

Remittances and Poverty in Ghana¹

Kwabena Gyimah-Brempong

Department of Economics
University of South Florida
4202 East Fowler Avenue
Tampa, FL 33620
email: kgyimah@coba.usf.edu
Tel: (813) 974 6520

and

Elizabeth Asiedu

Department of Economics
University of Kansas
Lawrence, KS 66045
email: asiedu@ku.edu

September 28, 2009

¹Paper to be presented at the 4th African Economic Conference (AEC), Addis Ababa, Ethiopia, November 2009. David Roodman suggested and provided the codes for the *cmp* program. We thank David Klinowski for outstanding research assistance. Any remaining errors are, of course, our own.

Abstract

This paper investigates the effects of international remittances on poverty incidence and severity in Ghana. Using both cross section data from Ghana Living Standards Survey wave 5 (GLSS5) and pseudo-panel data constructed from GLSS3-GLSS5 and a GMM pseudo-panel estimator, we find that international remittances decreases the probability of a family being poor or chronically poor. The effect of international remittances in reducing poverty is far higher than the effect of domestic remittances in reducing poverty. We also find that remittances increases the number of children in a family that attend school, suggesting that international remittances increase human capital formation. We interpret this to mean that international remittances also decreases poverty in the long run. Our results are robust to the measurement of “poverty”, sample, and estimation methodology. Our results have important policy implications.

KEY WORDS: REMITTANCES, INTERNATIONAL, INTERNAL, GHANA, POVERTY IMPACTS CROSS-SECTION, PSEUDO-PANEL, GMM ESTIMATION

JEL: O, O1, O24, O54, F35, F43

1 Introduction

International migrant remittances to the developing world has been increasing in importance relative to other transfers. It has eclipsed ODA in importance in the developing world as whole. International remittances to Ghana increased from \$31 million in 1999 to \$1.4 billion on 2002. Between 1990-1999 and 2000-2006, the share of international remittances in GDP increased by about 216% while foreign direct investment FDI/GDP and external aid (Aid) Aid/GDP ratios increased by only 8% and 16% respectively (World Development Indicators: 2007). The Bank of Ghana reports that in 2006, inward remittances to Ghana was \$4.25 billion, by far the largest source of foreign exchange for Ghana (eclipsing cocoa and gold exports). [check with Elizabeth]. These suggest that immigrant remittances are an important part of the Ghanaian economy and Ghanaian households in particular; international remittances are important to the well being of citizens of the developing world generally. While there has been a growing body of research on the effects of such flows on aggregate economic performance and balance of payments, it is only recently that a few studies have been conducted to investigate the effects of international remittances on the welfare of households in developing countries. Moreover, most of the studies on the subject has focused on the uses of international remittances rather on how remittances affect the living standards of households. The few studies that have been conducted have generally relied on cross sectional data. To what extent do remittances improve the living standards of Ghanaian households in the short and long runs?

This paper uses cross-section data from the latest wave of the Ghana Living Standards Survey (GLSS), pseudo-panel data constructed from waves 3-5 of GLSS, and pseudo-panel data estimation based on General Method of Moments (GMM) to investigate the effects of international remittances on the welfare of Ghanaian households. Specifically, we investigate whether international remittances help households escape income poverty, all things equal. We use three measures of income poverty—headcount, poverty gap and the square of poverty gap—as well a measure of consumption poverty in our analysis. To the extent that international remittances help households stay out of poverty, such remittances improve the living standards of Ghanaian households in the short run. If such remittances also help recipient households to acquire higher levels of human or physical capital or some form of business investment, these remittances may also decrease poverty of recipient households in the long run. Therefore, in addition to the effects of remittances on poverty, we

also investigate the effects of remittances on human capital formation at the household level. We measure human capital formation as the proportion of children in a household attending primary or completing school and the proportion of children attending secondary school in the household.

Investigating the effects of international remittances on the welfare of households of sending countries is of interest for a number of reasons. Among them, it is often argued that sending countries lose to the receiving countries when their young and brightest, often educated at public expense, emigrate to the latter countries that happen to be the developed countries. If remittances improves living standards of sending countries, then such remittances may offset some of the cost to the sending countries. Azam and Gubert (2006) argue that remittances must be seen as a contingent flow from a joint family decision to send its young ones abroad in exchange for financial flows from the emigrant to smoothen the family's consumption. If that is the case, investigating remittances on poverty will help shed light to what extent these flows fulfill the implicit contracts. Third, this study shed some light not only on how remittances affect the poverty status of households in the short run, but also how it determines poverty status in the long run through human capital formation. Finally, investigating whether the gender of the recipient household head makes a difference in the effect of remittances has important policy implication for household welfare and human capital development.

Our paper makes important contributions to the literature on the relationship between remittances and poverty in Less Developed Countries (LDCs). This paper uses both a cross section and pseudo-panel data constructed from the last three waves of GLSS to investigate the effect of remittances on poverty thus allowing us to compare the statics of poverty with possible dynamics of the relationship. We also use several measures of poverty that makes it possible for us to investigate the robustness of the effects of remittances on different measures of poverty. Third, we estimate the probability of being absolute poor or falling into relative poverty hence we use both probit as well as ordered probit estimation methods. Fourth, we use the latest GMM pseudo-panel data estimation methodology that provides consistent efficient estimates even in the presence of individual and cohort fixed effects. Finally, our estimation methods and data sets allows us to investigate the robustness of our results to the measurement of poverty as well as the estimation method used.

Our results can briefly be summarized as follows: We find that international remittances reduces the probability that a household will be poor either in the extreme sense or relative sense. This

results is robust to the measurement of poverty we use and the sample data—cross section or pseudo-panel—we use. We also find that there is a gender effect on the remittances having an effect on poverty incidence. We also find that the receipt of international remittances increases the number of children who attend primary and secondary school. These results indicate that international remittances have significant and positive effect on the education of children, hence long-run poverty reduction in Ghana.

The rest of the paper is organized as follows. Section 2 reviews the literature on the effects of remittances on poverty and consumption in Less Developed Countries (LDCs) generally and Africa in particular. Section 3 presents the equation we estimate and discusses the estimation method followed by a discussion the data and the construction of the pseudo-panel in section 4. Section 5 presents and discusses the results while section 6 concludes the paper.

2 Literature Review

Interest in the effects of international remittances on economic outcomes and household welfare in LDCs has been on the increase in recent years. Although most of the empirical work has been done for Latin American and Asian countries, a few studies have been done using African data. We review some of the studies that are relevant for our paper in this section.

Adams (2004, 2006) uses survey data for Guatemala and Ghana to investigate the effects of remittances from domestic and international migrants on poverty and income distribution. Using a methodology that estimates what household expenditures would have been had the households included the migrant, he finds that remittances reduce poverty but has no effect on income distribution in Guatemala and Ghana. The degree to which remittances impact poverty depends on how one measures poverty. Guzman *et al* (2006) uses the GLSS4 data and an intra-household bargaining framework to investigate the impact of gender of remittance recipients and senders on the patterns of expenditures. They find that female-headed household that receive remittances (withing Ghana and internationally) spend more on education, health, housing, and durable consumer goods compared to female household heads who do not receive remittances or their male counterparts.

Litchfield and Waddington (2003) uses GLSS3 and GLSS4 to investigate migration patterns and the effects of migration of household welfare. They conclude that migration generally im-

prove the welfare of households as measured by probability of being poor, household expenditures, and primary school enrollment of children in households. Our paper is similar to Litchfield and Waddington's except that we use pseudo-panel data estimation method to improve efficiency while they limit themselves to cross section analysis. Glewe (1991) uses data from the Cote d'Ivoire Living Standards Survey (CLSS) to investigate the determinants of welfare in Cote d'Ivoire and finds that education, asset ownership (including farm equipment and land in rural areas, savings and sector of employment are significant determinants of welfare.

Quartey and Blankson (2004) and Quartey (2006) use GLSS3-GLSS4 data and pseudo-panel data estimation method to investigate the effects of remittances on income smoothing in Ghana. They conclude that all things equal, remittances have been a source of income smoothing for Ghanaian especially during periods of macroeconomic instability. They estimated a random effects model. However, as Inoue (2008) argues, both RE and FE are inconsistent in the presence of individual or cohort fixed effects. Mukherjee and Benson (2003) investigates the determinants of poverty in Malawi and finds education, age profile of household head, the composition of the household, industry of employment, ownership of productive capital, as well as community characteristics are important determinants of poverty. At the macro level, Gupta, Pattillo and Wagh (2007) uses panel data to investigate the impact of remittances on poverty and financial development in Sub-Saharan Africa and find that international remittances significantly reduces poverty and improves financial development in Sub-Saharan Africa, all things equal.

Azam and Gubert (2006) investigates the effects of remittances on household in the Senegal Valley in Mali and Senegal. They develop a model in which migration and remittances are joint strategic decision by the migrant and his/her family to insure against income instability through diversification of income sources. They find that the threat of expulsion from immigrant and recipient network created ensures enforcement of the implicit contract between migrants and their families. However, the paper also finds that the reliable insurance provided by migrant remittances induce shirking on the part of remittances causing them to reduce their work effort at home. If this were the case, remittances cannot be a mechanism to reduce poverty in the long run.

Acosta *et al* (2008) use cross country panel data as well as household level survey data to investigate the effects of international remittances on poverty and income inequality in Latin America and finds that remittances reduces poverty by increasing income growth and reducing inequality at the aggregate level in Latin America. At the micro level however, they find that while remit-

tances reduce poverty substantially when one does not correct for potential income of the migrants, poverty reduction that is associated with remittances decreases substantially when one controls for ‘counterfactual’ of no migration. Brown and Jimenez (2007) conducts similar analysis using data from Fiji and Tonga and find results that are similar to those of Acosta *et al.* However they find that for income inequality, remittances increase the gini coefficient for Fiji while decreasing it for Tonga.

None of the studies reviewed above uses modern pseudo-panel methodology to study the effects of international remittances on poverty incidence and education as we do in this paper. Cross-section data will not be able to capture temporal variation on remittances, such as those that may be caused by world wide economic fluctuations. While cross-section data may capture the effects of variations in remittances on poverty across households, it may be necessary to investigate the effects of temporal variations as well, especially if there are temporal changes in poverty across households. For example, it is known that the parameters of poverty effect of remittances estimated from cross section data changes from period to period (McKenzie and Sasin: 2007). Besides, McKenzie and Sasin point out that the study of migration and remittances is fraught with endogeneity issues not likely to be solved cross-section data or simple estimation methodologies. Finally, investment in education has a strong temporal dimension that cannot be adequately captured by cross-section data. Panel data may capture such temporal effects. Lacking a true panel data, the next best way to study the long term effects of remittances on poverty and education is to use pseudo-panel data estimation approach.

3 Model and Estimation Method

3.1 Model

There are several ways to model the relationship between remittances and household welfare. One way is to estimate how remittances affect the welfare of families as measured by either household expenditures or some measure of household welfare such where the household ranks in some distribution measure. This is the approach followed by Adams (2004, 2006), Guzman *et al* (2006), Mukherjee and Benson (2003), Quartey and Blankson (2004), Quartey (2006), and Glewe (1991). An alternative approach is to investigate how remittances affect the probability of being poor or not being poor. This is the approach followed by Grootaert (1997), McKenzie (2006), and Brown

and Jimenez (2008). Each approach has its advantages and disadvantages, depending on the objectives of the study. For example, while a concern over the welfare of households may be better investigated using consumption, issues regarding inequality can better be investigated with income poverty. In this paper, we follow the latter approach and investigate the effect of remittances on the probability of being poor.

Following earlier researchers, we assume that the probability of being poor depends on the probability of receiving remittances (*remit*) and other explanatory variables such as family characteristics, location, and other characteristics (\mathbf{X}). We assume that the probability of being in a particular income class (non-poor, poor, extremely poor) (or a child in a household graduating from primary school/ attending secondary school) is determined by an underlying variable that captures the true economic status of the household. This variable (y^*) is assumed to depend on the probability of receiving remittances as well as a vector of other explanatory variables. Formally, we assume that the probability of being poor depends on receiving remittances (*remit*) and other explanatory variables (\mathbf{X}). This variable (y^*) is assumed to depend on receiving remittances as well as a vector of other explanatory variables. Formally:

$$y^* = \alpha_0 + \alpha_1 \textit{remit} + \mathbf{X}\beta + u \quad (1)$$

where α and β are coefficients to be estimated, u is a stochastic error term, and all other variables are as defined above. In general, the latent variable y^* in (1) not observable. What the researcher observes is an event that a household is either poor or not poor. In effect what one observes is:

$$\begin{aligned} y &= 1 && \text{if } y^* > 1, \text{ and} \\ y &= 0 && \text{otherwise} \end{aligned}$$

with $Prob(y = 1) = Prob(u > -\alpha \textit{remit} + \mathbf{X}'\beta) = 1 - F(-\alpha \textit{remit} + \mathbf{X}'\beta)$. We choose the probit functional form in our estimation hence the equation we estimate is: $Prob(\textit{poor} = 1) = \alpha \textit{remit} + \mathbf{X}'\beta + \mathbf{u}$

remit is a dichotomous endogenous variable that can be considered a function of \mathbf{X} and other variables (\mathbf{Z}) that do not directly affect *poor* but does so only through *remit*. Like *poor*, it is derived from a latent variable *remit*^{*} that is only observable when *remit*^{*} > 0, else it is unobservable. *remit* can be written as:

$$\textit{remit} = I(\textit{remit}^* > 0) = \mathbf{I}(\lambda, \mathbf{W}, \xi) \quad (2)$$

where $\mathbf{W} = \mathbf{X} + \mathbf{Z}$. Substituting *remit* into the y equation, one can write y as:

$$\begin{aligned}
y &= I(y^* > 0) \\
&= I(\alpha (\mathbf{X} + \mathbf{Z} + \xi) + \mathbf{X}'\beta + \mathbf{u} \geq 0) \\
&= I(\alpha\lambda, \mathbf{Z} + \mathbf{Z}'(\alpha + \beta) + \xi + u \geq 0) \\
&= I(\mathbf{Z}, \mathbf{X}, \beta, \gamma, \zeta \geq 0)
\end{aligned}$$

where $\gamma = \lambda * \alpha$ and $\zeta = U + \xi$. In this set up the effect of *remit* on poverty incidence is given as..

We follow earlier researchers in determining the variables contained in the \mathbf{X} vector. These include the education of the head of the household (*education*), the age of the head of the household (*age*) and its square (*agesq*), the gender of the head of household (*gender*), number of adult workers in the household (*workers*), household size (*hhsiz*) and rural location (*rural*). In addition, we include an ethnic variable, whether a household belong to the Asante ethnic group (*asante*). This ethnic group has an extensive migration network and their cultural heritage requires the younger generation to take care of their elderly as well as participate in civic projects. This implies that they will be more likely to help other members of their households by taking measures to help reduce poverty. Because we are interested in the effect of international remittances on household poverty, we break total remittances (*remit*) into domestic remittances (*domestic*) and international remittances (*abroad*).

The equation we estimate is given as:

$$\begin{aligned}
Prob(poor = 1|X) &= \alpha_1 domestic + \alpha_2 abroad + \alpha_3 age + \alpha_4 agesq + \alpha_5 gender \\
&+ \alpha_6 asante + \alpha_7 workers + \alpha_8 hhsiz + \alpha_9 rural + \alpha_{10} education \quad (3) \\
&+ \beta_{11} gender * abroad + \varepsilon
\end{aligned}$$

where ε is a stochastic error term and all other variables are as defined above. In addition to the variables discussed above, we have also included an interaction term between gender and abroad to see if there is a gender difference on the effect of remittances on the probability that a household will be poor, all things equal. If remittances decreases the probability that a household will fall into poverty, we expect the marginal effect of *domestic* and *abroad* to be negative, all things equal. We also expect the marginal effect of the *gender/abroad* interaction term to be significant if there is a gender difference in the effect of international remittances on household poverty in Ghana.

3.2 Estimation Method

We estimate (3) with two data sets—cross-section sample based on GLSS5 and a pseudo-panel data set constructed from GLSS3-GLSS5. Efficient estimation from each data may require different estimation method. We therefore briefly describe the estimation methods used for each data set in this section. Sub-section 1 describes the method for estimation with the cross-section data while sub-section 2 discusses the estimation method used for the pseudo-panel data.

3.2.1 Cross-section estimation

Estimating equation (3) will be straight forward with a probit estimator if all regressors were exogenous. If there is a continuous endogenous regressor, one could use standard instrumental variables (IV) two stage probit estimator to estimate the equation. In our study, *remit* is a binary endogenous variable that cannot be represented by the standard linear IV approach in a probit estimation strategy since *remit* is non-linear and linear IV representation will also lead to heteroskedastic errors. Under these circumstances the two stage probit estimation of poverty is not appropriate as Carrasco (2001) points out.¹ Because the dependent variable (*poor*) is binary and one of the regressors (the one of major interest) is also binary, we have a bivariate probit model in which the regressor of interest (*remit*) is binary and endogenous. Our approach to the solution of the problem posed by the endogeneity of *remit* follows the approach suggested by Carrasco (2001). The solution is to specify a reduced form probit equation for *remit* of the following form:

$$\begin{aligned} remit_i &= I(remit_i^* > 0) \\ &= I(\lambda_0 + \lambda_1 \mathbf{X} + \lambda_2 Z_i + \epsilon_i > 0) \end{aligned}$$

where ϵ_i is a normally distributed error term, Z is a vector variables that affect *poor* only through *remit* and \mathbf{X} is as defined above. The key to identification in this set up is to find a set of regressors in the *remit* equation that affect *remit* but does not directly affect *poor*. In this paper, we use migrant networks (*networks*) and the number of remitters (*remitters*) as instruments for the probability of remittances from abroad. These variables meet the criteria for appropriate instruments developed by McKenzie and Sasin (2007).

We instrument for *abroad* as discussed above in estimating the poverty equation. We measure migrant networks (*networks*) as the number of people in the community (town/neighborhood) who have migrated in the last 5 years and the number of people who have sent remittances to the

household in the past (*remitters*) as instruments. We used the *CMP* routine in STATA written by Roodman to implement this bivariate probit estimation. The *CMP* routine is a maximum likelihood estimator that is flexible enough to allow for several estimators, including the bivariate probit. *CMP* estimates the bivariate probit model recursively; while *abroad* is allowed to affect *poor*, *poor* does not affect *abroad*.

While we use bivariate probit to estimate the poverty equation when we measure poverty as *poor*, we use ordered bivariate probit estimator to estimate the poverty equation when we measure poverty as *pstatus* since it is ordered and takes on the value 0, 1, and 2, where 0 indicates extreme poverty, 1 indicates moderate but not extreme poverty, while 2 indicates not poor. As indicated, we instrument for both *poor* and *pstatus* in our estimation. In the bivariate ordered probit, we set the probability of being poor or not poor to zero, in the estimation and use the estimate as an instrument. In the education equation, we measure the dependent variable as the proportion of children in a household who have completed primary school or are enrolled in a secondary school, the variable is censored both from above and below and it is possible that there are a lot zero primary school completion rates.

3.2.2 Pseudo-panel Estimates

In estimating (4) with individual household data, a bivariate probit estimator is called for since both the depended variable and the endogenous regressor both take the value of 0 or 1. When one estimates the equation using a pseudo-panel data, the cohort means of both the dependent variable and the endogenous regressor are non zero but continuous although they may be censored. In this case the bivariate probit estimator is not appropriate for the estimation for the *poor* equation. An estimator with a non-limited dependent variable is the appropriate estimator for estimating the *poor* equation using pseudo-panel data.

In pseudo-panel data setting, one cannot use either the first difference or the fixed effects estimator since the sample household differs from one wave to the next and therefore one cannot estimate an individual fixed effects. On the other hand, individual errors are likely to be correlated with regressors in any wave, making the random effects (RE) estimator inconsistent. Deaton has suggests creating a panel of cohorts and using the cohort means as individual observations for estimation with appropriate panel estimator. Since the cohort means are not likely to represent the population means with errors, Deaton's estimator is an errors in variables estimator. The estimator

produces consistent estimates if the cohort sizes are large and the selection into cohorts do not change over time. In addition, in our setting, we have an endogenous regressor in *abroad*, hence this estimator may not be appropriate.

The Deaton estimator is based on group averages for the cohorts. Taking group time averages for equation (4), the pseudo-panel model can be written as:

$$p\bar{o}r_{st} = \bar{\alpha}_{st} + \delta_s + \beta' \bar{W}_{st} + \bar{\varepsilon}_{st} \quad (4)$$

where $p\bar{o}r_{st}$, \bar{W}_{st} are group means of the dependent and explanatory variables for group s at time t , $\bar{\alpha}_{st}$ group specific fixed effect for group s at time t , δ_s in time invariant group specific group effects for group s , $\bar{\varepsilon}_{st}$ is the mean error term for cohort s at time t , and β is a vector of coefficients to be estimated. The moment restrictions required for the estimation of this equation is that the group section variable ($i \in I_{N,st}$) is orthogonal to the error term $\alpha_i + \varepsilon_i$, where $I(\cdot)$ is an indicator function that selects into group st . Formally, the moment conditions necessary for FE or a GMM estimator to be used to estimate this equation is: $\bar{E}(\alpha_i + \varepsilon_i | i \in I_{1t(s)})$ for all T and S . For relatively large cohort sizes, Deaton suggests either a least squares estimator or a fixed effects (FE) as the appropriate estimator for such a pseudo-panel model.

Several authors have suggested that Deaton's estimator may be inconsistent or produce inefficient estimates when time invariant group fixed effects are not appropriately accounted for. In addition, we treat *abroad* as an endogenous regressor, it is unlikely that the FE estimator will be appropriate for purposes. In the presence of a binary regressor, some authors have suggested using a linear probability estimator to estimate the first stage and use a probit in the second stage.² Recent research has argued that the first stage linear probability estimator is inappropriate since there is no guarantee that the estimated linear probability in the first stage will lie in the $[0 \ 1]$ range; moreover the assumption of linear marginal effects may not be appropriate. Even if it did, the linear probability introduces heteroskedastic errors in the endogenous regressor. These authors have suggested various GMM estimators. Inoue (2008) has suggested that Deaton's least squares estimator produces estimates that asymptotically converges to a random variable while the fixed effects estimator is consistent but inefficient. He suggests a GMM estimator that is robust to the existence of time invariant group fixed effects and also efficient. This estimator is derived from the orthogonality conditions implied by the grouping to create the cohorts. We use the estimator suggested by Inoue.

The Inoue GMM estimator is given as:

$$\hat{\beta}_{\text{GMM}} = (\dot{\mathbf{W}}' \dot{\mathbf{\Omega}}^{-1} \dot{\mathbf{W}})^{-1} \dot{\mathbf{W}}' \dot{\mathbf{\Omega}}^{-1} \dot{\mathbf{y}} \quad (5)$$

where $\dot{\mathbf{W}}$ is the $S(ST - 1) \times (K + L)$ matrix obtained from deleting the $Tth, 2Tth \dots STth$ rows of \mathbf{MW} , where \mathbf{W} a matrix of regressors, \mathbf{M} is a set of orthogonality conditions obtained from forming the cohorts, $\dot{\mathbf{\Omega}}$ is the variance covariance matrix of ϵ adjusted for cohort sizes, and $\dot{\mathbf{y}}$ are the cohort means of the dependent variable. This estimator can be modified to account for heteroskedasticity and autocorrelation. Inoue shows that even when the FE and the GMM estimators are based on the same moment conditions, the GMM estimator is efficient because it is based on the optimal weighting matrix and is preferred to the FE estimator. We calculate Hansen's J statistic to check for over identifying restrictions in our estimation.

4 Data

The data used for this study comes from wave 5 and waves 3-5 (for pseudo-panel) of the Ghana Living Standard Standard Surveys (GLSS). Beginning in September 1987, Ghana with the help of the World Bank, has conducted surveys of living standards of large nationally representative samples of households at regular intervals. GLSS1 was conducted in 1987/1988, GLSS2 was conducted in 1988/89, GLSS3 was conducted in 1991/1992 and covered the entire country with a sample of 4552 households in all 407 enumeration areas; GLSS4 was conducted in 1998/1999, covered the entire country and had a sample of 6,000 households while GLSS5 was conducted in 2005/2006, covered the entire country with a sample size of 8,687 households. It appears that each wave of GLSS covered more households as well as provided more detailed and comprehensive information about the living standards of Ghanaian households than previous ones. Besides the increasing detail regarding information provided in succeeding waves, one difference between GLSS3 on the one hand and GLSS4 and GLSS5 on the other is the absence of information about Upper East and Upper West administrative regions which were carved out of the old Upper Region of Ghana in 1983.

These surveys contain detail information on socio economic characteristics of households, ethnicity, gender, household size and composition, income, employment, consumption, and educational attainment, among other variables. These surveys also have information on whether households receive remittances, source of remittances (internal or international), amount of remittances, as well

as the disposition of remittances, including consumption, private and public investment projects, as well human capital formation (health and education). The detailed nature of the survey data allows us to investigate the effects remittances on poverty status and human capital formation. We are not able to use data from GLSS1 and GLSS2 because the surveys did ask detailed questions about remittances as well as some of the socioeconomic variables necessary to estimate the equations.

The variable of main interest in this paper is remittance. The GLSS provides information on whether households receive remittance or not; and if so whether the remittance is from within Ghana (*domestic*) or from outside Ghana (*abroad*), whether these remittances are cash remittances or remittances of goods, as well the monetary value of such remittances. We measure remittance as the sum of monetary value of cash and good remittances received by households in a year. Because we are interested in the effects of international remittances on poverty status of Ghanaian households, we break remittances into *domestic* and international (*abroad*) remittances. Although the GLSS asks questions about the amount of remittances received by a household, because of recall problems, it is most likely that the amount will be measured with a large error. Moreover, the questionnaire is administered to the head of the household and while she/he may accurately recall the receipt of a remittance to another member of the household, she/he is unlikely to recollect the amount of the remittance with much accuracy. We therefore measure *remittance* as whether a household receives a remittance in a year without regard to the size of the remittance. However, we make a distinction between the probability of receiving remittance from within Ghana (*domestic*) and international (*abroad*).

The dependent variables we are interested in are the poverty incidence and school attendance. We measure poverty incidence in several different ways. First, we measure poverty as the probability that a household falls into poverty based on defined poverty lines.³ The lower poverty line (*POOR0*) is set at C700,000.00 with 199/99 as the base while upper poverty line (*POOR1*) is set at C900,000.00. This is consistent with the headcount measure of poverty. Second, we use the poverty lines to calculate poverty gap (*POVGAP*) as well as the square of the poverty gap (*POVGAPSQ*) based on the lower poverty line as additional measures of poverty. It is well known that the headcount measure of poverty does not adequately capture the *severity* of poverty. These additional measures of poverty are intended to capture these aspects of poverty. In addition to these additional measures of poverty, we also include consumption as additional measures of household welfare. We measure human capital investment by the proportion of children in a household

that are enrolled or completed primary school (*PRIMARY*) or enrollment in secondary school (*SECONDARY*).

We measure education (*education*) as the highest level of education attained by the head of the household where education is coded as follows: none = 0, primary = 1, technical, vocational = 2, secondary, teacher training A & B = 3, SSCE, GCE A level, teacher training post sec = 4, polytechnic = 5, bachelors = 6, masters = 7, doctorate = 8. Age (*age*) is the age of the head of the household, workers (*workers*) is the number of adult workers in a household, household size (*hhsiz*) is measured as the total number of people in a household, *gender* is an indicator variable that takes the value 1 if the head of the household is male, zero otherwise, *asante* is an indicator variable that equals unity if the household belongs to the Asante ethnic group, zero otherwise, while rural (*rural*) is a dichotomous variable that equals 1 if the household lives in a rural area, zero otherwise.

Sample statistics of the cross-section data from GLSS5 used for estimating the model are presented in table 1. The sample statistics suggest that about 24% households in the sample are poor. This poverty rate is further sub-divided into 16.04% extremely poor and 8.05% moderately poor. The 24.09% poverty rate in GLSS5 is a strong improvement over the poverty rate of 39.5% estimated in GLSS3.⁴ Heads of households in the sample are predominantly male (72%), while the average household has 4.2 members with a very large variation. Similarly, the average household head is 42.34 years old with a very large range (15 – 99 years) in age. 58.4% of the households in the sample reside in rural areas compared to about 41.6% living in urban areas. The mean educational attainment of household heads in the sample is low. About 31% of all household heads have no formal education, another 33% has only primary education; on the other hand only about 3% of household heads had the equivalent of a bachelors degree or more. About 29.8% of households in the sample received some form of remittances from within Ghana (*domestic*) while only about 6.9% of households received international remittances (*abroad*). The mean amount of *domestic* and *abroad* are C 1,687,258.00 and C 7,777,685.00 respectively indicating that the average amount international remittance is about five times that of domestic remittance.⁵

Some comments on the characteristics of the sample data, summarized in table 2, are in order. Of the 24.09% of households in poverty in 2006, fully 86.3% lived in rural areas. Compared to the proportion of rural households in the sample (58.4), the proportion of poor households in rural households suggests that poverty in Ghana is a predominatly rural phenomenon. Surprisingly,

a larger proportion of male-headed households were more likely to be poor than female headed households. Only 15.89% of female headed households were poor compared to 27.25% of male-headed households. This may partly be explained by the dominance of male-headed households in the sample from the three poor northern regions of Ghana. Nationally, the data indicates that 72.12% of households in the sample are headed by males and on average, 24.09% are poor. In the three poor northern regions, 85.92% of households are headed by men and the average poverty among households in these three regions is 64.41%. Unlike Quartey and Blankson (2004) who find that female headed-households were less likely to receive remittances compared to the male-headed households, we find that female-headed households are more likely to receive remittances both from Ghana and abroad. While 24.49% and 5.67% of male-headed households received remittances from within Ghana and abroad respectively, 44.01% and 11.15% of female headed households received domestic and foreign remittances respectively. While it is true that in absolute terms, fewer female-headed households received remittances compared to male-headed households, in relative terms, female-headed households have a higher probability of receiving international remittances than male-headed households.

While the sample data described above is based on the latest wave of GLSS (GLSS5), the pseudo panel data we construct and used for the pseudo panel data portion of the study is similarly structured. Deaton (1985) suggests creating cohorts based on some pre-determined characteristics that are time invariant. In building the pseudo-panel data set involves a trade off between the size of a cohort and the number of cohorts. Increasing the number of cohorts decreasing the average size of a cohort thus increasing the chance that the cohort means do not represent the population characteristics of that cohort. On the other hand, increasing the size of each cohort decreases the number of cohorts leading to inefficient estimates on account of possible lack of variation across cohort means and small sample size. We created cohorts based on the year of birth, gender, and location (rural or urban). We created 5 year birth year bands, two locations (rural and urban), and two gender categories (male/female). With 8 birth years, two locations and two genders, we obtained 32 cohorts for each wave for a total sample of 96 cohort observations.

The distribution of cohort sizes are presented in table 3. The average sample size for a cohort is 196.96 with a minimum of 88 and a maximum of 538. In general, the average cohort sizes are larger for male-headed rural household while they are smallest for female-headed urban households regardless of the age bracket one looks at. This is partly due to the fact that there are more male-

headed households in Ghana than female-headed households and the GLSS generally samples more rural households than urban households. Finally, younger cohorts are over-represented compared to older cohorts in the data. Another characteristic of the data is that poverty rates are higher in older, male-headed, rural cohorts than their female-headed, younger urban cohorts. The data also show that conditional on on year of birth and gender, urban cohorts are more likely to receive external remittances compared to rural cohorts. Even though we measure poverty as the probability that a household falls into a category of poverty, the cohort means are never zero hence these cohort means are essentially continuous variables.

5 Results

This section presents the estimates of equation (3) using both the cross-section data from GLSS5 and the pseudo-panel data constructed from GLSS3-GLSS5. The first subsection presents the estimates for the poverty equation while the second subsection presents the estimates for the school enrollment equation. The first part of each sub-section presents the estimates based on the cross-section data while the second section presents the estimates from the pseudo-panel data.

5.1 Poverty

5.1.1 Cross-Section Estimates: GLSS5

Estimates of the marginal effects of the various regressors on poverty rate based on the cross-section data are presented in tables 4 and 5. Columns 2 and 3 present the estimates of the probability of being poor which is a combination of the probability of being moderately poor and the probability of being extremely poor. Column 2 presents the estimates without a *gender/abroad* interaction while column 3 presents the estimates that includes the interaction term. Because this is single outcome event, we use a simple bivariate probit estimator to estimate the equation. Columns 4-6 present the estimates of poverty status (*pstatus*) which ranges from extreme poverty, moderate poverty to not poor. Because poverty status is ordered, we use an ordered bivariate probit estimator to estimate the equation. Regression statistics indicate that the model generally fits the data well. In all regressions, we reject the null hypothesis that all variables jointly have no significant on poverty probabilities at $\alpha = .01$ and we are unable to reject the null that the model is correctly specified. Finally, the estimated marginal effects have the correct signs and are significantly different from zero at conventional levels. The last two rows in table 4 show the the estimated equation have

reasonably good predictive ability.

The marginal effects of *abroad* in columns 2 and 3 is negative and significant at $\alpha = .01$ or better. This estimate suggests that international remittances have a significantly negative effect on the probability of a household being poor, all things equal. The estimates in column 2 suggest that the probability of of household being poor decreases by 0.10 when a household that did not previously receive a remittance from abroad receives a remittance from abroad, all things equal. The marginal effect of receiving an international remittance is relatively large; it is about 6 times the effect that education has on poverty incidence on Ghanaian households, all things equal. On the other side, it is large enough to completely eliminate the effects rural location on poverty incidence among households. In column 2, the marginal effects of *domestic* is negative, very small but statistically significant at $\alpha = 10$. This indicates that remittances from domestic sources have statistically significant impact on the probability of a household being poor. Does the gender of the recipient of international remittance makes a difference on its effect on poverty incidence? The marginal effect of *gender * abroad* is negative but insignificant at conventional levels, suggesting that the gender of the household head of recipient of international remittance has significant impact of poverty incidence among Ghanaian households, all things equal.

The marginal effects of *education* and *age* are negative significant at $\alpha = .01$ suggesting that the probability of a household being poor decreases with the educational and age of the household. On the other hand, the coefficient of *agesq* is positive and significant. The combination of the marginal effects of *age* and *agesq* suggests that age of the household head decreases the probability of a household being poor at a decreasing rate. The marginal effects of *workers*, *hhsiz* and *rural* are positive and significantly different from zero at $\alpha = .01$. These effects suggest that the probability that a household falls into poverty increases with the size of the household, the number of adult workers in the household, and rural location. These effects are consistent with our expectation and are similar to those found by earlier researchers (Glewe: 1991, Castaldo and Reilly: 2007, Acosta et al: 2008, Grootaert: 1997, Mukherjee and Benson: 2003, among others). The marginal effect of *gender* is positive but insignificant at any reasonable confidence level suggesting that male-headed households are no more/or less likely to be poor than female headed households. This estimate is counter intuitive and inconsistent with the results of previous studies that finds that male-headed households are *less* likely to be poor compared to female-headed households. However, as discussed above, male-headed households overwhelmingly dominate in the poorest regions in

the sample where on average about 66% of households are poor. This dominance of male-headed households in the poorest regions of the Ghana may be driving the coefficient on *gender*. The marginal effect of *asante* is negative and significantly different from zero, suggesting that Asante ethnicity is negatively correlated with poverty incidence.

In columns 2 and 3, we measure poverty as the probability of being poor. It is possible that remittances affect moderate poverty probability differently from the way it affects extreme poverty probability. We present estimates for poverty status (*pstatus*) where poverty status takes on the values extreme poor (*poor0*), moderately poor (*poor1*) and not poor (*notpoor*). Estimates of the marginal effects of poverty status equation are presented in columns 4-6 in table 4. Given the way poverty status is coded, we expect the coefficients in column 6 to be opposite in signs to their counterparts in columns 4 and 5. The marginal effect of *abroad* in columns 4 and 5 are negative, relatively large and significantly different from zero at $\alpha = .01$ while the marginal effect of that variable in column 5 is positive and significant. These coefficient estimates indicate that international remittances decrease the probability that recipient households will be either extremely or moderately poor; on the other hand, it increases the probability that these households are not poor. The marginal effects of *abroad* on the probability of being extremely poor and moderately poor are similar in magnitude.⁶ The marginal effects of *domestic* in columns 4 and 5 are negative but insignificant while it is positive and significant in column 5 suggesting that domestic remittances have no significant impact on the probability of a household being moderately poor or extremely poor but has a significantly positive effect on not being poor. The marginal effect of the other variables in columns 4 and 5 are similar in sign and statistical significance as their counterparts in column 2 while the estimates in column 6 are opposite in signs as their counterparts in column 2-5 but are equally significant as those estimates. The estimates in column 4-6 confirm the results we obtained in columns 2 and 3 and suggest that our results are robust to the level of poverty that is measured.

The estimates in table 4 are based on the headcount measure of poverty which does not reflect differences in the *severity* of poverty. In table 5, we present estimates of the poverty equation based on two measures of poverty—poverty gap and the square of poverty gap. We calculated two sets of poverty gaps and their squares—based on the high income poverty threshold of C900,000.00 and the other based on expenditure threshold. Columns 2 and 3 in table 5 present the estimates for the *gap* and *gapsq* based on income poverty while columns 4 and 5 presents the same sets of estimates

for poverty calculated from expenditure. We note that because *gapsq* are conceptually different from *gap* and headcount measures, the marginal effects are likely to be different and opposite in signs to those of the *gap* measures. In columns 2 and 4, the marginal effects of *abroad* is negative and significant at $\alpha = .01$ indicating that international remittances decreases the probability of a family being poor as measured by the *gap* approach. The marginal effects of *abroad* is positive and significant in the *incgapsq* and *expgapsq* equations in columns 3 and 5 indicating that receipt of external remittance have significant impact on poverty rates among Ghanaian households. The marginal effects of all other variables are similar in sign, statistical significance, and interpretation as their counterparts in table 3. We conclude that our results that international remittances reduces poverty incidence among Ghanaian households is robust to the measurement of poverty.

5.1.2 Pseudo-Panel Data Estimates

Are our results different when we move from cross-section data to panel data estimates? The pseudo-panel data estimates of the poverty equations are presented in table 6. We do not include *gender* as a regressor in the pseudo-panel estimates since we use it to construct the cohort. However, we include the interaction between *gender* and *abroad* to test for the existence of gender effects on the relationship between *abroad* and poverty. Column 2 presents the estimates when we measure *poor* as the probability of being poor, column 3 present the estimates when we measure poverty as the probability of being in a particular income class (*pstatus*), while columns 4 and 5 present the estimates based on income poverty gap and consumption poverty respectively. The regression statistics indicate a reasonably good fit to the data. We reject the null hypothesis that all regressors jointly do not contribute to the explanation of poverty at $\alpha = .01$. The Klienbergen-Paap LM test for identification indicate strong instruments while the Hansen *J* test of over-identifying restrictions suggest that our instrument vector is appropriate.

The marginal effect of *abroad* is negative, relatively large and significantly different from zero at $\alpha = .01$ indicating that international remittances have a significantly large negative effect on the probability that a household falls into poverty, all things equal. These marginal effects are *qualitatively* similar to those presented in table 4 for the GLSS5 data. The only difference between the two estimates is the larger magnitude of the estimate of *abroad* in table 6, compared to its counterpart in table 4. The marginal effects of *domestic* in column 2 is negative and significant at $\alpha = .10$ indicating that domestic remittances reduce the probability of a household being poor, all

things equal. The marginal effect $abroad * gender$ is positive and significant suggesting that there is a significant gender effect of international remittances on poverty. All things equal, the ability of international remittances to decrease the probability of a household being poor is higher for female-headed households than male-headed households. We conclude that our result that international remittances decrease poverty among Ghanaian households is robust to the data—cross section or pseudo-panel—used to estimate the poverty equation.

The marginal effects of *education*, *asante*, *workers* are negative and significant at conventional levels while the marginal effects of *rural* and *hhsiz*e are positive and significant at $\alpha = .01$, indicating that poverty incidence among Ghanaian households decreases with education, number of workers in the household, and Asante ethnicity while it increases with rural location and household size. These estimates are similar to the estimates in table 4. The marginal effects of *age* is negative while that of *agesq* is positive but they are insignificant at conventional levels. Although these coefficient estimates are insignificant, they have the same signs as their counterparts in the cross-section estimates presented in table 4. The poverty status estimates are presented in column 3. Because *pstatus* is coded in such a way that higher values imply less poverty, the signs of the coefficients will be opposite of their counterparts in column 2. The coefficients of *domestic* and *abroad* in column 3 are positive and significant as expected, indicating that increases in these variables increase the probability of a household not being poor. These estimates are consistent with their counterparts in column 2. Again, this confirm our conclusion that international remittances have a negative and statistically significant effect on poverty incidence in Ghana, all things equal. The marginal effects of *education* and *workers* are positive and significant while those of *rural* and *hhsiz*e are negative and significant. The estimates are consistent with their counterparts in column 2. The coefficients of *age*, *agesq*, and *asante* are insignificant, although they all have the expected signs.

The estimates based on gap measures of poverty are presented in columns 4 and 5. Column 4 presents the estimates for the income gap while column 5 presents the estimates for the expenditure gap. The signs and statistical significance of these estimates are remarkably similar their counterparts in column 2. In particular, the coefficient of *abroad* is negative and significant in both columns, suggesting that our results do not depend on how we measure poverty: regardless of the measure of poverty, international remittances have a statistically significant impact on its incidence on Ghanaian households. The signs and statistical significance of the coefficients of the

other variables are also similar to their counterparts in the cross-section estimates. We therefore conclude that international remittances have a strong negative and stable effect on the propensity of households to fall into poverty, all things equal and that our results do not depend on the data set we use to estimate the equation.

5.2 Education

The coefficient of *abroad* in both columns 2 and 3 is positive and significant suggesting that international remittance has positive and significant impact on primary school completion rate and secondary school enrollment rates. These are relatively large effects. For example, conditional on holding all other variables constant at their means, the probability that a child in a Ghanaian household attend/complete primary school or enroll in secondary school increases by 0.09 and 0.49 respectively when a household changes from non recipient to a recipient of international remittance. The gender/*abroad* interaction term (*abroad*gender*) has negative and significant effect on primary education but a positive and insignificant effect on secondary school enrollment rate, suggesting that male-headed households who receive international remittances are less likely to enroll their children in primary school compared to female-headed households who receive international remittances. The policy implication is that remittances to female-headed household is more likely to lead to human capital formation hence long term poverty reduction compared to remittances to male-headed households. This result is consistent with the results obtained by earlier researchers who find that females are more likely to use remittances take care of children than males, all things equal.

The estimates of the effects of international remittances on education are presented in table 7. Columns 2 and 3 present the estimates for primary school and secondary school enrollment using the cross-section data while columns 4 and 5 present their pseudo-panel counterparts. Regression statistics indicate a relatively good fit and the estimates are of the expected signs and generally significant. The coefficients of *education*, *age*, *gender*, the logarithm of *income* are positive and statistically significant in columns 2 and 3 indicating that these variables have positive and significant effects on primary school enrollment or completion rates and secondary enrollment probabilities among Ghanaian households. The coefficient of *asante* is positive but only significant in the primary school completion equation. The coefficient of *rural* is negative and significant indicating that primary school completing rates and secondary school enrollment rates among Ghanaian

households are lower in rural locations.

The pseudo-panel estimates for education are presented in columns 4 and 5 of table 7. Column 4 presents the estimates for primary school enrollment/completion while column 5 presents the secondary school enrollment rate. Regression statistics indicate a good fit to the pseudo-panel data. In particular, both the Kleinbergen-Paap LM test and Hansen J test indicate strong and appropriate instrument vector. The estimated coefficients are generally of the expected signs and are generally statistically significant.

The coefficient of *abroad* in columns 4 and 5 is positive, relatively large and significantly different from zero at $\alpha = .01$ or better. This estimate suggests that, all things equal, Ghanaian households that receive international remittances are more likely to enroll their children in primary and secondary school in the medium to long run. The estimate of the interaction term between *gender* and *abroad* is negative, relatively large, and significant in both columns 4 and 5. This gender effect suggests that female headed households that receive international remittances are more likely to educate children in the household than male-headed households that receive international remittances. These estimates are similar to their cross-section counterparts in columns 2 and 3. Perhaps, the only difference between the two sets of estimates is the relatively large magnitudes of the panel estimates. Of course it is known that the two sets of estimates are only comparable in direction but not magnitude. In addition to the coefficient of *abroad*, the coefficients of other variables in the equation—*education*, *age*, *log of income*, *domestic*—are positive and significantly different from zero $\alpha = .05$ or better. The only variable that is insignificant in the pseudo-panel equation is *asante*. We can conclude from this subsection that international remittances do have a positive and significant impact on education human capital formation in Ghanaian households and this result does not depend on the data used for estimation.

5.3 Policy Implications

Our results that international remittances significantly reduces poverty incidence among Ghanaian household is similar to the results of other researchers who have investigated the relationship between poverty and international remittances in Ghana (Adams: 2006a, Guzman *et al*: 2006, Litchfield and Waddington: 2003, Quartey and Blankson: 2004, Quartey: 2006) as well as those who have investigated the relationship elsewhere (Grootaert: 1997, Niimi *et al*: 2009, Mukherjee and Benson: 2003, Acosta *et al*: 2008, Adams: 2004, Brown and Jimenez: 2008, and Castaldo and

Reiley: 2007). Our results are also consistent with the results of studies that find that women are more likely to use remittances to take care of children than men who receive remittances, all things equal. We note that our results stand both in the short- and long-runs.

Our results have both policy and research implications. First, the results that international remittances reduces the incidence of poverty among Ghanaian households suggests that Ghanaian policy makers encourage their citizens in the Diaspora to increase the flow of remittances to Ghana through appropriate policy reforms. Specifically, policies to reduce the transaction cost, such as excessive bank and other transfer charges, associated with sending international remittances to Ghana make in order.⁷ In addition policy makes should provide incentives, such as paying reasonable interest or providing safe and profitable financial instruments to attract more remittances to Ghana. The gender differences on the effects of international remittances also have implications not only for those who send remittances to Ghana but for the long term development of Ghana generally. Since remittances sent to female headed household increases the probability of human capital formation compared to remittances to male-headed households, it implies that Ghanaians in the Diaspora sending remittances to their relatives should channel more of the remittances to female members of their households if their objective is to increase human capital formation and hence reduce poverty in their household the long run as well as contribute to Ghana's long-term development.

Previous studies have used either a simple probit estimator for cross-section data or the least squares of fixed effects estimator for pseudo panel data to investigated the effects of remittances on poverty in LDCs. However, the endogeneity of remittance (see McKenzie and Sasin: 2007) suggests that these estimators are not appropriate. Our results implies that researchers could use estimators that can account for endogeneity of remittances as well as cohort fixed effects to obtain efficient estimates. A large proportion of studies of the effects of remittances on welfare has focused on the effects on current consumption or current income. The direct effect of remittances on current consumption does not indicate the effect of such remittances on poverty in the long run. On the other hand, the effects of remittances on human capital formation may give an indication of the long term effect of remittances on poverty given that a major determinant of poverty in a household is the *quantity* and *quality* of human capital endowments of its members. Perhaps, researchers should focus a little more attention on the effects of remittances on human capital formation rather than the major focus on its effect on current consumption and income. Finally, we find a significant gender difference in the effects of remittances on education. Perhaps, researchers may need to

investigate other differential effects, such regional differences or locational differences (urban versus rural) in order to provide policy makers more detailed policy information.

6 Conclusion

This paper uses two sets of data—cross-section data from GLSS5 and pseudo-panel data set constructed from GLSS3-GLSS5—a bivariate probit and pseudo-panel GMM estimators to investigate the effects of international remittances on poverty incidence and primary and secondary education in Ghana. Controlling for several covariates, we find that international remittances have a significantly negative impact on the probability of a household being poor. We also find that international remittances increases the chances that a household will educate its young members, at least through primary and secondary school, all things equal, suggesting that international remittances have positive impacts on human capital formation, hence long term poverty reduction among households as well the long term growth of the Ghanaian economy. We also find that there is a gender difference in the effect of international remittances on human capital formation: conditional on receiving international remittances, male-headed households are less likely to educated their children than female-headed households. Our results are robust to the type of data used (cross-section or pseudo-panel) the measurement of poverty (headcount, poverty gap, poverty gap squared), as well as the estimation method (bivariate probit or pseudo-panel GMM).

An implication of our results is that increasing the flow of remittances to Ghana can significantly decrease poverty rates among households and increase educational attainment of the young members of recipient households. Another implication of our results is that while increasing remittances to all Ghanaian households decreases poverty in the short run, it makes a significance difference in human capital formation and long term poverty reduction whether the recipient household is headed by a male or a female. Female-headed household that receive international remittances are more likely to educate their children compared to male-headed households who receive international remittances. Our results have interesting and important policy implications.

7 Notes

1. See Carrasco (2001) and note 2 below.
2. Although Angrist (2001) suggests that researchers should worry more about drawing *causal* inference when they are faced with binary endogenous regressors rather than the “appropriate” estimation method, many authors argue that with the appropriate estimator, the wrong inference will be drawn from such estimates.
3. The poverty line is defined as total household consumption expenditure per adult equivalent expressed at in constant prices.
4. The moderate and extreme poverty rates estimated in GLSS3 are 12.7% and 26.8% respectively while the comparable rates for GLSS4 were 10.30% and 18.20% respectively. These figures suggest that consistent reduction in the poverty rate in Ghana in recent periods. Of course, the reduction in poverty incidence could be due to several factors, including sample selection over the various surveys.
5. The mean Cedi/Dollar exchange rate in 2006 was C9,550.00 indicating that the mean amount of domestic and international remittances were approximately \$170.00 and \$782.00 respectively.
6. Note that the marginal effects of *abroad* across the various poverty status (*poor* - *poor2*) sum to zero since the probability of poverty status sum to unity.
7. Currently, Ghanaian banks require one to maintain two separate accounts—one to receive foreign deposits and the other to withdraw money—in order to send and use remittance to Ghana. One pays money into the receiving account, then ask the money to be transferred into the paying account before one can withdraw money from the paying account. Each of these accounts attracts a transaction fee—a fee to pay into the receiving account and another fee to withdraw on the account.

8 References

1. Acosta, P., C. Calderon, P. Fajnzylber, and H. Lopez (2008), "What is the Impact of International Remittances on Poverty and Inequality in Latin America?" *World Development*, **36** (1), 89-114.
2. Adams, R. H. (2004), *Remittances and Poverty in Guatemala*, World Bank Policy Research Working Paper No. 3418.
3. Adams, R. H. (2006a), *Remittances and Poverty in Ghana*, World Bank Policy Research Working Paper No. 3838.
4. Adams, R. H. (2006b), "International Remittances and the Household: Analysis and Review of Global Evidence", *Journal of African Economies*, **15**, AERC Supplement 2, 396-425.
5. Adams, R. H. (2008), *The Demographic, Economic and Financial Determinants of International Remittances in Developing Countries*, World Bank Policy Research Papers, No. 4583.
6. Angrist, J. (2001), "Estimation of Limited Dependent Variable Models with Dummy Endogenous Regressors: Simple Strategies for Empirical Practice", *Journal of Business and Economic Statistics*, **19** (1), 2-16.
7. Azam, J-P and F. Gubert (2006), "Migrants' Remittances and the Household in Africa: A Review of Evidence", *Journal of African Economies*, **15**, AERC Supplement 2, 426-462.
8. Brown, R. P. C. and E. Jimenez (2008), "Estimating the the Net Effect of Migration and Remittances on Poverty and Inequality: Comparison of Fiji and Tonga", *Journal of International Development*, **20**, 547-571.
9. Carrasco, R. (2001), "Binary Choice with Binary Endogenous Regressors in Panel Data: Estimating the Effects of Fertility on Female Labor Participation", *Journal of Business and Economic Statistics*, **19** (4), 385-394.
10. Castaldo, A. and B. Reilly (2007), "Do Migrant Remittances Affect the Consumption Patterns of Albanian Households?", *South-Eastern Europe Journal of Economics*, **1**, 25-54.
11. Collado, M. D. (1997), "Estimating Dynamic Models from Time Series of Independent cross-Sections", *Journal of Econometrics*, **82**, 37-62.
12. Deaton, A. (1985), "Panel Data from Time-Series of Cross-Section", *Journal of Econometrics*, **30**, 109-130.
13. Ghana Statistical Service (2007), *Pattern and Trends of Poverty, 1991-2006*, Accra, Ghana

Statistical Services.

14. Glewe, P. (1991), "Investigating the Determinants of Household Welfare in Cote d'Ivoire", *Journal of Development Economics*, **35**, 307-337.
15. Grootaert, C. (1997), "The Determinants of Poverty in Cote d'Ivoire in the 1980s", *Journal of African Economies*, **6** (2), 169-196.
16. Gupta, S., C. Pattillo, S. Wagh (2007), *Impact of Remittances on Poverty and Financial Development in Sub-Saharan Africa*, IMF Working Papers No. WP/07/38, Washington DC, IMF.
17. Guzman, J. C., A. R. Morrison, and M. Sjoblom (2006), *The Impact of Remittances and Gender on Household Expenditure Patterns: Evidence from Ghana*, World Bank.. Papers No. ...
18. Inoue, A. (2008), "Efficient Estimation and Inference in Linear Pseudo-Panel Data Models", *Journal of Econometrics*, **142**, 449-466.
19. Litchfield, J. and H. Waddington (2003), *Migration and Poverty in Ghana: Evidence from the Ghana Living Standards Survey*, Sussex Migration Working Papers, No. 10, Sussex University, UK.
20. McKenzie, David and M. S. Sasin (2007), *Migration, Remittances, Poverty, and Human Capital: Conceptual and Empirical Challenges*, World Bank Policy Working Paper No. 4272, Washing DC, World Bank.
21. Mukherjee, S. and T. Benson (2003), "The Determinants of Poverty in Malawi, 1998", *World Development*, **31** (2), 339-358.
22. Niimi, Y., T. H. Pham, and B Reilly (2009), "Determinants of Remittances: Recent Evidence Using Data on Internal Migrants in Vietnam", *Asian Economic Journal*, **22** (1), 19-39.
23. Quartey, P. and T. Blankson (2004), *Do Migrant Remittances Minimize the Impact of Macro-volatility on the Poor in Ghana?*, Report to GDN.
24. Quartey, P. (2006), *The Impact of Migrant Remittances on Household Welfare in Ghana*, African Economic Research Consortium (AERC) Working Papers, RP 158, Nairobi, Kenya.
25. Roodman, D. (2009), *Estimating Fully Observed Recursive Mixed-Process Models with cmp*, Center for Global Development Working Paper No. 168.
26. Woolridge, J. (2008), *Minimum Distance Estimation Using Pseudo-Panel Data*, Department of Economics, Michigan State University Working Paper.

Table 1
SUMMARY STATISTICS OF GLSS5 DATA

VARIABLE	LABEL	MEAN*	STD. DEV	MIN	MAX
poverty rate	<i>poor</i>	0.2409	0.4276	0.00	1.00
extreme poverty rate	<i>poor0</i>	0.1604	0.3218	0.00	1.00
moderate poverty rate	<i>poor1</i>	0.0805	0.4718	0.00	1.00
education (levels)	<i>educ</i>	3.22	3.27	1.00	16.00
household head age (years)	<i>age</i>	45.34	15.63	15.0	99.00
gender household head, male = 1	<i>gender</i>	0.7212	0.4484	0.00	1.00
No. workers in family	<i>workers</i>	3.2375	2.2570	1.00	22.00
household size	<i>hhsiz</i>	4.2016	2.8303	1.00	29.00
domestic remittance (proportion)	<i>domestic</i>	0.2980	0.4574	0.00	1.00
foreign remittance (proportion)	<i>abroad</i>	0.06884	0.2532	0.00	1.00
Asante ethnicity (Asante = 1)	<i>asante</i>	0.1812	0.3852	0.00	1.00
rural (proportion)	<i>rural</i>	0.5837	0.4929	0.00	1.00
Primary (number)	<i>primary</i>	0.1613	0.1400	0.00	1.00
(Secondary Enrollment (ratio)	<i>secondary</i>	0.0556	0.1340	0.00	1.00
Regional Dummies					
Ashanti	<i>ashanti</i>	0.1812	0.3851	0.00	1.00
Brong Ahafo	<i>ba</i>	0.0915	0.2883	0.00	1.00
Central Region	<i>central</i>	0.0793	0.2702	0.00	1.00
Eastern Region	<i>eastern</i>	0.1052	0.3068	0.00	1.00
Greater Accra	<i>accra</i>	0.1447	0.3518	0.00	1.00
Northern Region	<i>northern</i>	0.0915	0.2884	0.00	1.00
Upper East Region	<i>uppereast</i>	0.0691	0.2536	0.00	1.00
Upper West Region	<i>upperwest</i>	0.0586	0.2349	0.00	1.00
Volta Region	<i>volta</i>	0.0829	0.2757	0.00	1.00
Western Region	<i>western</i>	0.0960	0.2946	0.00	1.00

27

N 8,687

*these are unweighted averages

Table 2
SOME CHARACTERISTICS OF GLSS5 DATA

PANEL A:	RURAL	URBAN	POVERTY
	Rural	Urban	Total
Poor	0.2079	0.0329	0.2408
Not Poor	0.3758	0.3833	0.7591
Total	0.5837	0.4162	0.9999*
PANEL B:	GENDER &	POVERT	DISTRIBUTION
	Male	Female	Total
Poor	0.1965	0.0443	0.2408
Not Poor	0.5247	0.2345	0.7592
Total	0.7212	0.2788	1.00
PANEL C:	REGION &	GENDER	DISTRIBUTION
	Gender	Poor	Not Poor
Ashanti	0.6741	0.1398	0.8602
Brong Ahafo	0.6692	0.2138	0.7862
Central Region	0.6343	0.1089	0.8911
Eastern Region	0.6685	0.1039	0.8911
Greater Accra	0.7008	0.0812	0.9188
Northern Region	0.8805	0.4327	0.5673
Upper East Region	0.8367	0.6567	0.3433
Upper West Region	0.8605	0.8428	0.1572
Volta Region	0.7028	0.2264	0.7736
Western Region	0.7158	0.2946	0.7054
PANEL D:	REMITTANCES	& GENDER	
	Male	Female	0.3851
	Domestic	0.2449	0.4401
	Abroad	0.0567	0.1115

these may not add up to unity because of rounding errors

Table 3
SUMMARY STATISTICS OF GLSS5 DATA

Cohort	identification	Households⁺	Obs.	Poor	Abroad
1	< 1932, R, F*	165	3	0.3389	0.0995
2	< 1932 R, M	280	3	0.4929	0.1071
3	< 1932 U, F	88	3	0.1909	0.2304
4	< 1932 U M	98	3	0.1992	0.3114
5	1932-1938, R, F	121	3	0.3162	0.0905
6	1932-1938, R, M	228	3	0.4952	0.0893
7	1932-1938, U, F	89	3	0.1272	0.2535
8	1932-1938, U, M	92	3	0.1802	0.2582
9	1939-1945, R, F	130	3	0.3339	0.1018
10	1939-1945, R, M	253	3	0.5135	0.1112
11	1939-1945, U, F	95	3	0.1806	0.2503
12	1939-1945, U, M	132	3	0.1889	0.2794
13	1946-1951, R, F	125	3	0.4342	0.1157
14	1946-1951, R, M	314	3	0.5556	0.0707
15	1946-1951, U, F	102	3	0.1806	0.2035
16	1946-1951, U, M	175	3	0.2159	0.2370
17	1952-1957, R, F	142	3	0.4392	0.1198
18	1952-1957, R, M	385	3	0.4865	0.0717
19	1952-1957, U, F	109	3	0.1437	0.1913
20	1952-1957, U, M	215	3	0.1667	0.2713
21	1958-1963, R F	140	3	0.3558	0.0699
22	1958-1963, R, M	429	3	0.4733	0.0998
23	1958-1963, U, F	123	3	0.1228	0.2131
24	1958-1963, U, M	241	3	0.1122	0.2303
25	1964-1969, R, F	212	3	0.2825	0.0626
26	1964-1969, R, M	415	3	0.3656	0.0946
27	1964-1969, U, F	115	3	0.1071	0.1972
28	1964-1969, U, M	242	3	0.0851	0.2640
29	> 1969, R, F	154	3	0.2042	0.0669
30	> 1969, R, M	538	3	0.3057	1027
31	> 1969, U, F	180	3	0.0444	0.1538
32	> 1969, U, M	394	3	0.0829	0.2912
Overall Mean		196.96	total = 96		

+ Mean; * F = Female; M = Male; R = Rural; U = Urban

Table 4

HEADCOUNT POVERTY GLSS5: MARGINAL EFFECTS					
Variable	Coefficient			Estimates	
	POOR	POOR	POOR0	POOR1	NOT POOR
<i>education</i>	-0.0148*** (8.79)	-0.0153*** (9.17) ⁺	-0.0074*** (8.69)	-0.0077*** (8.41)	0.0151*** (9.10)
<i>age</i>	-0.0500* * * (3.01)	-0.0049*** (2.96)	-0.0025*** (3.04)	-0.0025*** (3.05)	0.0050*** (3.07)
<i>agesq</i>	0.0001*** (3.06)	0.0001*** (2.96)	0.0001*** (3.04)	0.00003*** (3.05)	-0.00005*** (3.07)
<i>gender</i>	0.0169** (1.88)	0.0082 (0.65)	0.0034 (0.56)	0.0036 (0.55)	-0.0069 (0.55)
<i>asante</i>	-0.0300*** (3.45)	-0.0324*** (3.85)	-0.0146*** (3.68)	-0.0159*** (3.49)	0.0304*** (3.62)
<i>workers</i>	0.0074** (1.91)	0.0078** (2.03)	0.054*** (2.98)	0.0057*** (2.98)	-0.0111*** (3.00)
<i>hhsiz</i>	0.0265*** (13.24)	0.0265*** (13.20)	0.0123*** (11.40)	0.0128*** (11.60)	-0.0251*** (12.97)
<i>rural</i>	0.0969*** (10.86)	0.0997*** (11.32)	0.0493*** (10.24)	0.0486*** (10.42)	-0.0979*** (11.30)
<i>domestic</i>	-0.0018** (1.76)	-0.0016** (1.79)	-0.0217 (0.98)	0.1021 (1.29)	0.0104** (2.11)
<i>abroad</i>	0.0907*** (8.05)	-0.0968*** (6.55)	-0.0428*** (6.84)	-0.0561*** (6.77)	0.0989*** (7.07)
<i>abroad * gender</i>		0.1503 (1.26)	0.0867 (1.17)	0.0649* (1.69)	-0.1517 (1.32)
LR χ^2	960.21 [10]	935.54 [11]	960.35 [11]		
<i>Pr > χ^2</i>	0.00	0.00	0.00		
Pseudo R^2	0.1985	0.2055	0.1704		
<i>predict</i>	0.2116	0.2281	0.1531	0.0627	0.7842

+ absolute value of asymptotic 'z' statistics calculated from robust standard errors in parentheses. * 2-tail significance at $\alpha = .01$

** 2-tail significance at $\alpha = .05$ ***2-tail significance at $\alpha = .01$.

Table 5
POVERTY ESTIMATES, GLSS5: OTHER MEASURES

Variable	INCGAP	Coefficient INCGAPSQ	Estimates EXPGAP	EXPGAPSQ
<i>education</i>	-0.4193*** (15.50) ⁺	10.9465*** (4.89)	-0.2855*** (22.75)	6.5448*** (10.67)
<i>age</i>	-0.1616*** (4.39)	4.9243* (1.75)	-0.0925*** (5.37)	0.9822** (2.16)
<i>agesq</i>	0.0016*** (3.92)	-0.0510* (1.69)	0.0008*** (4.31)	-0.0045 (0.65)
<i>gender</i>	-0.5146*** (2.54)	21.0995 (1.37)	-0.0875 (0.92)	-2.2996 (1.02)
<i>asante</i>	0.3658* (1.73)	-50.2371*** (3.21)	-0.1784* (1.83)	7.3351* (1.71)
<i>workers</i>	-0.7313*** (7.42)	34.2735*** (4.56)	0.0806* (1.75)	-0.0204*** (1.02)
<i>hhsz</i>	-0.3052*** (6.73)	0.5360 (0.94)	-0.4045*** (19.08)	4.4507*** (4.28)
<i>rural</i>	0.8136*** (4.48)	14.7704** (2.09)	1.1868*** (14.12)	-10.2293*** (2.59)
<i>domestic</i>	-0.0019* (0.09)	-79.6120*** (5.57)	0.3177*** (3.26)	0.0014 (0.14)
<i>abroad</i>	-6.1933*** (9.84)	576.6802*** (28.70)	-1.1375*** (5.09)	4.2658 (0.47)
<i>abroad * gender</i>	-0.0041** (2.18)	0.4167** (1.98)	-0.2161** (2.89)	0.2161 (1.21)
<i>Constant</i>	4.8971*** (6.17)	-215.6188** (3.57)	-2.5374*** (5.98)	-26.9621*** (5.3467)
LR χ^2	1042.56 [11]	1295.43 [11]	2420.39 [11]	1099.97 [11]
<i>Pr</i> > χ^2	0.00	0.00	0.00	0.00
Pseudo <i>R</i>²	0.2456	0.1789	0.456	0.1335

+ absolute value of asymptotic 'z' statistics calculated from robust standard errors in parentheses.
 * 2-tail significance at $\alpha = .01$
 ** 2-tail significance at $\alpha = .05$ ***2-tail significance at $\alpha = .01$.

Table 6

POVERTY ESTIMATES: PSEUDO-PANEL DATA

Variable	POOR	Coefficient PSTATUS	Estimates INCGAP	EXPGAP
<i>education</i>	-0.0233*** (3.33) ⁺	0.0086** (2.35)	-0.0086** (2.29)	-0.0218*** (2.86)
<i>age</i>	-0.5632 (1.35)	0.2451 (1.29)	-0.8075* (1.75)	-0.5065** (2.09)
<i>agesq</i>	0.0001 (1.54)	0.0001 (1.10)	0.00005 (0.77)	0.0064 (1.02)
<i>asante</i>	-1.9304*** (4.03)	-0.1028 (0.44)	-0.1027 (0.44)	-0.3211 (1.06)
<i>workers</i>	-0.0716** (2.06)	0.0268** (2.15)	-0.0417 (1.01)	-0.00274* (1.71)
<i>hhsiz</i>	1.1821*** (6.33)	-0.2011** (2.31)	1.1999*** (4.45)	1.2883*** (3.28)
<i>domestic</i>	-0.1621* (1.82)	0.0164** (2.11)	-0.0013* (1.76)	-0.0022 (1.56)
<i>abroad</i>	-1.0908*** (2.98)	0.4274** (2.05)	-1.1505*** (2.77)	-0.7386*** (3.11)
<i>abroad * gender</i>	0.0116** (2.09)	-0.0041** (1.99)	0.0142** (2.12)	0.0124** (1.91)
<i>Constant</i>	3.2422** (1.96)	1.0681** (1.99)	1.8962** (1.23)	1.2614 (2.48)
LR χ^2	92.33 [9]	109.65 [9]	141 [9]	89 [9]
<i>Pr > χ^2</i>	0.00	0.00	0.00	0.00
Pseudo R^2				
Hansen J	0.00	0.00	0.001	0.002
Kleinbergen-Paap LM	29.84 (0.00)	31.09 (0.00)	28.185 (0.00)	19.93 (0.00)
N	96	32		

+ absolute value of asymptotic 'z' statistics calculated from robust standard errors in parentheses. * 2-tail significance at $\alpha = .01$
 ** 2-tail significance at $\alpha = .05$ ***2-tail significance at $\alpha = .01$.

Table 7

INTERNATIONAL REMITTANCES AND EDUCATION

Variable	Coefficient		Estimates	
	PRIMARY GLSS5	SECONDARY	PRIMARY1 PSEUDO	SECONDARY1 PANEL
<i>education</i>	0.0055*** (3.44) ⁺	0.0041*** (2.69)	0.1108*** (3.21)	0.1066** (2.66)
<i>age</i>	0.0047*** (12.43)	0.0042*** (11.60)	0.1281*** (3.22)	0.2293*** (2.96)
<i>gender</i>	0.0496*** (4.45)	0.0395*** (3.73)		
<i>asante</i>	0.0189* (1.72)	0.0127 (1.20)	-0.0064* (0.28)	-0.1341 (0.72)
<i>rural</i>	-0.0736*** (8.10)	-0.0691*** (7.83)		
<i>logincome</i>	0.0100*** (2.78)	0.0089*** (2.89)	0.0009*** (2.87)	0.0019*** (2.97)
<i>domestic</i>	0.0061** (1.79)	0.0024 (1.28)	0.0026** (1.89)	0.0041** (2.11)
<i>abroad</i>	0.0896** (2.07)	0.4948*** (2.82)	0.6894*** (3.12)	1.4606*** (4.79)
<i>abroad * gender</i>	-0.0587** (1.89)	0.0594 (1.42)	-0.2144** (2.11)	-0.8132*** (3.09)
<i>Constant</i>	-0.1805*** (3.16)	-0.1576*** (2.92)	-0.2188** (2.01)	0.1644** (2.88)
N	8,687	8,687	96	96
LR χ^2	316 [9]	267 [9]	358 [7]	312 [7]
<i>Pr</i> > χ^2	0.00	0.00	0.00	0.00
Pseudo R^2	0.2043	0.2239	0.2927	0.3123
Klienbergen-Paap LM			44.21	37.11
Hansen J		33	0.021	0.011

+ absolute value of asymptotic 'z' statistics calculated from robust standard errors in parentheses. * 2-tail significance at $\alpha = .01$
** 2-tail significance at $\alpha = .05$ ***2-tail significance at $\alpha = .01$.