Remittances and Poverty in Ghana[1]

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May 10, 2011

[1]Paper presented at the 8th IZA Annual Migration Meeting, Washington D.C., May 12-15 2011. 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, bivariate probit and GMM pseudo-panel estimators, 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. 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 (remittances henceforth) to Less Developed Countries (LDCs) has been increasing in importance relative to other transfers. It has eclipsed official development assistance (ODA) in importance in LDCs 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)/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 by far the largest source of foreign exchange earnings for Ghana (eclipsing cocoa and gold exports). The overwhelming proportion of these remittances are sent to support either households consumption or for the construction of homes and other social services. These statistics suggest that migrant remittances form an important part of the Ghanaian economy and Ghanaian households in particular.

Previous work indicate that remittances have, at least a stabilizing effect on the growth of GDP in developing countries (Chanti, Harura, and Montiel: 2009). While there has been a growing body of research on the effects of remittances on aggregate economic performance and balance of payments, it is only recently that a few studies have investigated the effects of international remittances on the welfare of households in LDCs. Moreover, most of the studies on the subject have focused on how remittances are used rather than on how remittances affect the living standards of households. The few studies that investigate the effects of remittances on poverty have generally focused on one measure of poverty—the headcount measure of poverty.

This paper uses cross-section data from Wave 5 of Ghana Living Standards Survey (GLSS5), 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.

Investigating the effects of remittances on the welfare of households of sending countries is of

interest for a number of reasons. International migration improves the global allocation of labor hence global welfare. However, it is often argued that sending countries lose to the receiving countries when their young and brightest, often educated at public expense, emigrate to developed countries. If remittances improve living standards of sending countries, then such remittances may offset some of the cost to the sending countries. Some researchers argue that emigration often leads to increased supplies of educated people in the sending countries. If we find that remittances finance education in the sending country, we would have found a *mechanism* through which emigration may increase the supplies of educated people in the sending country. 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 on the extent to which these flows fulfill the implicit contracts. Finally, investigating the gender effect of remittances on poverty may have important policy implication for household welfare and human capital development.

This paper makes important contributions to the literature on the relationship between remittances and poverty in LDCs. We use both a cross section and pseudo-panel data in our investigation thus allowing us to compare the static effects of remittances on 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 in absolute as well as 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 and efficient estimates in the presence of individual and cohort fixed effects. Finally, our estimation methods and data sets allow us to investigate the robustness of our results to the measurement of poverty as well as the estimation method used.

Our results are briefly summarized as follows: We find that remittances reduce the probability that a household will be poor either in the extreme sense or relative sense. This result is robust to the measurement of poverty and sample data—cross section or pseudo-panel—we use. We find that there is a gender difference on the effect of remittances on poverty incidence. The results indicate that international remittances have significant and positive effects 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 LDCs generally and Africa in particular. Section 3 presents the equation we estimate and discusses the estimation method followed by a discussion of the data 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 at the household level has been done for Latin American and Asian countries, a few studies have used African data. We review some of the relevant studies 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 without migration, 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 (both sender and recipient) on the patterns of expenditures from remittances. They find that female-headed household that receive remittances spend more on education, health, housing, and durable consumer goods compared to female household heads who do not receive remittances. The paper also finds that female recipients spend more on these items than males who receive remittances.

Litchfield and Waddington (2003) uses GLSS3 and GLSS4 to investigate migration patterns and the effects on migration of household welfare. They conclude that migration generally improves household welfare as measured by the probability of being poor, household expenditures, and primary school enrollment. Our paper is similar to Litchfield and Waddington's except that we also use a bivariate probit estimator and 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, 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 smoothening in Ghana. They conclude that all things equal, remittances have been a source of income smoothening for Ghanaians 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 welfare in Mali and Senegal. They develop a model in which migration and remittances are joint strategic decisions 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 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 recipients 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 because it serves as a disincentive for recipients to work hard, save and invest.

Acosta *et al* (2008) use cross country panel data as well as household level survey data to investigate the effects of remittances on poverty and income inequality in Latin America and finds that remittances reduce poverty by increasing income growth and reducing inequality at the aggregate level. At the micro level however, they find that while remittances reduce poverty substantially when one does not correct for potential income of the migrants, poverty reduction that is associated with remittances is moderate at best, when one controls for 'counter factual' 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 pseudo-panel methodology to study the effects of

international remittances on poverty incidence as we do in this paper. Cross-section data will not be able to capture the temporal effects of variation in remittances on poverty. 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. For example, it is known that the parameters of remittances in poverty equations estimated from cross section data changes from period to period (McKenzie and Sasin: 2007). Besides, McKenzie and Sasin (2007) point out that the study of migration and remittances is fraught with endogeneity issues not likely to be solved with cross-section data or simple estimation methodologies.

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 household expenditures or household rankings in some distributive 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. 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 factors ($\mathbf{X}$). We assume that the probability of being in a particular income class (non-poor, poor, extremely poor) (or child education) is determined by an underlying latent variable that captures the true economic status of the household. This variable (y^*) is assumed to depend on the probability of receiving remittances (*remit*) as well as a vector of other explanatory variables ($\mathbf{X}$). Formally:

$$y^* = \alpha_0 + \alpha_1 \, remit + \mathbf{X}\beta + u \tag{1}$$

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) is not observable. What the researcher observes is an event that a household is either poor or not poor. In effect what one observes is:

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

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

We are interested in the effects of remittances on poverty in Ghana. Remittances come from those who have emigrated and there is evidence to suggest that migration may depend on family income making *remit* an endogenous variable. *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:

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

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

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

where $\gamma = \lambda * \alpha$ and $\zeta = U + \xi$.

We follow earlier researchers in choosing the variables contained in the $\mathbf{X}$ vector. These include the education (*education*), gender (*gender*), and age (*age*) of the head of the household and its square (*agesq*), number of adult workers in the household (*workers*), household size (*hhsize*) and rural location (*rural*). In addition, we include an ethnic variable, whether a household belongs to the Asante ethnic group (*asante*). This ethnic group has an extensive migration network and their culture requires the younger generation to take care of their elderly as well as contribute to civic

projects even if one had emigrated. This implies that they will be more likely to send remittances more than other ethnic groups. 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:

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

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 poverty, 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 *gender* $\times$ *abroad* to be significant if there is a gender difference in the effect of international remittances on household poverty in Ghana.

3.2 Estimation Methods

We estimate (3) using two data sets—cross-section sample based on GLSS5 and a pseudo-panel data set constructed from GLSS3-GLSS5. Efficient estimation from each data set may require different estimation method. We 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 describes 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] We follow the approach suggested by Carrasco (2001) to solve the endogeneity problem. The solution is to specify a reduced form probit equation for *remit* of the 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 of variables that affect *poor* only through *remit* and **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 in the previous period (*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 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.

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 are dichotomous. When one estimates the equation using a pseudo-panel data, the cohort means of both the dependent variable and the endogenous regressor are continuous although they may be censored. In this case the bivariate pro-

bit estimator is not appropriate for the estimation for the *poor* equation. A non-limited dependent variable estimator is appropriate for estimating the *poor* equation using pseudo-panel data.

One cannot use either the first difference or the fixed effects estimator in a pseudo-panel since the sample household differs from one wave to the next. On the other hand, individual errors are likely to be correlated with regressors in any wave, making the random effects (RE) estimator inconsistent. Deaton (1985) suggests creating a panel of cohorts and using the cohort means as individual observations for estimation with appropriate panel estimator. Deaton's estimator is an errors in variables estimator which produces consistent estimates if the cohort sizes are large and the selection into cohorts does 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:

$$p\bar{o}or_{st} = \bar{\alpha}_{st} + \delta_s + \beta^{'}\bar{W}_{st} + \bar{\varepsilon}_{st} \tag{4}$$

where $p\bar{o}or_{st}$, $\bar{W}_{st}$ 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 is 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 selection variable ($i \in I_{N,st}$) is orthogonal to the error term $\alpha_i + \varepsilon_i$, where I(.) is and 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) estimator 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, since we treat *abroad* as an endogenous regressor, it is unlikely that the FE estimator will be appropriate for our purpose. 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 estimator in the second stage.[2] 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 proba-

bility introduces heteroskedastic errors in the endogenous regressor. These authors have suggested various GMM estimators. Inoue (2008) suggests an efficient GMM estimator that is robust to the existence of time invariant group fixed effects. 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:

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

where $\dot{\mathbf{W}}$ is the $S(ST-1)\times(K+L)$ matrix obtained from deleting the $Tth, 2Tth...STth$ 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 $\dot{y}$ 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 waves 3-5 of 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 in 1988/89, GLSS3 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. Each succeeding wave of GLSS covers more households as well as provides more detailed and comprehensive information about the living standards of Ghanaian households than previous ones. Besides increasing detail information 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, poverty status, employment, and consumption,

among other variables. The surveys also have information on whether households receive remittance, source of remittance (internal or international), amount and form of remittance, as well as the disposition of remittance. The detailed nature of the survey data allows us to investigate the effects remittances on poverty status. 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 as 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 remittance by 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 or not without regard to the size of the remittance.

The dependent variable we are interested in is the poverty incidence. We measure poverty incidence in several 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 1998/99 as the base while upper poverty line ($POOR1$) is set at C900,000.00. This is consistent with the headcount measure of poverty. It is well known that the headcount measure of poverty does not capture the *severity* of poverty. Therefore, 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. These additional measures of poverty are intended to capture these aspects of poverty. In addition to these measures of poverty, we also include consumption as additional measures of household welfare.

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 household head (in year), workers (*workers*) is the number of adult workers in a household, household size (*hhsize*) is the total number of people in a household, and all other variables are as defined in the text above.

Sample statistics of the cross-section data from GLSS5 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] Household heads in the sample are predominantly male (72%), the average household has 4.2 members and the average houshold head is 42.34 years old. 58.4% of the households in the sample reside in rural areas compared to about 41.6% living in urban areas. 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 have the equivalent of a bachelors degree or more. About 29.8% of households in the sample received some form of remittance from within Ghana (*domestic*) while only about 6.9% of households received international remittance (*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 of 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. This 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, a result that is at variance with general observation. This may partly be explained by the dominance of male-headed households in the sample from the three poor northern regions of Ghana. 72.12% of households in the sample are headed by males and on average, 24.09% are poor. In the three poor northern regions—North, Upper East, Upper West—, 85.92% of households are headed by men and the average poverty rate 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 male-headed households, the GLSS5 sample shows that female-headed households are more likely to recieve 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 respcetively. While it is true that in absolute terms, fewer female-headed households recieved rimttances compared to male-headed households, in relative terms, female-heades households have a higher probability of receiving international remittances than male-headed households.

While the sample data described above is based on GLSS5, the pseudo panel data we 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. Building pseudo-panel data set involves a trade off between the size of a cohort and the number of cohorts. Increasing the number of cohorts decreases 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 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 largest for male-headed rural households while they are smallest for female-headed urban households regardless of the age bracket. This is partly due to the fact that there are more male-headed households in the sample and the GLSS generally samples more rural households than urban households. In addition, 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 shows that conditional on year of birth and gender, urban cohorts are more likely to receive external remittances compared to rural cohorts.

5 Results

This section presents the estimates of equation (3) using both the cross-section data from GLSS5 and the pseudo-panel data. The first part of this section presents the estimates based on GLSS5

data while the second part of the section presents the estimates from the pseudo-panel data.

5.1 Cross-Section Estimates: GLSS5

Estimates of the marginal effects of the various regressors on poverty rate based GLSS5 data are presented in tables 4 and 5. Columns 2 and 3 present the marginal effects of being poor which is a combination of being moderately poor and extremely poor. Because this is a single poverty outcome, we use a simple bivariate probit estimator to estimate the equation. Columns 4-6 present the marginal effects of poverty status (*pstatus*) which ranges from extreme poverty through moderate poverty to not poor. Because poverty status is ordered, we use an ordered bivariate probit estimator to estimate the equation. Regression statistics indicate a good fit. 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 expected 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 power.

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 remittance from abroad receives one, all things equal. This marginal effect is relatively large; it is about 6 times the effect that education has on poverty incidence on Ghanaian households, all things equal, and it is large enough to completely eliminate the effects of rural location on poverty incidence. 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 $gender \times abroad$ in column 3 is negative but insignificant at conventional levels, suggesting that there is no gender effect of international remittance on poverty incidence among Ghanaian households, all things equal. 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 effects of *education* and *age* are negative and 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*, *hhsize* and *rural* are positive and significantly different from zero at $\alpha = .01$. 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, all things equal. This estimate is counter intuitive and inconsistent with the results of previous studies that find 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.

Columns 2 and 3 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 (*poor*0), moderately poor (*poor*1) and not poor (*notpoor*). Estimates of the marginal effects of poverty status 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 6 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 6 suggesting that domestic remittances have no significant impact on the probability of being moderately 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 columns 2 and 3 while the estimates in column 6 are opposite in signs as their counterparts in column 2-5 and are equally significant as those estimates. The estimates in column 4-6 confirm the results 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. Because *gapsq* is 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 external remittance has 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.

5.2 Pseudo-Panel Data Estimates

Are our results different when we use pseudo-panel data? 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 regression coefficients are jointly equal to

zero 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 poverty probabilities 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 effect of *hhsize* is positive and significant at $\alpha = .01$, indicating that poverty incidence decreases with education, number of workers in the household, and Asante ethnicity while it increases with 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 that of *hhsize* is 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. 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.

5.3 Policy Implications

Our results that remittances significantly reduce poverty incidence among Ghanaian household is similar to the results of other researchers who have investigated the relationship between poverty and international remittances (Adams: 2006a, Guzman *et al*: 2006, Litchfield and Waddington: 2003, Quartey and Blankson: 2004, Quartey: 2006, 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 male recipients. 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 reduce 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. Policies to reduce the transaction cost, such as excessive bank and other transfer changes, associated with sending international remittances to Ghana may be 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.

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 investigate the effects of remittances on poverty in LDCs. However, the endogeneity of remittance (McKenzie and Sasin: 2007) suggests that these estimators are not appropriate. Our results suggest that researchers could use estimators that can account for endogeneity of remittances as well as cohort fixed effects to obtain efficient estimates.

We find differential gender effects of remittances on poverty incidence. 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. 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. 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 sugges 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* - *poor*2) 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.

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Table 1

SUMMARY STATISTICS OF GLSS5 DATA

VARIABLE	LABEL	MEAN*	STD. DEV	MIN	MAX
poverty rate	*poor*	0.2409	0.4276	0.00	1.00
extreme poverty rate	*poor*0	0.1604	0.3218	0.00	1.00
moderate poverty rate	*poor*1	0.0805	0.4718	0.00	1.00
education (levels)	*educ*	3.22	3.27	1.00	16.00
household head age (years)	*age*	45.34	15.63	15.0	99.00
gender household head, male = 1	*gender*	0.7212	0.4484	0.00	1.00
No. workers in family	*workers*	3.2375	2.2570	1.00	22.00
household size	*hhsize*	4.2016	2.8303	1.00	29.00
domestic remittance (proportion)	*domestic*	0.2980	0.4574	0.00	1.00
foreign remittance (proportion)	*abroad*	0.06884	0.2532	0.00	1.00
Asante ethnicity (Asante = 1)	*asante*	0.1812	0.3852	0.00	1.00
rural (proportion)	*rural*	0.5837	0.4929	0.00	1.00
Regional Dummies					
Ashanti	*asante*	0.1812	0.3851	0.00	1.00
Brong Ahafo	*ba*	0.0915	0.2883	0.00	1.00
Central Region	*central*	0.0793	0.2702	0.00	1.00
Eastern Region	*eastern*	0.1052	0.3068	0.00	1.00
Greater Accra	*accra*	0.1447	0.3518	0.00	1.00
Northern Region	*northern*	0.0915	0.2884	0.00	1.00
Upper East Region	*uppereast*	0.0691	0.2536	0.00	1.00
Upper West Region	*upperwest*	0.0586	0.2349	0.00	1.00
Volta Region	*volta*	0.0829	0.2757	0.00	1.00
Western Region	*western*	0.0960	0.2946	0.00	1.00
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**
Region	**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**
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 EFECTS

Variable	**Coefficient Estimates**				
	POOR	**POOR**	**POOR0**	**POOR1**	**NOT POOR**
education	-0.0148***	-0.0153***	-0.0074***	-0.0077***	0.0151***
	(8.79)	(9.17)$^{+}$	(8.69)	(8.41)	(9.10)
age	-0.0500* **	-0.0049***	-0.0025***	-0.0025****	0.0050***
	(3.01)	(2.96)	(3.04)	(3.05)	(3.07)
agesq	0.0001***	0.0001***	0.0001***	0.00003***	-0.00005***
	(3.06)	(2.96)	(3.04)	(3.05)	(3.07)
gender	0.0169**	0.0082	0.0034	0.0036	-0.0069
	(1.88)	(0.65)	(0.56)	(0.55)	(0.55)
asante	-0.0300***	-0.0324***	-0.0146***	-0.0159***	0.0304***
	(3.45)	(3.85)	(3.68)	(3.49)	(3.62)
workers	0.0074**	0.0078**	0.054***	0.0057***	-0.0111***
	(1.91)	(2.03)	(2.98)	(2.98)	(3.00)
hhsize	0.0265***	0.0265***	0.0123***	0.0128***	-0.0251***
	(13.24)	(13.20)	(11.40)	(11.60)	(12.97)
rural	0.0969***	0.0997***	0.0493***	0.0486***	-0.0979***
	(10.86)	(11.32)	(10.24)	(10.42)	(11.30)
domestic	-0.0018**	-0.0016**	-0.0217	0.1021	0.0104**
	(1.76)	(1.79)	(0.98)	(1.29)	(2.11)
abroad	0.0907***	-0.0968***	-0.0428***	-0.0561***	0.0989***
	(8.05)	(6.55)	(6.84)	(6.77)	(7.07)
$abroad * gender$		0.1503	0.0867	0.0649*	-0.1517
		(1.26)	(1.17)	(1.69)	(1.32)
LR χ^2	960.21 [10]	935.54 [11]	960.35 [11]		
$Pr > \chi^2$	0.00	0.00	0.00		
Pseudo R^2	0.1985	0.2055	0.1704		
predict	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	Coefficient Estimates			
	INCGAP	**INCGAPSQ**	**EXPGAP**	**EXPGAPSQ**
education	-0.4193***	10.9465***	-0.2855***	6.5448***
	(15.50)$^{+}$	(4.89)	(22.75)	(10.67)
age	-0.1616***	4.9243*	-0.0925****	0.9822**
	(4.39)	(1.75)	(5.37)	(2.16)
agesq	0.0016***	-0.0510*	0.0008***	-0.0045
	(3.92)	(1.69)	(4.31)	(0.65)
gender	-0.5146***	21.0995	-0.0875	-2.2996
	(2.54)	(1.37)	(0.92)	(1.02)
asante	0.3658*	-50.2371***	-0.1784*	7.3351*
	(1.73)	(3.21)	(1.83)	(1.71)
workers	-0.7313***	34.2735***	0.0806*	-0.0204***
	(7.42)	(4.56)	(1.75)	(1.02)
hhsize	-0.3052***	0.5360	-0.4045***	4.4507***
	(6.73)	(0.94)	(19.08)	(4.28)
rural	0.8136***	14.7704**	1.1868***	-10.2293***
	(4.48)	(2.09)	(14.12)	(2.59)
domestic	-0.0019*	-79.6120***	0.3177***	0.0014
	(0.09)	(5.57)	(3.26)	(0.14)
abroad	-6.1933***	576.6802***	-1.1375***	4.2658
	(9.84)	(28.70)	(5.09)	(0.47)
abroad $*$ *gender*	-0.0041**	0.4167**	-0.2161**	0.2161
	(2.18)	(1.98)	(2.89)	(1.21)
Constant	4.8971***	-215.6188**	-2.5374***	-26.9621***
	(6.17)	(3.57)	(5.98)	(5.3467)
LR χ^2	1042.56 [11]	1295.43 [11]	2420.39 [11]	1099.97 [11]
$Pr > \chi^2$	0.00	0.00	0.00	0.00
Pseudo R^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	Coefficient Estimates			
	POOR	**PSTATUS**	**INCGAP**	**EXPGAP**
education	-0.0233***	0.0086**	-0.0086**	-0.0218***
	(3.33)+	(2.35)	(2.29)	(2.86)
age	-0.5632	0.2451	-0.8075*	-0.5065**
	(1.35)	(1.29)	(1.75)	(2.09)
agesq	0.0001	0.0001	0.00005	0.0064
	(1.54)	(1.10)	(0.77)	(1.02)
asante	-1.9304***	-0.1028	-0.1027	-0.3211
	(4.03)	(0.44)	(0.44)	(1.06)
workers	-0.0716**	0.0268**	-0.0417	-0.00274*
	(2.06)	(2.15)	(1.01)	(1.71)
hhsize	1.1821***	-0.2011**	1.1999***	1.2883***
	(6.33)	(2.31)	(4.45)	(3.28)
domestic	-0.1621*	0.0164**	-0.0013*	-0.0022
	(1.82)	(2.11)	(1.76)	(1.56)
abroad	-1.0908***	0.4274**	-1.1505***	-0.7386***
	(2.98)	(2.05)	(2.77)	(3.11)
$abroad * gender$	0.0116**	-0.0041**	0.0142**	0.0124**
	(2.09)	(1.99)	(2.12)	(1.91)
Constant	3.2422**	1.0681**	1.8962**	1.2614
	(1.96)	(1.99)	(1.23)	(2.48)
LR χ^2	92.33 [9]	109.65 [9]	141 [9]	89 [9]
$Pr > \chi^2$	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	28		

+ 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 $\alpha = .01$.