance is not known.

Despite the ever increasing size of remittances, both internal and international, there has been little effort to analyze its effect on economic development especially on poverty in Nigeria. As a result, policy measures that will enhance putting remittances to their best uses do not exist. The situation persists in spite of the recognized fact that a well articulated remittance management regime can aid growth and development by providing much needed foreign exchange, and serve as a palliative for its balance of

payment deficit (Nightingale, 2003). Even though, the overall poverty effect remains ambiguous, results elsewhere shows that the comparison of poverty headcounts before and after excluding remittance from the total income of recipients in Latin America do suggest large reductions in poverty levels, especially in those countries where migrants tend to come from the lower quintiles of income distribution (Fajnzylber and Humberto Lopez, 2007). This needs to be verified in Nigeria.

Hence, the key policy question is: how do remittances affect poverty in Nigeria? Specifically, what is the impact on poverty level as measured by depth and severity of poverty on households that receive remittance (internal and international)? Therefore, the main objective of this study is to ascertain the impact of international (inter and intra-regional) and internal remittances on poverty in Nigeria. The remaining part of the paper is organized as follows: section 2 is theoretical framework; section 3 methodology, section 4 is on results and discussion, while section 5 is conclusion.

## II. Theoretical framework

Motivation to remit, as reflected by some schools of thought, includes risk sharing, altruistic or livelihood and risk sharing with altruism. The risk-sharing school maintains that remittances are installments for individual risk management (Stark, 1991; Stark and Lucas, 1988). The altruism or livelihood school considers remittance to be an obligation to the household and remittances are sent out of affection and responsibility towards the family (Chimhowu et al, 2003). The evidence from U.S.-Nigeria migration study (Osili, 2006) suggests that transfers to origin family are motivated by altruistic considerations, with poorer origin-family members in Nigeria receiving larger transfers. The migrant is simply part of a spatially extended household that is reducing the risk of impoverishment by diversifying across a number of activities (de Haan, 1998; Agrawal and Horowitz, 2002). The third school sees both altruism and self-interest as playing a role in the motivation to migrate and remit (Ballard, 2001; Clarke and Drinkwater, 2001).

On the impact of remittance, two dominant perspectives are emerging in literature. The neo-liberal-functionalism persuasion suggests that remittances are beneficial at all levels particularly the individual, household, community and national level (Orozco, 2002; Skeldon, 2002; Ratha, 2003). Remittances are seen to play a crucial role in developing local level capital markets and productive infrastructure as well as increasing the effective demand for local goods and services. Households who are more insured by remittances shift their portfolios towards riskier investments (Paulson and Miler 2000). On impact on poverty, studies have found that both international migration (the share of a country's population living abroad) and international remittances (the share of remittances in country GDP) have a strong,

statistical impact on reducing poverty in the developing world (Adams and Page, 2003). On average, a 10 percent increase in the share of international migrants in a country's population will lead to a 1.6 percent decline in the poverty headcount. Also, a 10 per cent increase in per capita official international remittances in a developing country lead to a 3.5 per cent decline in share of people living on less than \$1/person/day in that country (Adams and Page, 2004). For example, in Guatemala, remittances reduce the severity of poverty; families who report remittance tend to spend a lower share of total income on food and other non-durable goods, and more on durable goods, housing education and health (Adams, 2004)., In rural Mexico, international remittances account for a sizeable proportion of total per capita household income and it reduces both the incidence and depth of poverty (Taylor, Mora and Adams, 2005). Remittance led to reduction in poverty of migrants' origin households (Yang and Martinez, 2005). Also, comparison of poverty headcounts before and after excluding remittance from the total income of recipients in Latin America do suggest large reductions in poverty levels, especially in those countries where migrants tend to come from the lower quintiles of income distribution (Fajnzylber and Humberto Lopez, 2007)

On the other hand, those looking at remittances from historical-structuralist perspective consider remittances to be responsible for creating dependant relations between the sending and the receiving countries (Portes and Borocz, 1989). Remittances are seen to cause inequality in households and macro-economic distortion especially in countries with low GDP. Generally, it remains controversial whether remittances have an overall positive or negative impact on a receiving country's economy and its migrant-producing communities (Page and Plaza, 2005). However, whilst the overall poverty effect as seen from literature remains ambiguous, the overwhelming results from empirical studies show that, apart from possible increase in social inequality and social differentiation, remittances make a powerful contribution to reducing poverty or vulnerability in the majority of households and communities (Chimhowu et al, 2003).

Isolating this impact of remittances on poverty poses some problem because of the nature of remittances. First, it is possible to treat remittance as a simple exogenous transfer of income of migrants. In this regard, the economic question is how remittances in total or at a margin affect the observed level of poverty and inequality in a specific country. However, the problem is that in many cases migration also entails potential losses of income associated with the migrants' absence from their families and communities. In other words, remittances are not exogenous transfers but rather they substitute for the home earnings that migrants would have had if they had not decided to leave their countries to work abroad. In fact, the relevant question is, how would the income distribution of

remittances-receiving households be if the contributing member of the households had not migrated? To consider these effects one needs to estimate the value that household income would have had if migrants had stayed in their households. Hence, it will be more informative to compare the level of poverty in the country with and without remittances. This will require the development of counterfactual income estimates for remittance receiving and non remittance receiving households by using econometric estimations to predict the incomes of households with and without remittances. That is the prediction (estimation) of income of remittance receiving households on the basis of the observed incomes of non-remittance receiving households. However, doing this is subject to the problems of selection bias and endogeneity. For example, if remittance receiving (migrants) and non-receiving (non-migrants) households differ systematically in their unobservable characteristics (e.g. skills and ability), there will be selection bias in any estimate of income which are based on non-remittance receiving households. Also it is difficult to ensure that the variables to be used are exogenous especially as some variables relating to household, for example, education of households are endogenous to remittances and thus will not give independent variations required for estimation.

To capture the impact of remittances, we used two different approaches, propensity score matching approach and multinomial logistic selectivity model with instrumental variable following Adams, Cuecuecha and Page (2008). The use of propensity matching is due to the fact that the implicit hypothesis of estimating the expenditures of the counterfactual group is in similarity between the group that receives remittances (the treatment group) and the other that does not (the untreated group). For example, suppose that a high proportion of those households that do not receive remittances are poor. In that case, the bias is evident and expenditures for the counterfactual group are underestimated. The use of multinomial Logistic selectivity model with instrumental variable is to account for selection bias and endogeneity (for example, the initial level of income can make people to migrate) in the impact estimation. Based on the selection model, an expenditure model that enables us to determine the impact of remittances (internal and international) on poverty is estimated. Endogeneity is taken care of by use of instrumental variables to obtain independent variations in the first-stage choice equation that identify the second-stage expenditure equation.

Note that Heckman (1979) has proposed an econometric approach to correct the selectivity problem, and this, by using the instrumental variables. The estimation of the model can be performed in two stages of estimations (estimating in first stage the inverse Mills ratio), or in one stage of estimation by using maximum likelihood model. However, Heckman's approach explicitly allows for binomial outcomes only. In this study, there are three categories of remittance in which an individual can be self

selected, namely, no remittance, internal remittance from Nigeria and international remittance from Africa and other countries. Therefore, the model used here must account for multinomial selection effects. Hence, multinomial logit selectivity model is used to implement selectivity bias correction when selection is over a large number of exclusive choices, for example, the choices of no remittance, internal remittance and international remittance, as in this case. Additional hypothesis is mobilized to embed the multinomial Logit into a selection bias correction model (Bourguignon, Fournier and Gurgand, 2004). Two traditional approaches are those suggested by Lee (1983) and Dubin and McFadden (1984).

Lee (1983) suggested a polychotomous selection correction model; however, the covariance and linearity assumptions behind it have strong practical implications, as shown by Schmertmann (1994) and Bourguignon, Fournier & Gurgand (2004). As an improvement, Dubin & McFadden (1984) proposed another correction based upon the multinomial logit. Their correction, although more robust than Lee's (1983), might be problematic, when the IIA assumption inherent in the multinomial Logit is violated. More recently, Dahl (2002) proposed a non-parametric correction model. The real drawback in Dahl's (2002) model, compared to the others, is that it is not feasible to test whether the index sufficiency assumption holds especially when the dimension issue is at stake and secondly, the reduction of dimensionality is made at the cost of a restrictive assumption on the correlation structure of the error term. There is a difficulty in interpreting the correction parameters, which have no meaning. A Monte Carlo comparisons implemented by Bourguignon et al. (2004) suggest that a modification of Dubin & McFadden (1984) performs well, even if the IIA assumption from the multinomial Logit is incorrect, while the semi-parametric version performs well, when the conditional mean of the residual is either nonlinear or non-monotonic. Also, Schmertmann (1994) has carefully analyzed the Lee and Dubin & McFadden methods and concluded that the Dubin-McFadden method should be preferred on theoretical grounds although it does not always perform better. The findings suggest that Dubin & McFadden's (1984) model provides consistent and efficient estimates. The Lee methods can only be used in very small samples as suggested by Bourguignon, Fournier & Gurgand (2004).

### III. Methodology

#### 3.1 Data and Household Survey

The data obtained from the Nigerian National Living Standard Survey (NNLSS) conducted in 2004 was used for the study. In the NNLSS data was collected on some indicators which include demography, education, health, employment and time use, migration, housing, social capital and community



participation, agriculture, household expenditure, non-farm enterprise, credit, assets and saving, income transfer and household income schedule. Data on remittances covered total amount received from both migrant members of household and any other individual, total value of food and non-food items received, source of remittances and whether remittances are to be repaid or not

To carry out this study and based on available data, households were classified as receiving internal (from Nigeria), international (from Africa and other countries) and no remittances. As indicated, data on remittances includes transfers received in three forms: money (cash), food and non-food goods. Adding all these together is important because it leads to a more accurate measure of the total flow of remittances to households in Nigeria. Thus the total remittances in this study were obtained by adding together the three different forms of receipts as households had reported cash receipts and the value of food and non-food items received. This gave rise to a total of 7931 households used for the study. Out of 7931 households, 15.53% (1232) received internal remittances from Nigeria, 0.37% (29) received international remittances from Africa and other countries while 84.10% (6670) did not receive remittances. The population weight was used as the weighing variable while the household size was used as the size variable.

## **3.2 Adopted Approaches and Methods**

### **3.2.1 Propensity Score Matching Approach**

In Propensity Score Matching (PMS), we first considered receiving remittances as a “treatment” so that we estimated an average treatment effect of remittance using propensity score matching approach. Propensity score matching in its simplest form involves predicting the probability of treatment on the basis of observed covariates for both the treatment and the control group samples (Rawlings and Schardy, 2002). The propensity score matching method summarizes the pre-treatment characteristics of each subject into a single index variable, the propensity score, which is then used to match similar individuals (Esquivel and Huerta-Pineda, 2007). In propensity score matching, one picks an ideal comparison group from a larger survey and then matches the comparison group to the treatment group on the basis of set of observed characteristics on the predicted probability of treatment given observed characteristics (“propensity score”) (Ravallion, 2001). The observed characteristics are those used in selecting individuals but not affected by the treatment. Thus in this study, the critical assumption that we are making in using this methodology is that the decision to be treated (that is, receiving remittances), although not random, ultimately depends upon observable variables. Rosenbaum and Rubin (1983) show that if you can match on variable  $x$ , then one can match on probability of  $x$ . Therefore, for estimating the impact of remittance on poverty, two groups are identified, those with

remittance (denoted as  $R_i = 1$  for household  $i$  and those without ( $R_i = 0$ ). Those with remittance (treated) are matched to those without (control group) on the basis of the propensity score: (probability of receiving remittance given observed characteristics)

$$p(x_i) = \text{prob}(R_i = 1 | x_i) \quad (0 < p(x_i) < 1) \text{-----equation (1)}$$

where  $x_i$  is a vector of pre-remittance control variables. If the  $R_i$ 's are independent over all  $i$ , and the outcomes are independent of remittance transfers given  $x_i$  then outcomes are also independent of remittances given  $p(x_i)$ , just as they would be if remittances were transferred randomly.

Propensity score matching is a better method of dealing with differences in observables. However, a few tests that have been done suggest that with good data, propensity score matching can greatly reduce the overall bias and outperforms regression-based methods (Ravallion, 2001). Rosenbaum and Rubin (1983) established the following conditions in order to be able to estimate Average Treatment on the Treated (ATT) effect based on the propensity score:

Condition 1: The Balancing Hypothesis

$$R \perp X | p(X) \text{-----equation (2)}$$

This means that for observations with the same propensity score, the distribution of pre-treatment characteristics must be the same across control and treated groups. That is, conditional on the propensity score, each individual has the same probability of assignment to treatment, as in a randomized experiment.

Condition 2: Unconfoundedness or [Conditional Independence Assumption](#) given the Propensity Score:

$$Y_1, Y_0, \perp R | X \Rightarrow Y_1, Y_0, \perp R | p(X) \text{----- equation (3)}$$

If assignment to treatment is unconfounded conditional on the variables pre-treatment, then assignment to treatment is unconfounded given the propensity score.

After computing the propensity score, the ATT effect ( $\tau$ ) is estimated as follows:

$$\tau = E\{Y_{1i} - Y_{0i} | D_i = 1\} \text{-----equation (4)}$$

$$\tau = E\{E\{Y_{1i} - Y_{0i} | D_i = 1, p(X)\}\} \text{-----equation (5)}$$

$$\tau = E\{E\{Y_{1i} | D_i = 1, p(X_i)\} - E\{Y_{0i} | D_i = 0, p(X_i)\} | D_i = 1\} \text{-----equation (6)}$$

Where:  $Y_{1i}$  is the potential outcome if the individual is treated.

$Y_{0i}$  is the potential outcome if the individual is not treated.

Different matching methods are used in calculating to construct the counterfactual group since the propensity score is a continuous variable. Among these methods we can cite nearest neighbor matching, kernel matching, radius matching, local linear regression matching. The nearest neighbor matching was used in this study. The nearest neighbor consists of matching each treated individual to the nearest untreated individual, that is individuals with closest propensity scores are matched. The major issues in nearest neighbor matching are whether to match with or without replacement and number of nearest neighbors to use. Matching with replacement allows the untreated observation to form the counterfactual for more than one treated observation. Matching without replacement can yield very bad matches if the number of comparison ( $D=0$ ) observations comparable to the treated observations is small. Matching without replacement keeps variances low at the cost of potential bias while matching with replacement keeps bias low at the cost of larger variance. The other issue regards number of nearest neighbors to use. In single neighbor matching,  $w(i, j) \in \{1,0\}$ . In k nearest neighbor matching,  $w(i, j) \in \{1/k,0\}$ . In number of nearest neighbor, there is also a tradeoff between bias and variance. Matching one nearest neighbor minimizes bias as all matches are close matches while additional nearest neighbor increases the bias, as marginal observation are necessarily worse matches, but decreases the variance, because more information is being used to construct the counterfactual for each treated person.

We employed nearest neighbor matching, matching five neighbors with replacement to estimate the ATT. The ATT in the nearest neighbor is computed as follows:

$$\tau^{NN,M} = \frac{1}{N^T} \sum_{i \in T} \left[ Y_i^T - \sum_{j \in C(i)} w_{ij} Y_j^C \right] \text{-----equation (7)}$$

$$= \frac{1}{N^T} \left[ \sum_{i \in T} Y_i^T - \sum_{i \in T} \sum_{j \in C(i)} w_{ij} Y_j^C \right] \text{-----equation (8)}$$

$$= \frac{1}{N^T} \sum_{i \in T} Y_i^T - \frac{1}{N^T} \sum_{j \in C} w_j Y_j^C \text{-----equation (9)}$$

where

$$w_{ij} = \frac{1}{N_i^C} \text{ if } j \in C(i) \text{ and } w_{ij} = 0 \text{ otherwise}$$

$$w_i = \sum_j w_{ij} \text{ and } C(i) = \min \|p_i - p_j\| \text{ for the nearest neighbor matching method}$$

Where  $N^T$  is number of treated observations,  $N^C$  is number of control observations;  $w_{ij}$  is weight of the set of treatment and comparison unit. In the propensity score analysis, different remittance situation namely, received remittance versus no remittance, internal remittance versus no remittance, international remittance versus no remittance and international remittance versus internal remittance were matched. The aim was to ascertain the effect of different remittance situation on poverty (per capita household expenditure). The variables included in the propensity score matching are human capital and household variables. The basis for including them in the analysis follows the standard literature on migration and remittances. According to human capital model, human capital variables are likely to affect migration and then remittances because more educated people have access to better employment and increased income earning opportunities. Also household characteristics, for example, age of household head, number of males members and children have been shown to affect migration and hence remittances. Adams, (1993) and Lipton, (1980) indicated that households with older heads and more males over age 15 and fewer children under age 5 are more likely to be involved in migration and hence remittance. Other variables were also included. Considering the issue of conflicts that is rampant in some parts of Nigeria, household affected by conflict was also included as a variable. It is expected that households affected by conflict will have more migrants who are avoiding the conflict situation and they will also be sending in more remittances for those who have stayed back to cope with the situation. In addition, considering the level of social capital networks in Nigeria, a variable to capture social capital – household participation in community programmes- was included. It is expected that the variable will be positive to remittances. Moreover, variables to account for migration networks and some control variables were included in the estimation. Variables accounting for migration network at the level of ethno-religious group, namely, number of female headed households receiving internal and international remittance was included. Ethno-religious groups were used based on the fact that sociological literature has stressed the importance of family and village networks in encouraging migration (Massey, Golring and Durand, 1994) and the fact that ethnicity and religion and the major social networks in Nigeria.

### **3.2.2. Multinomial Logit Selectivity Model with Instrumental Variable**

In line with the selection model developed by Dubin-McFadden and Bourguignon, Fournier and Gurgand (2004) and following Adams, Cuecuecha and Page (2008), assume that households can select between three states ( $r$ ): receive international remittances =1, receive internal remittances=2 and receive no remittances =3. If a household chooses a state, they decide their level of expenditure  $y_r$ , where  $y_r$  is the optimal expenditure for households that chose  $r=r$  depending on their own characteristics. In order to describe the model, consider the expenditure of international remittance

situation given as  $y_{r1}$ , then following Bourguignon, Fournier and Gurgand (2004), the model can be specified thus:

$$y_{r1} = x\beta_{r1} + \mu_{r1} \text{-----equation (10)}$$

$$y_j^* = z\gamma_j + \eta_j \text{-----equation (11) } (j = 1,2,3)$$

where the disturbance  $\mu_1$  is not parametrically specified and verifies  $E(u_1 | x, z) = 0$  and  $V(u_1 | x, z) = \sigma^2$ .  $j$  is the categorical variable that describes the different choices of remittance situation where  $y_j^*$  is a latent function to capture a discreet observation either the individual is in a remittance situation or not. The vector  $z$  represents the maximum set of explanatory variables for all alternatives plus a set of instrumental variables that are supposed to affect the migration decision and the vector  $x$  contains all determinants of expenditure of international remittance situation. The outcome variable  $y_{r1}$  is observed if and only if (*iff*) international remittance situation is chosen, that is, when

$$y_{r1}^* > \max(y_j^*)_{j \neq 1} \text{-----equation(13)}$$

Let us define 
$$\begin{aligned} \varepsilon_1 &= \max(y_j^* - y_{r1}^*)_{j \neq 1} \\ &= \max(z\gamma_j + \eta_j - z\gamma_{r1} - \eta_{r1}) \end{aligned} \text{-----equation (14)}$$

Under equation (14), equation 13 is equivalent to:  $\varepsilon_1 < 0$

Assuming that the  $(\eta_j)$ 's are independently and identically Gumbel distributed (that is the IIA hypothesis), and the cumulative and density functions of the error term are respectively  $G(\eta) = \exp(-e^{-\eta})$  and  $g(\eta) = \exp(-\eta - e^{-\eta})$ , the discreet choice component, as shown by McFadden (1973) can be estimated using a multinomial logistic regression. However, to estimate  $\beta_{r1}$  consistently, it is important to consider the fact that  $E[\mu_{r1} | x] \neq 0$ .

Given that the outcome variable  $y_{r1}$  is observed *iff*  $y_{r1}^* > \max(y_j^*)_{j \neq 1}$  then

$$\begin{aligned} E[y_{r1} | x] &= E[x\beta_{r1} + \mu_{r1} | y_{r1}^* = \max y_j^*] \\ &= x\beta_{r1} + E[\mu_{r1} | y_{r1}^* > y_{r2}^*, y_{r1}^* > y_{r3}^*] \text{-----equation (15)} \end{aligned}$$

$$= x\beta_{r1} + \mu(p) \text{-----equation (16)}$$

where  $\mu(p)$  measures the bias in the error term, due to the fact that the error is taken from a truncated multinomial distribution, a Gumbel distribution in this case (Koch and Ntege, 2008). Identification requires an exclusion restriction where at least a variable, an instrumental variable (IV), is included in the first stage equation of receipt of remittances and not included in the second stage expenditure equation. Normally, the main econometric problem lies in selecting the instrumental variables. The

major problem with the use of instrumental variable is that it is difficult to obtain a good instrument from a cross sectional data set. Normally, the validity of the exclusion restriction required by IV is questionable with only a single cross-sectional data set; while one can imagine many variables that are correlated with remittance, such as household characteristics, community characteristics, geographic characteristics of an area etc., it is questionable on a priori grounds that those variables are uncorrelated with expenditure per capita (poverty) given remittance. Hence the major issue is to have a good instrument that can be used for estimation.

To derive the instrument and solve the problem of endogeneity, we followed the approach used by Adams, Cuecuecha and Page (2008). Considering that migration networks are important in migration decision and in receipt of remittances (as found out by Woodruff and Zenteno, 2007; and Munshi, 2003), and since ethnicity and religion represent two important form of association in Nigeria as in Ghana, we assumed that households in Nigeria will form migration networks and then remit on the basis of ethnicity and religion. Migration network factor and ethnicity can affect the decision to migrate and not the level of income or remittance. Thus we partitioned the data into 18 ethno-religious groups based on three religions (Christianity, Moslem and Traditional as found in the data) and six geopolitical zones. The zones are South East, representing the Igbo speaking area, the South West, representing the Yoruba speaking area, the South-South representing the Ijaws mainly with other small groups, North Central, representing the Gwari's and other minor groups, the North East representing the Hausa Fulani and the North West representing the Hausas. The observed ethnic groups are the major ones in the different zones although some minor ones exist. Table 5 shows how the households are distributed based on ethnic and religious groups. The Table shows that four ethno-religious groups account for 62.16% of the sample. The two instrumental variables are also presented in the Table. They are remittances received as a percent of household income in the ethno-religious group, and international migrants as a percentage of population in the ethno-religious group.

Table 5 equally shows that some ethno-religious groups receive remittances more than the others. The result shows that those in the southern part of Nigeria (whether Christians or Moslems) receive more remittances than those in the northern part of the country. It also shows that some groups do not have international migrants while those that have produced migrants at different rates. The basis for using the variable as instruments is because they are correlated with the size and efficiency of the ethno-religious group in generating remittances (Adams, Cuecuecha and Page, 2008). The validity of the instruments was checked by the test of overidentifying restriction which was carried out using a linear version of the model. The result of the test shows that Hansen's  $J$   $\chi^2(1)$  of 1.61731 was not significant

with a p-value of 0.2035 suggesting that the instruments are valid, that is, that they are uncorrelated with the unobserved component of the expenditure equation.

The instrumental variables were included in the first stage equation but not in the second stage equation. All the variables included in the first stage equation were also included in the second equation with the exception of the IVs. The variables and rationale for including them was the same for the propensity score matching already described above. Besides the other variables already described, a control variable for group wealth, square of income of ethno-religious group of the household, was also included to control for the externality effect of the benefits due to remittances which households without remittances can receive from their ethno-religious group. Other control variables included are regional dummies, square of age, square of the human capital variables, and interaction of squared age with regional dummies. The identification assumption is that subject to the observable characteristics of households and ethno-religious groups, that the IVs are uncorrelated with the observed components of the expenditure equation.

After the estimating the model with sample selection, a counterfactual expenditure for households in the no remittance situation was developed by using predicted expenditure equations to identify the expenditures of households with and without remittances. The methodology for obtaining these estimates was based on the literature on the evaluation of programs for the case in which instrumental variable is available (Maddala, 1983; Wooldridge, 2002). The methodology as used by Adams, Cuecuecha and Page, (2008) includes three steps. First, starting with observed expenditure, that is, the expenditure reported by households in the survey. Second, the predicted expenditures of type  $j$ , conditional on choosing type  $j$  is obtained. Third, the counterfactual expenditures for households, defined as the expected value of expenditures for households of type  $r$ , conditional on them choosing type  $j$ .

## IV. Results

### 4.1 Summary Data on Remittances from NNLSS

The summary data presented in Table 1 reveals some interesting differences between the different categories of remittances. The result shows that those receiving international remittances have more human capital than those receiving internal and no-remittances. The number of household members over age 15 with university education is significantly different between those with no-remittances and

those with international remittances. Those with international remittances have more members with university education suggesting that households with more adults with university education are likely to receive international remittances. In terms of household characteristics, the age of household head in households receiving international and internal remittances are higher and significantly different from those receiving no remittances. This suggests that households headed by older people are more likely to receive internal and international remittances than those headed by younger people. Number of males over age 15 was found to be significantly different between households that receive no remittances and those that receive internal and international remittances. Households with more males over age 15 are more likely to receive internal and international remittances. Also the Table shows that households receiving international remittances have the highest mean per capita expenditure, while those with no remittances have the lowest. The means of international and internal are significantly different from those without remittances. The mean amount received by households that received internal remittance was ₦21,726.43 while for households that received international remittance, the mean amount was ₦52,112.24.

#### **4.2 Propensity Score Matching**

In the propensity score matching, different remittance situations, namely, received remittance versus no remittance, internal remittance versus no remittance, international remittance versus no remittance and international remittance versus internal remittance were matched. The propensity score tests showed that the all untreated and treated samples for the analysis were in the region of common support. The variables met the balancing tests at different steps. Normally, in balancing test, paired t-test examine whether the mean of each element of the independent variables for the treatment group is equal to that for the matched sample for the different steps. Table 2 shows the logit estimates from the propensity score matching for different remittance receiving situations. The results shows that, with the exception of the variable- number of household members over age 15 with junior secondary education- that was significant at 1% level of probability for receiving remittances against no remittance situation, and receiving internal remittance against no remittance situation, the human capital variables generally did not have any significant effect in receiving remittances versus no remittances, and in receiving internal/international remittances versus no remittances. Some household characteristics influenced remittance receipts. Age of first marriage of the household head negatively and significantly influenced receiving remittances as against no remittances, and internal remittance as against no remittances. This suggests that household heads that marry late (at an advanced age) are less likely to receive remittances. Some variables which include household size, and sex negatively and significantly influenced receiving remittance versus no remittance and receiving internal remittance versus no



remittance. This suggests that those with large households and male headed are less likely to receive internal remittances. Migrations networks although positive to remittances did not significantly influence receiving internal remittance as against no remittance. However, the number of female headed households receiving international remittances in the ethno-religious group positively and significantly influenced receipt of remittance generally as against no remittance and receipt of international remittances as against no remittance. Furthermore, almost all the control variables did not influence receipt of remittances. Participation in community programmes significantly influenced receiving remittance versus no remittance and receiving internal remittance versus no remittance. This suggests that participation in community programmes, a proxy for social capital, increases the likelihood of receiving internal remittances. As regards international remittances versus no remittance, living in an urban area positively and significantly influences international remittances.

The result of the average treatment effect on the treated (ATT) that is average gain in expenditure per capita by remittance receiving households, using nearest neighbor matches is shown in Table 3 and 4. The result shows that based on analytic standard errors, the ATT for remittance receiving versus non receiving, receiving internal remittance versus no remittance and receiving international remittance versus no remittance was 8200.27, 7261.71 and 15,236.70 Nigerian naira respectively. The t values of 3.77 and 3.28 for remittance receiving versus non receiving, receiving internal remittance versus no remittance respectively for test of difference between the treated and control groups was greater than the tabular value of 1.96 at a probability value of 0.05. This shows that the impact of remittance on per capita expenditure between remittance receiving versus non receiving households and receiving internal remittance versus no remittance households using nearest neighbor matching was significant. On the other hand, the t-value for receiving international remittances versus no remittances of 1.31 was not significant suggesting that the impact of international remittances in this study is not significant. Also, when international remittance receiving was compared with internal remittances, the ATT (9683.03) showed that remittance receiving between the two groups was not significantly different at a t-value of 0.57.

To show the expected level of remittances according to income level, a non-parametric regression was carried out. The curve (Figure 1) shows that the expected per capita remittances differ with income level. Initially, the expected remittances increased with income level up to a point after which it either decreased or increased with income. Generally, those with more income are more likely to receive more remittances than those with less income.

### 4.3 Multinomial Logit Selectivity Model with Instrumental Variable

The result of the first stage model is presented in Table 6. The result shows that none of the human capital variable is related to the receipt of internal or international remittances. The result from the table further indicates that some household variables, namely, age of household head, and sex category of household head is significantly related to the receipt of internal remittances. Age and sex have negative effect suggesting that young female household heads will more likely receive internal remittances. The variable representing ethno-religious group characteristics (square of income of ethno religious group) is negatively and not significantly related to internal remittances. The instrumental variables, remittances as percentage of household income and international migrants as percentage of population in group had no influence on receiving internal remittance. As regards international remittance, household size is positively and significantly related to international remittances while sex category of an individual is negatively related to international remittance thus female headed households with large households are more likely to receive international remittances.

The result of the second stage equation is presented in Table 7. The result shows that human capital is associated with higher levels of expenditure for non-remittance receiving households. The expenditure per capita for these households were significantly (at 1 and 5% probability levels) influenced by number of households members over age 15 with senior secondary education and university education. On the other hand, unexpectedly, the number of household members over age 15 with primary education was negative and significant to per capita expenditure. This suggests that low levels of expenditure per capita is associated with non remittance receiving households with higher number of its members age 15 with primary school education. The findings as regards human capital of households and its effect on expenditure per capita is in line with a priori expectation that households with higher levels of human capital are more likely to have higher per capita expenditure.

In terms of household characteristics, the findings indicate that household characteristics influences per capita expenditure. As may be expected, non remittance receiving households with large household sizes and those with elderly heads of household have low levels of expenditure per capita as the result shows that age of the household head, and household size negatively and significantly influenced expenditure per capita. On the other hand, non remittance receiving households with more males over the age of 15 and those that live in urban areas have significantly higher rates of per capita expenditure.

The result further shows that ethno-religious group characteristic is associated with high levels of expenditure per capita for non-remittance receiving households. Moreover, migration networks are significantly associated with levels of expenditure per capita for non-remittance receiving households. The results in Table 7 shows that the higher the numbers of female-headed households receiving internal remittances among the ethno-religious groups the lower the per capita expenditure for non-remittance receiving households, while the higher the number of female headed households receiving international remittances among the ethno-religious groups the higher the expenditure per capita.

In addition, the findings show that the number of household members over age 15 with primary school education negatively and significantly (at 5% level of probability) influenced per capita expenditure for households that received internal remittance. This suggests that higher number of household members with primary school education is associated with low levels of expenditure per capita for internal remittance receiving households. As regards household characteristics, the result shows that household size negatively and significantly influenced expenditure per capita for internal remittance receiving households. Thus households with large household size have significantly lower levels of expenditure per capita for internal remittance receiving households. Households with more males over 15 years of age also have significantly higher expenditure per capita for households that received internal remittance. Also, like the non-remittance receiving households, migration networks significantly influenced expenditure per capita for internal remittance receiving households. The results shows that the higher the numbers of female-headed households receiving internal remittances among the ethno-religious groups the lower the per capita expenditure, while the higher the number of female headed households receiving international remittances among the ethno-religious groups the higher the expenditure per capita. Generally, the analysis for those that received international remittances was not significant suggesting that international remittance is not a major issue. This may be as a result of the low sample size (29) of households that reported international remittances in the data set.

Furthermore, the observed, predicted and counterfactual expenditures for the three groups of households, (those receiving no remittance, those receiving internal remittance and those receiving international remittance) and poverty indices based on these expenditure levels and poverty line of twenty three thousand, seven hundred naira (N23,733) is reported in Table 8.

The poverty line used was the one used by the Nigeria's National Bureau of Statistics (NBS) in calculating poverty indices in 2004 when the data used was collected. The poverty measures considered were poverty headcount, poverty gap and squared poverty gap. The first measure – poverty

headcount- shows the percent of the population living below the poverty line. The second measure reported on the Table, which is the poverty gap is the percentage of expenditure required to bring each individual below the poverty line up to the poverty line. The third reported measure, the squared poverty gap indicates severity of poverty by giving larger weight to the extremely poor (core poor) thus it is sensitive to the changes in the distribution of the poor. For example, a transfer from a poor person to a poorer person will decrease the squared poverty gap but will not influence headcount or poverty gap index.

The result shows that households receiving international remittances have the highest mean per capita expenditure, followed by those that received internal remittances while non-remittance receiving households have the least per capita expenditure. Thus, households with no remittances have more observed poverty (68.84% - column 1) than households receiving internal remittances (49.82%-column 3) and those receiving international remittances (13.49%-column 6). With the receipt of remittances, the result further shows that the poverty status of households that receive internal remittances improves. The result from comparing the predicted poverty value in column (4) with the counterfactual poverty value in column (5) shows that for households with internal remittances, the receipt of internal remittances reduces the poverty headcount of this group of households by 11.14% and poverty gap by 9.7%. Thus percentage of expenditure required to bring each individual below the poverty line up to the poverty line is reduced by 9.7% due to internal remittances. Also, the result shows that internal remittances reduces squared poverty gap by 10.01%.

In addition, notwithstanding receipt of international remittances was not significant in the expenditure equation, the results in Table 8 shows that remittances also play a lot of role for households receiving international remittances. In addition to having the highest observed per capita expenditure and the lowest observed poverty (13.49%) of all the households, their economic status improves considerably with the receipt of remittances. Comparing the predicted value in column (7) and the counterfactual value in column (8) shows that for households receiving international remittances, the receipt of international remittances reduces poverty headcount, poverty gap and squared poverty gap of this group by almost 100% respectively. Thus international remittance is more poverty reducing than internal remittances which in turn is more poverty reducing than no-remittance situation.

## V. Conclusions

This study, analyzed the impact of remittances on poverty in Nigeria using the Nigerian National Living Standard Survey, 2004 data. Two approaches, multinomial logit model with instrumental variables and

propensity score matching method (PSM) were applied in estimating the impact of remittance on poverty. The use of these methods was based on two reasons. The first is to control for the problems of selectivity and endogeneity. The second is the fact that the implicit hypothesis of estimating the expenditures of the counterfactual group, as done in some previous studies, is in similarity between the group that receives remittances (treated) and the other that does not (untreated). In the PSM, the nearest neighbor matching was used. The instrumental variable in the multinomial logistic selectivity model focused on variation in remittance receiving among various ethno-religious groups in Nigeria due to the fact migration networks are formed based on these groups.

The study finds that internal and international remittances reduce the level, depth and severity of poverty in Nigeria. Using PSM, the result shows a significant Average Treatment Effect on the Treated (ATT), due to internal and international remittances after the nearest neighbor matching suggesting that the gains due to internal and international remittances are significant. In addition, the receipt of internal remittances reduces the poverty headcount of households by 11.14% and poverty gap by 9.7% while the receipt of international remittances reduces poverty headcount, poverty gap and squared poverty gap by almost 100%. Thus international remittances have more poverty reducing effect although this needs to be further verified with a more robust international remittance data. Generally, the findings suggest that remittances can be used as a tool to fight poverty in Nigeria considering the fact that remittances had effect on poverty. Poverty alleviation intervention projects especially carried out presently in Nigeria by National Poverty Eradication Programme (NAPEP) could be targeted more on poor households that do not receive remittances. On the other hand, policies to encourage remittances could be encouraged, for example, providing hassle free means of bringing in and transferring remittance. In this regard, there is need for an appropriate regulatory framework and monitoring in addition to the expansion and deregulation of financial infrastructure for the movement of remittances in Nigeria. By focusing poverty alleviation on non-remittance receiving households, the inequality that could be created by remittances would be reduced. Also, by improving the ability of remittance receiving households to receive remittances, for example, by making remitting and receiving measures hassle free, poverty can be reduced among remittance receiving households. Also, more people could then be encouraged to remit thus reducing poverty generally. In addition, the increase in remittances due to enhancement of remittance infrastructure and the resultant increase in indirect tax especially for international remittance receipts could trigger poverty reduction. Poverty reduction is possible as the taxes from remittances could be redistributed to poorer households through targeted programs

Considering the poverty reducing effect of internal remittances, it is imperative that this type of remittances is encouraged in Nigeria. To encourage internal remittances, there is need to incorporate the microfinance banks which are more in the rural areas into the electronic money transfer infrastructure which is currently operated by commercial banks in Nigeria. This will help to reduce the stress those in rural areas undergo in a bid to reach big banks in cities for their remittance. Also, policies to strengthen social capital networks could enhance remittances. Also, policies to strengthen the capital market and banks and increase the confidence of bank customers as regards the stability of the banks would help enhance internal remittances.

Moreover, policies to encourage better use of remittance funds could be focused more on low household size cum female headed households and households with elderly household heads that are likely to receive more remittances. Such programs could be in form of capacity building and campaigns to encourage better use of international remittances. Above all, policies to enhance the level of infrastructure development especially roads and electricity will support migration within the country and hence internal remittances. In fact, improved infrastructure will enhance the business environment (trade facilitation, business registration and licensing and contract enforcement) in Nigeria and encourage Nigerians outside Nigeria to do business in Nigeria, leading to increased international remittances. In all, the findings provide enough evidence to show that remittances have significant effect on poverty. Thus incorporating the findings through some policy measures as indicated would help reduce poverty in Nigeria.

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## Appendix : Tables and Figures

**Table 1: Summary data of non-remittances and remittances households**

Variable	Receive no remittances	Receive internal remittances (from Nigeria)	Receive international remittances (from African or other countries)	t-test (No remittances vs. internal remittances)	t-test (No remittances vs. International remittances)
<b>Human Capital</b>					
Number of household members over age 15 with primary school	0.448 (0.804)	0.402 (0.752)	0.241 (0.577)	0.046 (1.871)*	0.207 (1.38)
Number of household members over age 15 with junior secondary school	0.147 (0.46)	0.125 (0.40)	0.00	0.022 (1.57)	0.147* (1.71)
Number of household members over age 15 with senior secondary school	0.309 (0.707)	0.319 (0.714)	0.517 (1.089)	-0.010 (-0.49)	-0.208 (-1.58)
Number of household members over age 15 with university	0.078 (0.350)	0.070 (0.347)	0.344 (0.857)	0.008 (0.70)	-0.267 (-4.05)***
<b>Household Characteristics</b>					
Age of household head in years	46.112 (13.739)	53.132 (16.889)	56.137 (18.492)	-7.020*** (-15.86)	-10.026*** (-3.91)
Age of first marriage	25.860 (5.933)	24.960 (6.306)	26.556 (7.546)	0.899 (4.56)***	-0.696 (-0.61)
Household size	5.042 (2.960)	4.226 (3.014)	4.172 (2.450)	0.816*** (8.86)	0.870 (1.58)
Number of males over age 15	1.285 (0.908)	1.072 (0.996)	0.897 (0.900)	0.213*** (7.44)	0.388** (2.298)
Number of children under age 5	0.011 (0.130)	0.006 (0.089)	0.00	0.005 (1.34)	0.012 (0.48)
Mean per capita expenditure	32328.28 (36874.32)	44987.95 (51808.50)	53227.62 (25426.94)	-12659.68*** (-10.32)	-20899.34*** (-3.05)
Mean remittance received	-	21,726.43 (43081.27)	52,112.24 (66845.93)		
N	6670	1232	29		

Source: Computations by the authors from the data

Note: values in parenthesis are standard deviations while the last two columns, the values are t-values

Note: \*\*\*, \*\*, \* refer to significant difference at 1%, 5% and 10% probability levels respectively

**Table 2: Logit estimates from the propensity score matching for different remittance receiving situation**

Variables	Received remittance vs no remittance	Internal remittance vs no remittance	International remittance vs no remittance	International vs internal remittance
<b>Human Capital</b>				
Number of household members over age 15 with primary school	-0.10 (-1.10)	-0.09 (-0.94)	-0.53 (-0.81)	-0.36 (-0.57)
Number of household members over age 15 with junior secondary school	-0.27*** (-2.97)	-0.24*** (-2.69)	-	-
Number of household members over age 15 with senior secondary school	-0.02 (-0.18)	-0.008 (-0.08)	-0.16 (-0.34)	-0.53 (0.82)
Number of household members over age 15 with university	-0.28 (-1.32)	-0.29 (-1.32)	0.059 (0.08)	0.87 (0.99)
<b>Household Characteristics</b>				
Age of household head in years	-0.014 (-0.97)	-0.009 (-0.61)	-0.12* (-1.68)	-0.12 (-1.62)
Age of first marriage	-0.02*** (-3.14)	-0.021*** (-3.24)	0.028 (0.75)	0.23 (0.58)
Household size	-0.032* (-1.65)	-0.036* (-1.79)	0.018 (0.13)	0.13 (0.93)
Number of children under age 5	-0.11 (-0.35)	-0.092 (-0.29)	-	-
Number of males over age 15	0.03 (0.53)	0.041 (0.76)	-0.56 (-1.40)	-0.71 (-1.56)
Sex	-0.86*** (-7.58)	-0.84*** (-7.33)	-0.85 (-1.29)	-0.031 (-0.04)
<b>Migration Networks</b>				
Number of female headed households receiving internal remittances in group	0.002 (0.10)	0.003 (1.06)	-0.022 (-1.50)	-0.023 (-1.43)
Number of female headed households receiving international remittances in group	0.081** (2.06)	0.065 (1.63)	0.71*** (2.71)	0.72** (2.51)
Square of internal migrants in group	5.61x10 <sup>-6</sup> (0.73)	4.75x10 <sup>-6</sup> (0.61)	0.000012 (0.28)	0.000012 (0.24)
<b>Control Variables</b>				
Squared number of household members over age 15 with primary school	0.003 (0.10)	0.0004 (0.01)	0.089 (0.36)	0.11 (0.46)
Age squared	0.0004*** (2.90)	0.0003** (2.50)	0.0011** (2.02)	0.0010 (1.56)
Squared number of household members over age 15 with junior secondary school	-	-	-	-
Squared number of household members over age 15 with senior secondary school	-0.006 (-0.21)	-0.012 (-0.39)	0.091 (0.80)	0.21 (1.34)
Squared number of household members over age 15 with university	0.109 (1.37)	0.091 (1.09)	0.199 (0.87)	-0.005 (-0.02)
Region dummy-Christian	-0.401 (-0.52)	-0.42 (-0.55)	13.30*** (6.23)	13.18*** (5.69)
Religion dummy-Moslem	-0.55 (-0.72)	-0.54 (-0.70)	10.94*** (4.81)	10.81*** (4.38)

Religion dummy-Tradobief	-0.013 (-0.02)	-0.25 (-0.03)	13.52*** (5.74)	13.67*** (5.30)
<b>Others</b>				
Sector (urban =1, rural otherwise)	0.12 (1.09)	0.04 (0.40)	1.96*** (3.46)	2.15*** (3.43)
Participation in community programmes	0.18** (2.50)	0.16** (2.18)	0.82* (1.82)	0.75 (1.57)
Household affected by conflict	0.33* (1.83)	0.32* (1.80)	0.045 (0.04)	-0.18 (-0.12)
Constant	-0.65 (-0.75)	-0.77 (-0.89)	-17.09	15.08

Source: Computations by the authors from the data

Note: \*\*\*, \*\*, \* refer to significant difference at 1%, 5% and 10% probability levels respectively Z values in parenthesis.

**Table 3: Average treatment effect on the treated (ATT) for the nearest neighbour matches based on the outcome variable (per capita expenditure) – Analytical Standard Errors**

Remittance situation	No Treated	No Control	ATT	Standard Error	T-stat
<b>Received remittance vs no remittance</b>	1261	1366	8200.27	2178.15	3.77
<b>Internal remittance vs no remittance</b>	1232	1362	7261.71	2216.55	3.28
<b>International vs no remittance</b>	29	1547	15,236.70	11635.16	1.31
<b>International vs internal</b>	29	288	5505.07	9683.03	0.57

Source: Computations by the authors from the data

Note: The number of treated and controls refer to actual nearest neighbour matches

**Table 4: Average treatment effect on the treated (ATT) for the nearest neighbour matches based on the outcome variable (per capita expenditure) – Bootstrapped Standard Errors**

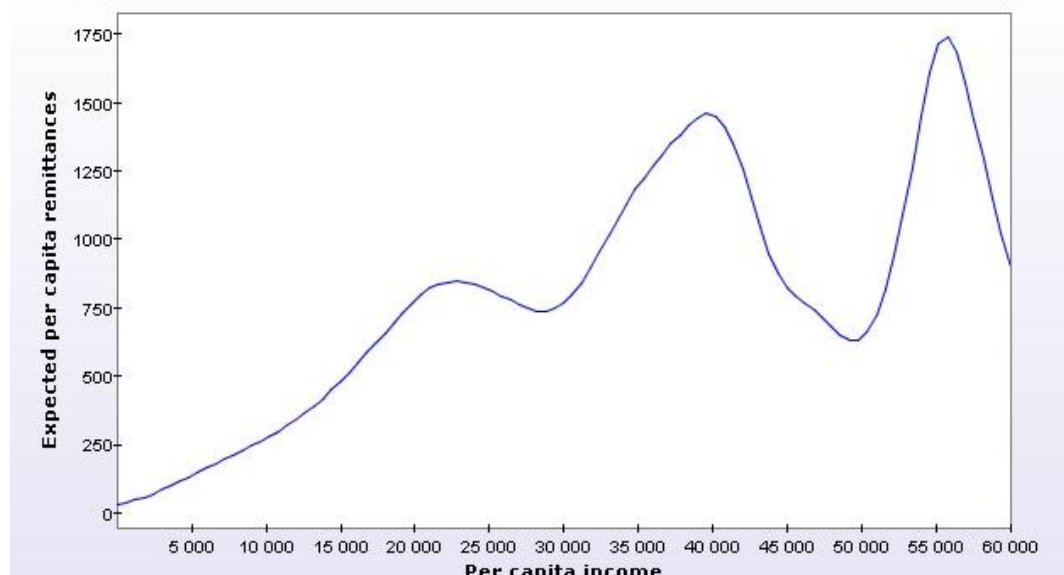
Remittance situation	No Treated	No Control	ATT	Standard Error	T-stat
<b>Received remittance vs no remittance</b>	1261	1360	8084.41	2309.27	3.50
<b>Internal remittance vs no remittance</b>	1232	1362	7333.85	2240.71	3.27
<b>International vs no remittance</b>	29	1547	15,236.70	10985.99	1.39
<b>International vs internal</b>	29	288	5505.07	12399.31	0.44

Source: Computations by the authors from the data

Note: The number of treated and controls refer to actual nearest neighbour matches

**Figure 1 :**

Non parametric regression of per capita income on per capita remittances



**Table 5: Ethno-religious groups of Nigeria and instrumental variable**

S/No	Ethno-religious group	Number of households	Percent of households	Instrumental Variable - Remittances received as percent of household income in group (%)	International migration as a percent of population in group (%)
1	Christian South-East	1,087	13.71	24.78	0.38
2	Christian South-South	1,127	14.21	15.12	0.44
3	Christian South-West	768	9.68	17.10	0.52
4	Christian North East	360	4.54	0.93	-
5	Christian North –Central	517	6.52	7.51	0.58
6	Christian North –West	135	1.70	0.88	-
7	Moslem South-East	9	0.11	14.41	-
8	Moslem South-South	31	0.39	19.21	-
9	Moslem South West	484	6.10	27.09	1.45
10	Moslem North East	1,163	14.66	2.21	-
11	Moslem North –Central	424	5.35	1.18	-
12	Moslem North –West	1,553	19.58	5.32	0.06
13	Traditional South-East	134	1.69	16.8	-
14	Traditional South-South	62	0.78	9.40	1.61
15	Traditional South-West	22	0.28	27.07	-
16	Traditional North East	21	0.27	0.50	-
17	Traditional North –Central	27	0.34	16.76	-
18	Traditional North –West	7	0.09	0.00	-
<b>Total</b>		<b>7,931</b>	<b>100.00</b>		

Source: Authors computations from data

**Table 6 : Result of the multinomial logit model**

Variables	Receive internal remittances (Nigeria)		Receive international remittances (Africa and others)	
	Coefficient	z-values	Coefficient	T values
<b>Human Capital</b>				
Number of household members over age 15 with primary school	-0.14	-1.58	-0.68	-0.95
Number of household members over age 15 with junior secondary school	-	-	-	-
Number of household members over age 15 with senior secondary school	0.01	0.11	-0.24	-0.54
Number of household members over age 15 with university	-0.31	-1.45	-0.11	-0.16
<b>Household Characteristics</b>				
Age of household head in years	-0.04***	-3.20	-0.07	-1.00
Household size	-0.01	-0.89	0.19**	2.02
Number of males over age 15	0.09	1.63	-0.22	-0.59
Number of children under age 5	-0.17	-0.51	-31.64	-0.00
Sex	-1.03***	-10.62	-1.07*	-1.89
Sector (urban and rural)	0.22***	2.50	2.39***	4.66
<b>Ethno-religious group characteristics</b>				
Square of income of ethno religious group	-2.07x10 <sup>-11</sup>	-1.08	1.20x10 <sup>-11</sup>	0.11
<b>Migration Networks</b>				
Number of female headed households receiving internal remittances in group	-0.002	-0.44	-0.08	-1.99
Number of female headed households receiving international remittances in group	-0.09	-1.00	-5.07	-1.08
Square of internal migrants in group	0.00	1.15	0.0009	1.37
<b>Control Variables</b>				
Squared number of household members over age 15 with primary school	0.01	0.38	0.06	0.21
Age squared	0.0007***	5.46	0.0009	1.33
Squared number of household members over age 15 with junior secondary school	-0.10	-1.06	7.26	0.00
Squared number of household members over age 15 with senior secondary school	-0.02	-0.77	0.05	0.54
Squared number of household members over age 15 with university	0.09	1.06	0.17	0.78
Region dummy-Christian	-0.19	-0.23	10.70	0.52
Religion dummy-Moslem	-0.26	-0.32	13.76	0.56
Religion dummy-Tradobief	-0.36	-0.45	-15.04	-0.00
Agesquared_Northwest region	-0.0001**	-2.46	-0.001	-0.97
Agesquared_Northcentral region	-0.0001**	-2.26	-0.0003	0.65
Agesquared_Northeast region	-0.0004***	-5.92	-0.13	-0.00
Agesquared_Southwest region	0.00002	-0.40	0.00008	0.31
Agesquared_South-south region	-0.00005	-0.88	-0.00002	-0.06
Agesquared_Southeast region	-	-	-	-

### Instrumental Variables

Remittances as percentage of household income in group	0.01	0.99	-0.05	-0.91
International migrants as percentage of population in group	0.32	1.24	20.19	1.24
Constant	-0.12	-0.15	-19.87	-0.77
Log likelihood	-3216.46			
Pseudo R <sup>2</sup>	10.95			
N	1232		29	

**Table 7 : Per capita household expenditure estimates (selection corrected)**

Variables	Receive no remittance		Receive internal remittances (Nigeria)		Receive international remittances (Africa and others)	
	Coefficient	T-values	Coefficient	T-values	Coefficient	T values
<b>Human Capital</b>						
Number of household members over age 15 with primary school	-2844.04**	-2.53	-11708.11**	-2.11	-244977.9	-1.09
Number of household members over age 15 with junior secondary school	-852.09	-0.75	-3294.89	-0.51	-	-
Number of household members over age 15 with senior secondary school	2248.39*	1.94	4605.71	0.96	-80639.21	-0.32
Number of household members over age 15 with university	18662.13***	6.85	2438.91	0.17	-129811	-0.55
<b>Household Characteristics</b>						
Age of household head in years	-763.17***	-2.72	-807.77	-0.75	-56197.17*	-2.50
Household size	-4286.62***	-22.54	-6248.59***	-8.21	82902.66	1.63
Number of males over age 15	2416.68***	3.42	13453.84***	4.29	-98724.56	-2.13
Number of children under age 5	2519.59	0.69	-9806.91	-0.60	-	-
Sex	-5075.64	-1.05	-26201.96	-1.03	-1057167	-1.66
Sector (urban and rural)	11997.64***	9.63	15196.20*	1.90	1241542	2.16
<b>Ethno-religious group characteristics</b>						
Square of income of ethno religious group	5.32x10-7***	3.26	1.15x10-7	0.22	-0.00004*	-2.40
<b>Migration Networks</b>						
Number of female headed households receiving internal remittances in group	-133.39**	-2.19	-570.08**	-2.53	-24544.5*	-2.23
Number of female headed households receiving international remittances in group	2822.85***	5.63	7702.99***	3.49	-741652.6	-1.26
Square of internal migrants in group	0.29	1.40	0.33	0.44	-0.00004*	-2.40
<b>Control Variables</b>						
Squared number of household members over age 15 with PS	555.46*	1.72	1348.04	0.86	-20566.48	-0.16
Age squared	-10.09	-1.51	15.01	0.95	751.40*	2.34
Squared number of household members over age 15 with SSS	-405.92	-1.09	-1218.51	-0.69	147.95	0.00
Squared number of household members over age 15 with university	-3954.93***	-3.70	-1494.49	-0.27	88772.09	1.47



Region dummy-Christian	-6634.99	-0.64	48363.33	0.96	-386843	-1.27
Religion dummy-Moslem	-14245.41	-1.38	14564.42	0.29	-	-
Religion dummy-Tradobelief	-7076.07	-0.67	21268.08	0.42	-3701001	-1.21
Agesquared_Northwest region	17.87**	2.59	-10.58**	-2.48	-4669.15	-1.55
Agesquared_Northcentral region	18.56***	2.68	-10.05***	-2.73	-164.97	-2.00
Agesquared_Northeast region	-	-	-72.35	-1.32	-	-
Agesquared_Southwest region	17.62**	2.45	-4.84***	-2.80	58.05	1.72
Agesquared_South-south region	17.59**	2.48	-7.90***	-4.30	12.14	0.55
Agesquared_Southeast region	18.69***	2.60	-	-	-	-
_m1	-15556.38	-1.03	24828.05	0.64	-	-
_m2	20645.45	1.20	-	-	2095285	1.55
_m0	-	-	-44800.31	-0.79	-2534218	-1.68
Constant	83361.11***	4.51	-2427.14	-0.03	1985034	1.11
Adjusted R <sup>2</sup>	21.94		13.89		1.15	
N	6670		1232		29	

Source: Authors computations from data using selmlog from SATA

Note: \*\*\*, \*\*, \* refer to significant difference at 1%, 5% and 10% probability levels respectively. Analysis for those that received international remittances was not significant (Prob>F = 0.57)

**Table 8: Effects of remittances on poverty for non-remittance and remittance receiving households**

<i>Poverty Measures</i>	<i>Received no remittance</i>		<i>Receive internal remittances</i>			<i>Receive international remittances</i>			<i>Internal remittance vs no remittance</i>	<i>International remittances vs no remittance</i>
	Observed (1)	Predicted (2)	Observed (3)	Predicted (4)	Counterfactual (5)	Observed (6)	Predicted (7)	Counterfactual (8)	(4 vs 5)	(7 vs 8)
Poverty headcount (%)	61.84	45.25	49.82	38.75	43.61	13.49	0.00	3.47	--11.14	-100.00
Poverty gap (%)	25.17	55.54	18.72	61.88	68.53	2.71	0.00	2.95	-9.70	-100.00
Squared poverty gap (%)	13.18	124.99	9.24	191.75	213.08	0.7	0.00	5.24	-10.01	-100.00
Mean per capita household expenditure	32,328.28	31,921.99	44,987.95	45,130.88	35,689.20	53,227.62	58,796.85	43,004.78	26.46	36.72
N	<b>6670</b>	<b>6670</b>	<b>1232</b>	<b>1232</b>	<b>1232</b>	<b>29</b>	<b>29</b>	<b>29</b>	<b>1232</b>	<b>29</b>

Source: Authors computations from data