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Migration as a Household Decision: What are the Roles of Income Differences? Insights from the Volta Basin of Ghana

Migration as a Household Decision: What are the Roles of Income Differences? Insights from the Volta Basin of Ghana

DANIEL TSEGAI

This paper examines the determinants of migration decision with a special emphasis on the role of income differences. As migrants are not a random part of the population, the migration equation is corrected for selectivity bias using the Heckman procedure. The data for this study is collected under a Common Sampling Frame approach, which resulted in a wide variety of data sets. Empirical results show the statistically significant effects of income differentials on households' decisions to participate in migration. This result lends credence to the significance of economic incentives on the intra-household migration decision making process. Additionally, factors like migration experience, household size, education, social capital, ethnic networks, off-farm activities, and irrigation also explain migration decisions.

Cet article étudie les déterminants de la décision de migration avec un accent particulier mis sur le rôle des écarts de revenues. Le choix des migrants n'étant pas dû au hasard, le biais de sélectivité de l'équation de migration a été corrigé par la procédure de Heckman. Les données de cette étude ont été collectées selon une approche de cadre d'échantillonnage commun (Common Sampling Frame) qui fournit une grande variété de séries de données. Les résultats empiriques montrent des impacts statistiquement significatifs des écarts de revenus sur les décisions de ménages de participer aux migrations. Ils donnent du crédit aux incitations économiques face au processus de prise de décision des ménages. De plus, des facteurs tels des expériences de migrations antérieures, la taille des ménages, l'éducation, le capital social, les réseaux ethniques, les activités non agricoles et l'irrigation expliquent également les décisions migratoires.

INTRODUCTION

One of the most significant demographic phenomena facing many of the developing economies is the dramatic acceleration of population growth in the urban areas,

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largely triggered by the incidence of rural–urban migration (Agesa, 2001). Current rates of urban population growth reach over 6 per cent in many African cities including Nairobi, Lagos and Accra (Dao, 2002). As migration increases, this phenomenon promises to loom even larger in the future.

Population migration has had enormous social, political and economic significance (Beals and Menzes, 1970). In Ghana, as in other developing countries, migratory movements have multiplied greatly in volume in recent years, as transport and communications have improved (Mensah-Bonsu, 2003). The issue of migration is particularly important to Ghana, a country with a long tradition of population mobility and high rates of rural–urban migration. Moving to towns has been an important part of the farm households' livelihood strategies for many years (Kasanga and Avis, 1988). For many Ghanaians, urban life represents new possibilities; modernity; the possibility of work indoors; and being less tied to family duties, as opposed to the traditional life with relatively heavy family duties, mainly working in farming in the rural areas (Caldwell, 1969). Consequently, Ghana has witnessed a great deal of population mobility historically and at present.

Based on cross-sectional household survey data conducted within the GLOWA-Volta project,[1] this study analyses the complex behaviour of migrant and non-migrant households in the Volta Basin (VB) of Ghana. The study also aims to identify the motives behind the migration process by placing a special focus on the income disparity between migrant and non-migrant households.

The rest of the paper is organised as follows. The next section discusses the various migration theories. Section three describes the theoretical framework, which outlines the basic assumptions and theory behind the study. Section four provides the details of the model specification and estimation. The estimation sample and the explanation of variables are explained in section five. Section six considers the presentation of results and discussion, while conclusions and policy implications are presented in the last section.

MIGRATION THEORIES

There have been a number of migration theories to explain the reasons for migration at different scales. This section is devoted to describing briefly the synthesis of these various migration theories in the literature.

Neoclassical Economic Theory

The macro-economic version of this theory, as cited in Massey et al. (1993) and Todaro (1976), regards migration as a result of geographic differences in the supply and demand for labour which result in difference in wage rates. The push factors in the place of origin (poverty, unemployment, etc.) and pull factors in the place of destination (job opportunities, high incomes, better rainfall rates, etc.) are the key determinants of migration. On the other hand, the micro-economic version of the theory considers migration to be the outcome of the rational decision making behaviour of individuals in which a cost–benefit calculation leads them to expect a positive net return from migration (Sjaastad, 1962; Todaro, 1976). Sjaastad (1962) regards migration as an investment decision while Todaro (1976) considers migration from low to high wage areas as triggered by wage differentials and equilibrium in the labour market is only reached with the elimination of wage differentials.

Dual Labour Market Theory

In this theory the main cause of migration is the intrinsic labour needs of modern economies in destination areas. According to the dual labour market theory, migration is a result of the pull factors in the receiving countries (Massey et al., 1993). Thus migration is largely demand-based from industrial societies and wage-level differences only reflect social stratification.

New Economics of Labour Migration (NELM) Theory

This theory is built upon the framework that migration is a joint decision by household members and not an individual decision (Stark and Bloom, 1985). NELM sees migration as a livelihood strategy for diversifying family income sources such as labour and as a means of absorbing shocks. It lays emphasis on remittances as the main source of income. In the NELM theory, minimising risk plays a role in the decision to migrate while wage differential is not a necessary condition for migration. Other factors, such as insurance, capital and credit markets are also important elements in the decision to migrate.

World Systems Theory

This theory relates to the world market as a determinant of migration. The theory also argues that migration is caused by a capitalist market formation in the developing world in which the penetration of the global economy into peripheral regions catalyses migration (Massey et al., 1993). As a result of globalisation, owners and managers of firms from rich countries enter the poor countries in search of land, raw materials, labour, and new consumer markets so as to make profits and generate wealth. According to world systems theory, migration is a natural outgrowth of disruptions and dislocations that inevitably occur in the process of capitalist development.

Social Network Theory

The flow of information has been considered important for migration before it was a major concern for the rest of economics (Gallup, 1997). Family and friends provide important information on the place of destination. So the bond between migrants and their family or friends in the origin area motivates new migration routes. This network lowers the cost and risk of migration for newcomers, thus encouraging potential migrants.

Institutional Theory

This theory points out that once international migration has begun, institutions and voluntary organisations develop to support the movement of migrants. These institutions can be legal or illegal migration circuits which facilitate migration that persists over time and increases migration by providing transport, labour contracting, housing, and legal and other services, many of which have proven difficult for governments to regulate.

Cumulative Causation Theory

This theory pronounces that each act of migration results in alteration of the social context in which subsequent migration decisions are taken, making new movements more likely. The distribution of income and land; the organisation of agriculture; culture; regional distribution of human capital; and the social meaning of work are the factors that are affected by this cumulative tendency (Massey et al., 1993).

In sum, the various migration theories help analysts to understand the contemporary processes of migration at different scales. Though with different policy implications, the theories are not necessarily contradictory to each other. The current study builds upon the Todaro model together with the NELM to come up with a model for analysing migration determinants at household level.

THEORETICAL FRAMEWORK

The theoretical framework for migration is usually based on the assumption that migration is an investment which entails costs as well as benefits (Kau and Sirmans, 1977). Most of the recent studies dealing with the mobility/earnings issue start with a human capital model of migration which regards migration as an investment decision. This is because the benefits can only accrue over a period of time, and as the investment is in the individual or family, it represents an investment in human capital (Cadwallader, 1992). According to this approach, a utility maximising household would invest (in this case, decide to migrate) whenever the benefits of migration exceed the costs, after properly discounting both to their present values (Navratil and Doyle, 1977). In this study, a consideration of the determinants in the case of household labour migration is undertaken.

Following Schultz (1961) and Becker (1962), Sjaastad (1962) has applied the notion of investment in human capital to the decision to migrate in which migration is viewed as an investment through which income can be augmented. Sjaastad's framework also treats migration as an instrument for promoting efficient resource allocation and as one means of investing in human capital. His work has found wide application in migration literature (Bowels, 1970; Nabila, 1974; Kau and Sirmans, 1977; Cebula, 1979; Nakosteen and Zimmer, 1980; Taylor and Martin, 2001). The strength of this framework lies in the fact that there exists a possibility of meaningful comparisons between migration and alternative methods of promoting better resource allocation.

Migrants are a restricted, non-random part of an entire population. The propensity to migrate varies by migrant's attributes, such as age, income, education and length of residence, although these attributes tend to be highly correlated with each other (Tabuchi, 1985). Thus differences in the return to migration may be explained by differences in skill-related attributes among the migrants, including experience and schooling. For instance, Agesa (2001) remarked from his research in Kenya that individuals sort themselves into migratory and non-migratory persons, given their characteristics. His findings illustrate that skilled workers self-select to migrate to urban areas. Thus an attempt to investigate migrant households' behaviour within a population leads to incidental truncation problems (Greene, 2000). With such a distortion, results from a standard Ordinary Least Squares (OLS) procedure are simply not consistent.

Ghatak et al. (1996) also explained that migrants are self-selected in that they decide to leave their source community rather than stay and because they choose one particular destination from a number of possibilities. Following this line of thought, people that migrate choose to do so because they perceive a benefit (be it social or economic) compared to those who do not choose to migrate. This is especially the case for economic migrants. This implies that persons selecting a particular course of action tend to be non-randomly distributed within the population as a whole. Accordingly, there is an inherent 'selectivity bias' in data which reports relative returns to competing alternatives (Heckman, 1979; Nakosteen and Zimmer, 1980). The fact that one migrates while the other does not suggests an essential difference does exist between individuals.[2] Ghatak et al. (1996), for example, mentioned that it is unlikely for households who would have negative benefits from migrating to choose to migrate, as their reservation income at home would be greater than the income obtained by migrating. The same applies to households that deliver 'migrant labour' as these households may possess unobserved characteristics that are generally positively related to income causing a sample selection bias. Thus in the framework of this study, the selectivity bias is inherent to the fact that some households consider sending migrants out while others do not.

In the context of econometric models, a number of empirical studies have explicitly taken selectivity bias in wage comparisons and migration activities into account. Heckman (1979), for example, mentioned that the reason for the self-selection bias in relation to migrants is because the wages of migrants do not afford a reliable estimate of what non-migrants would have earned had they not migrated. The effect of job search strategy on wage levels by Gronau (1974); the importance of education on migration by Agesa (2001); the effect of job location on migrants' wages by Hare (2002); the impact of income differentials on migration decisions in China by Zhu (2002); and a study on the question of selective migration and its effect on the income of immigrants to Germany by Constant and Massey (2003) are some of the many empirical studies which consider selectivity bias in their econometric models.

In this study, it is assumed that there is a persistent communication between migrants and sending households, which suggests that a household model would be more suitable than an individual model of migration decisions. This new perspective, which stresses the complexity of migration as an economic institution, the relationships between migration's determinants and impacts, and the household's role in migration decision making, emerged with the shift of emphasis of development economics towards the study of market imperfections (Taylor et al., 2003). Stark (1993) hypothesises that migrants play the role of financial intermediaries, enabling rural households to overcome credit and risk constraints on their ability to achieve the transition from domestic to commercial production. The underlying view of this

NELM, as presented in Stark and Bloom (1985) and Stark (1993) is that migration decisions are not taken by isolated actors but by larger units of related people, typically households or families. People act collectively not only to maximise income, but also to minimise imperfections, including missing or incomplete capital, insurance, labour markets, and to satisfy changing demands for location-specific goods (Graves and Linneman, 1979). The study builds upon this framework to consider that migration decisions are taking place at household-level, instead of being the domain of individuals.

MODEL SPECIFICATION

The model used in this study fits within the framework of maximisation of Net Present Value (NPV) of the household resulting from sending out a migrant. The general form of the Harris and Todaro model is used. It is, however, extended to include migration decision at household-level in contrast to the individual model of Harris and Todaro (Todaro, 1976). By examining the incomes of migrant and non-migrant households and by controlling the selection problem, it becomes apparent what the earnings of a household would have been had it not sent out a migrant. In the human capital theory of Sjaastad (1962), the migrants' objective function is to maximise the present value of net gains resulting from migration. The objective function designates an income differential and the direct costs of migration (Ghatak et al., 1996):

$$PV(t) = \int_0^T \left[pW_{bt} - W_{at}\right] e^{-rt} dt - C_{ab} = \frac{1}{r}\left[pW_{bt} - W_{at}\right] \quad (1)$$

where W_{at} and W_{bt} stand for household wage in origin and destination areas respectively, at time t, C_{ab} is the cost of migration from area a to b, r is the implicit discount rate while p is the probability to find employment and T represents the time during which the individual will remain in the labour force. The objective function, PV(t) represented by Equation 1 should have a positive value, otherwise no migration occurs (Cebula, 1979).

Household variables that influence individuals' income creation as migrants or non-migrants (for example, the household size, composition and demographic characteristics) often are found to significantly affect migration as well. To capture the effects of these variables on a household's participation in migration, the determinants of income for migrant households and non-migrant households are analysed separately. An equation describing the decision to migrate is also considered. If consistent estimates of income equations can be obtained, then fitted values from the income equations may be used to estimate the parameters of the migration decision equation.

The underlying assumption here is that an individual migrates, if the net benefit for moving is greater than 0, that is, if:

$$(pW_{bt} - W_{at}) - rC_{ab} > 0 \quad (2)$$

The equilibrium migration condition is thus:

$$pW_{bt} - W_{at} = rC_{ab} \tag{3}$$

The probability of finding a job in the destination areas, p, is equal to the number of available jobs in destination areas L_b, divided by the total active population size ($15 \leq$ age ≤ 65 years, according to the International Labour Organisation (ILO) standard indicators definition) in the area of destination after migration takes place, namely $L_b + MN_a$, where M is the rate of migration and N_a is the population size in the origin area. N_a and N_b are exogenous variables, which are independent of migration and M is sufficiently small compared with N_a, so that it does not influence the origin population size, thus $L_b = \bar{L}_b,\ N_a = \bar{N}_a$. The probability of obtaining employment p is given by:

$$p = \frac{\bar{L}_b}{\bar{L}_b + MN_a} \tag{4a}$$

However, the education level of the unemployed in the destination area also influences the probability of employment, given the level of education of the migrant. Thus,

$$p = \frac{\bar{L}_b}{\bar{L}_b + MN_a} \cdot \left(\frac{Z^a}{Z^b}\right) \tag{4b}$$

where Z^a and Z^b refer to relative education level of the migrant from the origin area and the education level of the unemployed in the destination areas respectively. Hence, a higher probability of employment is attached to a relatively lower level of education of the unemployed in the destination area. The following equilibrium migration rate can then be deduced by inserting Equation 4b into Equation 3 as follows:

$$M = \left[\frac{(Z^a W_{bt} - W_{at}) - rC_{ab}}{rC_{ab} + W_{at}}\right] \frac{\bar{L}_b}{Z^b \bar{N}_a} \tag{5}$$

From Equation 5, we get the following familiar results (Ghatak et al., 1996):

$$\frac{\partial M}{\partial W_{bt}} > 0; \frac{\partial M}{\partial W_{at}} < 0; \frac{\partial M}{\partial \bar{L}_b} > 0; \frac{\partial M}{\partial C_{ab}} < 0 \tag{6}$$

The expressions in Equation 6 show that any marginal increase in the wages of the destination area or a decrease in wages of the origin areas would enhance migration. Furthermore, any policy to increase employment in the destination areas or a decrease in the cost of migration would raise the migration rate and may increase unemployment in the destination area. Migration flows are determined by job opportunities. This simple explanation of the migration phenomena suggests that to reduce the flows of migration, it is necessary to raise the opportunity cost of migration, $W_{at} + rC_{ab}$. As suggested by Todaro (1976), the net difference between income in origin area and destination area plays a dominant role in migration behaviour.

Analysing the impact of income gap requires us to introduce the difference in origin and destination income into the equation of migration decisions.

However, recently an alternative theory on migration has emerged: the NELM view that the migration decision is not only a response to wage differential but families also spread their labour assets over geographically dispersed and structurally different markets to reduce risks. Stark (1993) argues that if future earnings are uncertain and imperfectly but positively related in a geographically specific area, the migration policy of a member of the income pooling family diversifies risk. Ghatak et al. (1996) formalised the idea of NELM by the Harris and Todaro model.

Let the utility of a representative family be $U(Y)$, where Y is income and U is a concave utility function with $U' > 0$, $U'' < 0$. Let the family choose a proportion M of the family to migrate. As before, let N_a be the labour force in the origin area so that $M{\cdot}\bar{N}_a$ is total migration. The family then must choose a proportion M of its members to migrate at a cost rC_{ab} per period who obtain employment with probability p at the destination wage W_{bt}. The proportion that remains, $1-M$ receives a certain domestic (origin) wage W_{at}.

Let $\bar{W}_{bt} = W_{bt} - rC_{ab}$ be the net wage at the destination after paying for migration costs. Then the family maximises its expected per period utility as follows (Ghatak et al., 1996):

$$E(u(Y)) = pU\left(M\bar{W}_{bt} + (1-M)W_{at}\right) + (1-p)U[(1-M)W_{at}] \tag{7}$$

To proceed further with the utility function, we choose a logarithmic function $U(Y) = \log \text{Y}$. Then solving for M, we arrive at the following equilibrium condition (Ghatak et al., 1996):

$$M = \left[\frac{p\left(\bar{W}_{bt} - W_{at}\right) - (1-p)W_{at}}{W_{at}\left(\bar{W}_{bt} - W_{at}\right)}\right] W_{at} \tag{8}$$

Provided that the right hand side of Equation 8 lies in the interval [0.1], when $\bar{W}_{bt} > W_{at}$ then migration takes place (i.e., $M \geq 0$) if and only if $p(\bar{W}_{bt} - W_{at}) \geq (1-p)W_{at}$. Thus $W_{at} \geq pW_{bt} - rC_{ab}$ is the condition for any migration to occur.

On the other hand, as mentioned earlier in this paper, analysing the behaviour of migrant households from a population leads to a self-selection problem. To correct the selection problem, we use a two-step Heckman procedure. Following Nakosteen and Zimmer (1980), the Heckman two-step self-selection model is specified as follows:

$$I_i^* = \beta_0 + \beta_1 Z_i + \beta_2 X_i + \in_i \tag{9}$$

The above equation explains the migration decision. I_i^* is an unobserved variable. What we observe is the dummy variable I which equals 1 when the household is a migrant household and equals 0 otherwise. That is, $I = 1$, if $I_i^* > 0$;

and $I = 0$, otherwise. Z_i and X_i represent the independent variables of the selection equation and those of the income equation respectively.

On the basis of the observed dummy variable I, the β parameters can be estimated by the probit method only up to a proportionality factor. Hence, to normalise, we need to impose the restriction that the variance of $\in_i$ be unity (Lee et al., 1980).

The model[3] is completed by specifying income equations[4] for non-migrant households Equation 10 and migrant households Equation 11, as follows:

$$W_{ai} = \gamma_{a0} + \gamma_{a1}x_i + \in_{ai} \tag{10}$$

$$W_{bi} = \gamma_{b0} + \gamma_{b1}x_i + \in_{bi} \tag{11}$$

The appropriate measure of income in the study is the natural logarithm of annual incomes, thus we insert $\log W_b - \log W_a$ into Equation 9. The final model[5] to be estimated is presented in Equation 12:

$$I_i^* = \beta_0 + \beta_1 Z_i + \beta_2\left[\log W_{bi} - \log W_{ai}\right] + \in_i \tag{12}$$

$$\log W_{ai} = \gamma_{a0} + \gamma_{a1}x_{ai} + \in_{ai} \tag{13}$$

$$\log W_{bi} = \gamma_{b0} + \gamma_{b1}x_{bi} + \in_{bi} \tag{14}$$

We estimate the parameters of Equation 12 by the maximum likelihood probit technique, as the observed migration decision (the dependent variable) has a binary nature. Because it fails to reflect the presence of self-selection in migration, OLS is inappropriate for the income equations. This can be observed by noting that the conditional means of the income disturbance terms are non-zero and not constant for all observations (Maddala, 1983):

$$E(\in_{bi} | I_i = 1) = \sigma_{b\in*}\left[-f(\psi_i)/F(\psi_i)\right] \tag{15}$$

$$E(\in_{ai} | I_i = 0) = \sigma_{a\in*}\left[f(\psi_i)/1 - F(\psi_i)\right] \tag{16}$$

$$\lambda_i = \frac{f(\psi_i)}{1 - F(\psi_i)} = \frac{f(\psi_i)}{F(-\psi_i)} \tag{17}$$

Where $\sigma_{b\in*}$, $\sigma_{a\in*}$ and ψ are elements of the covariance matrix of disturbances; λ is the 'inverse Mill's ratio'; while f (·) and F (·) are the standard normal density and distribution functions respectively. Heckman (1979) remarked that the function λ is a monotone decreasing function of the probability that an observation is selected into the sample. Substituting Equations (13) and (14) into (12) gives the reduced form of the migration decision equation as follows:

$$I_i^* = \beta_0 + \beta_1 x_i' + \in_i^* \tag{18}$$

In Equation 18, $x_i^{'}$ consists of all exogenous variables in the model. This leads to Equation 19, which is the empirically estimated model.

$$\xi = \beta_0 + \beta_1 X_i^{'} \tag{19}$$

The probit estimation of Equation 19 yields the fitted values, $\hat{\xi}$, which will then be used as estimates in Equations 15 and 16. The selectivity bias is captured by Equations 15 and 16. Our model recognises the endogenous nature of the migration decision and thus formally accounts for the problem of migrant self-selection.

The procedures of estimating the parameters are as follows: first, we estimate by probit model the reduced form of the decision equation, Equation 19. This probit model explains whether a household is a migrant one or not and estimates β parameters. Secondly, we estimate the inverse Mill's ratio for each observation using the results of the probit estimation. Thirdly, we insert the 'inverse Mill's ratio' into the income equations and estimate the income equations using the Heckman (1979) selection model including the 'inverse Mill's ratio'. Finally, the fitted values from the income equations, log w_b and log w_a, are inserted into the appropriate structural migration model and these are estimated by the probit model.

Following the estimation of the Heckman procedure, the marginal effects of the variables are also estimated. Parameter estimates from discrete choice models, such as probit, must be transformed to yield estimates of the marginal coefficients – that is, the change in the predicted probability associated with changes in the explanatory variables must be taken into account (Greene, 2003). Marginal effects are nonlinear functions of the parameter estimates and the levels of the explanatory variables, so they cannot generally be inferred directly from the parameter estimates (Anderson and Newell, 2003).

The marginal effects of the migration decisions are different from the estimated coefficient in the migration model and can be specified by Equation 20 as follows. The predicted probability from a binary choice model is given by:

$$E[Y|I = 1] = E[Y_b] = F(\beta^{'} X) \tag{20}$$

Where Y is a choice variable (participation in migration); X is a vector of explanatory variables; $\beta^{'}$ is a vector of parameter estimates; and F is an assumed cumulative distribution. Thus the marginal coefficients are equal to:

$$\partial E[Y_b]/\partial X = f(\beta^{'} X)\beta \tag{21}$$

SAMPLING PROCEDURE AND EXPLANATORY VARIABLES

Sampling Procedure

The data used in this study was collected from the VB of Ghana between May and September 2001 using a Common Sampling Frame (CSF)[6] approach. The survey aimed at building a common primary database within the project for different research teams including migration.

The sampling procedure benefited from the World Bank Ghana Living Standard Survey (GLSS IV) conducted in 1998/99. This survey used the list of 1984 population census Enumeration Areas (EAs) that considered population and household information as important factors in the selection criteria for their sampling frame. Their sampling design involved stratification according to the three ecological zones – savannah, forest and coastal. Further stratification was made in each zone to categorise it as rural or urban. Then, in each stratum, EAs were selected based on systematic sampling with probability proportional-to-size criterion. The number of EAs selected in each stratum is proportional to the size of that stratum. This first stage of sampling resulted in the selection of 300 EAs.

The 300 GLSS IV EAs were used as sampling units for the GLOWA-Volta survey. Of these 300 EAs that were drawn from the Ghana 2000 population census, 112 of them fall within the Basin and 84 EAs were selected purposively from the 112 EAs as they captured the research interests of all sub-projects of the GLOWA-Volta project. After compiling a list of operational selection criteria that captured the research interests of all sub-projects involved, Principal Component Analysis (PCA) was used. Eight factors were identified as principal components that explain 70 per cent of the variation in the data. Based on the results of the PCA, ten clusters (or strata) were finally identified in a subsequent cluster analysis (Berger et al., 2002). The EAs closest to the cluster *centroid* were then selected as representative communities according to the proportional-to-size rule.

A list of 20 rural communities was selected spanning two ecological zones. In each of the 20 survey communities, 23–27 households were randomly selected making a total of 501 households. As shown in Table A1 (Appendix), the survey involves 221 migrant households and 280 non-migrant households. Generally, the survey to obtain estimation samples is interdisciplinary in nature and migration is a part of the wide ranging survey. The survey covers topics such as agricultural and non-agricultural activities; on-farm and off-farm labour; household water supply; irrigation activities; and basic household characteristics. With respect to income of the household, the data furnishes information on incomes from crop and livestock production; harvested roots; fruits and vegetables; off-farm wages; remittances; assistance from relatives; sales of firewood and charcoal; pension; and other miscellaneous activities. The other variables include age; gender; education; household size; dependency ratio; local association participation (social capital);[7] migration experience; irrigation activities; and ethnic group.

Explanatory Variables

The structural form of the model consists of a migration decision equation and income equations for migrant and non-migrant households. The model is specified by asserting the exogenous variables and the dependent variable included in each equation.

Household size (HHSIZE1) is included in the migration equation to observe the impact of household size on migration decisions. It is expected that larger households would send migrants out, and thus a positive relationship is expected. With respect to the average years of education of the adult household members (EDUADULT), a positive relationship is expected owing to the importance of education in migration activities. The dummy (IRRIG), the soil quality index (SOILQ), the application of fertiliser per acre of land (FERPERAC), and farm size (FARMSZPE) are considered in the migration model to indicate the relevance of agricultural activities in the migration decisions of households. The expectation is that households with irrigation activity, high soil quality, higher application of fertiliser, and bigger farms are less likely to migrate. For the dummy off-farm activity (OFF), a negative sign is expected as households with less off-farm activity seek migration activity as a means of income diversification. Besides, households with off-farm activity would require more labour at home, which in turn means less labour supply for migration.

The variable sex of household head (HEADSEX) is included to reflect the widely held notion that the probability of migration is higher for males than females. Its coefficient is expected to be negative to indicate the consequence of family ties on the migratory behaviour of females. There is a considerable ambiguity in the literature concerning the effect of gender on migration. Mincer (1978), for example, reports that family ties tend to deter migration by reducing the employment and incomes of migrating wives. On the other hand, studies by Caldwell (1969), Nabila (1974), Yang (1992) and recently Litchfield and Waddington (2003) found that females are more mobile than males. Yet, as an apparent paradox, Gbortsu (1995) found that males are more mobile than females.[8]

TABLE 1
LABELS AND MEAN VALUE OF VARIABLES

Variables	**Definition**	**Migrant household**	**Non-migrant household**
HHSIZE1	Household size	10.22	8.10
DEPRATIO	Dependency ratio	0.50	0.75
HEADSEX	Sex of the household head (1 = female, 0 = male)	0.24	0.10
ETHNIC	Ethnic group (1 = Akan,[a] 0 = Otherwise)	0.47	0.36
MEAGE	Mean age of adults in a household (≥15 years)	35.43	35.08
PARTICIP1	HH members' participation in local associations (1 = Participation, 0 = Otherwise)	0.51	0.48
MIGEXP	Migration experience of the HH (1 = Yes, 0 = No)	0.48	0.39
EDUADULT	Average adult education years in a household	3.23	2.59
FERPERAC	Fertiliser spending (kgs per acre)	8.33	12.30
OFF	If the household engages in off-farm activity (1 = Yes, 0 = Otherwise)	0.71	0.80
CROPS	The number of types of crops grown in two seasons	1.56	1.57
IRRIG	If the household irrigates (1 = Yes, 0 = Otherwise)	0.20	0.13
FARMSZPE	Farm size in acres per person	1.33	1.30
SOILQ	The soil quality index[b]	2.12	2.06

[a] Akan is a major ethnic group in Ghana, comprising about 40% of the total sample households (Table A2 in Appendix).
[b] The indicators for the soil quality index of the farm household are the amount of stone, water absorption, water holding capacity, and ease of cultivation, ranging from 1 to 3, 3 being the highest (this is self-reported data from the respondent households).
Source: Computed from GLOWA-Volta survey (2001).

The coefficient of the ratio of dependants to adults in a household variable (DEPRATIO) is expected to be negative as more dependants in a household means more responsibility and a higher reservation wage for potential migration, which would deter migration. The migration experience (MIGEXP) explains if the household head or the spouse had been somewhere else except their place of birth and their current place of residence. It is expected that households with migration experience are more likely to carry out further migration by sending out their household members.[9]

For the dummy variable ethnic group (ETHNIC), the value of 1 for those belonging to *Akan* and 0 otherwise is assumed. This model includes observation whether networks represented by ethnic enclaves play a role and if households belonging to a certain ethnic group are more inclined to migration than others. For household members' participation in local associations, self-help groups or community developments (PARTICIP1), the coefficient is expected to be negative, since households with higher local participation have strong social ties, which ultimately would discourage out-migration. The MEAGE variable, which explains the mean age of the adult members of the household, is included in the migration equation to understand the role of age in intra-family migration decision making. It is expected the more senior (the higher the average age) the household is the higher the probability of sending out a migrant.

In the income equation, the average educational level of the household (EDUCADULT) is important in determining the income of households and its coefficient is expected to be positive, showing the positive role of education on income. Since the survey is essentially done in the rural areas, the total farm size cultivated per person (FARMSZPE) and the fertiliser spending per acre (FERPERAC) are considered to illustrate the influence of agricultural inputs on income and their respective signs are expected to be positive. The expected effect of the off-farm activity (OFF) is positive, reflecting the positive role of off-farm activity on the income of households.

RESULTS AND DISCUSSION

The income model evaluates the determinants of income for the migrant and non-migrant households independently, while the migration model, corrected for selectivity bias, examines the influence of the income differential and other factors for household migration decisions.

The Probit Model

The first step is to estimate a reduced form decision equation, which includes as explanatory variables all the exogenous variables in Equation 19. The maximum-likelihood probit estimates of this equation are presented in Table 2 (column two). Estimation results show that the signs of the parameter estimates generally conform to prior expectations. The probability of migrating is statistically significantly dependent on education; migration experience; household size; dependency ratio; off-farm activity; irrigation access; ethnic network; and social capital.

TABLE 2
MIGRATION DECISION AND THE HECKMAN SELECTION MODEL RESULTS

Explanatory variables	**Migration**	**Income of migrant households**	**Income of non-migrant households**
Average education years for adults in a household	0.092 (3.25)	−0.030 (−2.30)***	−0.008 (−0.59)
Off-farm activity	−0.479 (−3.17)***	0.386 (5.25)***	0.226 (3.11)***
Farm size in acres (per person)		0.047 (2.94)***	0.017 (1.74)**
Fertiliser application (kgs per acre)	−0.005 (−2.32)***	0.003 (2.21)**	0.000 (0.04)
Having irrigation fields	0.588 (3.25)***	0.034 (0.42)	0.111 (1.26)
Crop types grown in two seasons	−0.122 (−1.24)	0.013 (0.31)	−0.038 (−0.87)
Soil quality	0.434 (1.80)**	−0.003 (−0.02)	0.067 (0.64)
Sex of household head	0.201 (1.26)		
Mean age of adult members of the household	0.008 (1.11)		
Household size	0.123 (7.23)***		
Migration experience	0.436 (3.05)***		
Dependency ratio	−0.243 (−2.55)***		
Household's participation in local association	−0.435 (−3.26)***		
Ethnic group	0.351 (2.33)***		
Intercept	−2.162 (−3.45)***	−2.162 (−3.45)**	6.270 (27.62)***
Inverse Mill's ratio (λ)		−0.259 (−2.62)***	0.059 (0.57)
Observations	467		

Value of z statistics in parentheses.
prob > $chi^2 = 0.0000$.
*** Significant at 1%; ** significant at 5%.
Source: Computed from GLOWA-Vo lta survey (2001).

Consistent with prior expectations, the probability of migrating increases with the increase in education (EDUADULT). The statistical significance of this human capital coefficient suggests that households with more education are more likely to send out migrants. As expected the participation variable (PARTICIP1) returned a negative and statistically significant coefficient. This shows that households are genuinely reluctant to leave their source communities when they actively participate in local associations, self-help groups or community development groups. The positive and statistically significant coefficient on migration experience (MIGEXP) lends credence to the fact that households with migration experience are more likely to consider participating in migration than households with no migration experience. An interesting finding is the negative and statistically significant coefficient on the dummy variable, the off-farm activity (OFF). This finding suggests that as households' possibility for off-farm activity increases, the likelihood of participation in migration activity decreases. A possible explanation for this phenomenon may be that the off-farm activity creates a source of employment and livelihood for the members of the household who would potentially migrate and thus decreases likelihood of migration.

The significant coefficient on the ethnic dummy variable (ETHNIC) indicates that network created by ethnic enclaves acts strongly in migration activities. The positive sign of the coefficient of irrigation variable (IRRIG) also implies that households with access to irrigation are more likely to migrate. The positive coefficient of the household size suggests that a large family size (HHSIZE1) may be viewed as a risk-pooling strategy that may encourage migration. This result is consistent with the underlying migration theory of Stark (1993), who argues that it is plausible for a household with a large family size to encourage migration by providing a diversified source of income and hence controlling for the level of risk. The negative and significant coefficient of the dependency ratio variable (DEPRATIO) can have two interpretations. First, this result could show that the presence of dependents in a household is expected to increase the reservation wage of the potential migrant, hence deterring migration. The second possible interpretation of this result is that there may be an agglomeration effect to household size in the source community. This may be particularly important in rural areas where additional family members may lend extra help on family land. Children often contribute to domestic activities and hence are a valuable source of labour. Indeed, this result is consistent with that of another finding in the literature, which suggests that a large family size (including the presence of other dependents) may act as a deterrent to migration (Agesa, 2001; Agesa and Kim, 2001).

The Income Equations

The next step is to model the determinants of income for migrant and non-migrant households. To counter any estimation problems of the model with sample selection bias, Heckman's two-step selection model is employed. The estimates of the income model for the migrant and non-migrant households are presented in Table 2, columns three and four respectively. Inclusion of all exogenous variables in both the decision and income equation yields a collinearity problem in the second stage of the estimation procedure[10] (Nakosteen and Zimmer, 1980). Thus the income model variables are specified in such a way to include those variables which are thought to influence incomes in a manner different from their impact on the decision to migrate.

Although the income estimates are only used for obtaining consistent estimates of the migration status equation, they are of interest and deserve discussion as well. As shown in Table 2 (column three), parameter estimates of the regression indicate that the cultivated farm size (FARMSZPE) and off-farm activity (OFF) positively affect the income of migrant households, as expected. Consistent with prior expectations, the income of migrant households decreases with the increase of the fertiliser application (FERPERAC). On the other hand, contrary to the prior expectation, the coefficient for adults' education in the household (EDUADULT) turned out to be negative. Of special importance is the estimated coefficient of the inverse mill's ratio, λ. What is more important is that this is a statistically significant estimate. This result lends support to the hypothesis of self-selection at least as far as the migrants from the population are concerned. This can be interpreted in support of the view that migrant households in the population choose to send a migrant out because they find it to be more favourable than not sending one.

With respect to the income for non-migrant households, the farm size cultivated (FARMSZPE) positively affects the income of the non-migrants (Table 2, column four), as expected. The parameter estimate on the dummy variable off-farm activity (OFF) is statistically significant and the sign is positive as expected. The absence of statistical significance for the coefficients of education and fertiliser suggests that non-migrant household income is insensitive to these two variables. The inverse mill's ratio, λ, also turned out to have an insignificant impact, indicating that the self-selection procedure pertains only to the migrants from the population.

It is also interesting to note the combined effect of the inverse mill's ratios on unconditional incomes. In essence, the combined truncation effect should be positive so that the process of self-selection serves to enhance unconditional expected incomes. Following Nakosteen and Zimmer (1980), the unconditional expected income is specified as follows:

$$E(Y_i) = E(Y_i \backslash I_i = 1) \cdot P(I_i = 1) + E(Y_i \backslash I_i = 0) \cdot P(I_i = 0) \tag{22}$$

$$\begin{aligned} E(Y_i) = {} & (\theta_b^{'} X_{bi} - \delta_{b\in} \cdot (f(\psi_i)/F(\psi_i)))F(\psi_i) \\ & + (\theta_a^{'} X_{ai} + \delta_{a\in}(f(\psi_i)/1 - F(\psi_i))) \cdot (1 - F(\psi_i)) \end{aligned} \tag{23}$$

Where X_{bi} and X_{ai} refer to all exogenous variables in the migrant and non-migrant income equations, respectively. Rewritten as:

$$E(Y_i) = (\theta_b^{'} X_{bi})F(\psi_i) + \theta_a^{'} X_{ai})\left[1 - F(\psi_i)\right] + (\delta_{a\in} - \delta_{b\in})f(\psi_i) \tag{24}$$

The term $\delta_{a\in} - \delta_{b\in}$ (which is the difference in the inverse mill's ratios) in Equation 24 represents the combined effect of self-selection on expected incomes. Based on the estimates from Table 2 (columns three and four), we have: $\hat{\delta}_{a\in} - \hat{\delta}_{b\in} = 0.318$. This indicates that the combined effect on income is positive.

For the estimation procedure, the final step entails a probit estimation of the structural form of the migration decision Equation (Table 3). We computed the predicted values of the log incomes for both the migrant and non-migrant equations and further computed the difference. These are then inserted into the structural decision equation. The results of the parameter estimates are presented in Table 3. Perhaps the most important finding is the positive and statistically significant estimated coefficient on the income differential variable. The estimates reveal that the leading factor determining household migration decisions is the migrant/non-migrant income difference.

Specifically, the effect of expected monetary gains is to significantly increase the probability of migration. This result is consistent with underlying migration theory (Todaro, 1976) and is also consistent with previous research findings (Agesa, 2001; Konseiga, 2004) in the literature which suggest that observed levels of migrant incomes are higher than those of non-migrants and the incidence of migration is relatively higher for those with positive earning differences. An additional point of interest is that the magnitudes and standard errors of the other coefficients are very close to their counterparts in the reduced form of the decision equation. The marginal coefficients for the parameter estimates can be different from the Heckman estimates in both magnitude and sign (Greene, 2000). It is thus important to investigate the marginal coefficients of the variables. The marginal effect shows that the income

TABLE 3
STRUCTURAL MODEL OF THE MIGRATION DECISION EQUATION

Variables	**Coefficient**
Education of adults in a household	0.126 (3.69)***
Off-farm activity	−0.756 (−3.51)***
Fertiliser application (per acre)	−0.009 (−2.94)***
Gender of household head	0.239 (1.49)
Migration experience	0.456 (3.16)***
Dependency ratio	−0.234 (−2.45)***
Household size	0.128 (7.39)***
Household's participation in local association	−0.442 (−3.30)***
Ethnic group	0.327 (2.15)**
Irrigation activity	0.586 (3.23)***
The number of crop types grown in two seasons	−0.121 (−1.22)
Soil quality	0.439 (1.82)**
Mean age of adults in the household	0.006 (0.436)
Log of income differential	1.713 (1.85)**
Constant	−2.591 (−3.87)***
Observations	467

Value of z statistics in parentheses.
prob $>$ chi$^2 = 0.0000$.
LR chi^2 (14) $= 107.57$.
*** Significant at 1%; ** significant at 5%.
Source: Computed from GLOWA-Volta survey (2001).

differential has by far the strongest marginal impact (Table 4). As the income differential between the migrant and non-migrant household increases by 10 per cent, the probability of migration will increase by 6.75 per cent. Households with migration experience are 18 per cent more likely to migrate than their non-migrant household

TABLE 4
MARGINAL EFFECTS OF THE EXPLANATORY VARIABLES OF THE STRUCTURAL MIGRATION MODEL

Variables	**Coefficient**
Education of adults in a household	0.050 (3.69)***
Off-farm activity*	−0.294 (−3.72)***
Fertilizer application (per acre)	−0.004 (−2.94)***
Gender of household head*	0.952 (1.49)
Migration experience	0.179 (3.20)***
Dependency ratio	−0.092 (−2.45)***
Household size	0.051 (7.38)***
Household's participation in local association*	−0.174 (−3.34)***
Ethnic group*	0.129 (2.16)**
Irrigation activity*	0.230 (3.35)***
The number of crop types grown in two seasons	−0.476 (−1.22)
Soil quality	0.173 (1.82)**
Mean age of adults	0.002 (0.78)
Log of income differential	0.675 (1.85)**

* dy/dx is for discrete change of dummy variable from 0 to 1.
Source: Computed from GLOWA-Volta survey (2001).

counterparts. In other words, having migration experience increases the probability of participation in migration by 18 per cent. The increase by a household member results in a 5 per cent increase in the probability of migration, *ceteris paribus*. Households with off-farm activity are likely to have a 29 per cent reduced probability of migration than those with no off-farm activity.

CONCLUSIONS AND POLICY IMPLICATIONS

The human investment approach to migration is a sound behavioural model and the empirical findings presented here further support it. Unlike previous studies, this paper attempts to make a simultaneous use of the NELM theory, which regards migration as a household decision (Stark, 1993), sample-selection bias, together with the Todaro (1976) model of migration. By doing so, this study provides a possible explanation for the increase in migration as ordinary effect of the rising income differential between migrant and non-migrant households. This paper additionally attempts to incorporate endogenous selectivity into a model of migration and income.

The result from this paper confirms that migrant households earn more income than their non-migrant counterparts: *ceteris paribus*. A study on the pattern of inter-regional labour migration in Ghana by Beals et al. (1967) also found a similar result on the positive income effects of migration. The positive income difference between migrant and non-migrant households supports the theory of Sjaastad (1962) in such a way that migration is viewed as one means of resource allocation. Choosing to have a family member migrate from a household is mainly a reaction to economic incentives arising from imbalance across spatially separated labour markets, which has also received considerable attention in the theoretical literature on investment in human beings (Sjaastad, 1962). Estimation results demonstrate high indication of self-selection in the incomes of migrant households. It is also shown that the outcome of the self-selection process on unconditional, expected incomes is positive. Other factors also affect the migration status of households. Among these factors are household size, education, migration experience, ethnic networks, and social capital.

When there is a lack of smoothly functioning credit markets, rural households try to diversify incomes by reorganising the utilisation of their own resources. Such macro-level factors affect the household's migration decision (Stark, 1993). The fact that migrant households have higher earnings than non-migrant households also lends support to this view. This would implicitly indicate to the non-migrant households that a promising channel for diversifying/increasing income, pooling risk, and increasing household farm production is sending out a migrant. Thus an important policy implication facing national planners is that, if the government wants to control the mass flow of migrants out of rural areas, it may need to boost the means by which rural households can reduce their financial constraints and thus increase farm productivity. Such measures would range from reforming and promoting rural credit systems to creating off-farm employment opportunities in the rural areas. In general, investment in rural development is expected to reduce incentives to migrate.

NOTES

1. The GLOWA (Global Hydrological cycle)–Volta Project (http://www.glowa-volta.de) is an interdisciplinary project that strives to support sustainable water resource management in the Volta Basin. The primary goal is the development of a Decision Support System (DSS) that will help the authorities in Ghana, Burkina Faso, and the other riparian countries to optimise water allocation within the basin. This paper is a part of the sub-project in the context of the whole project.
2. Empirical evidence from Ghana (Caldwell, 1969; Nabila, 1974; Litchfield and Waddington, 2003) shows that migrants tend to be disproportionately young, better educated, less adverse to risk, more achievement-oriented, and they also have better personal contacts in destination areas than non-migrants from the same area.
3. See Agesa (2001) for a similar model, which allows for different earning structures for migrant and non-migrant individuals by estimating separate log earning equations for the migrants and non-migrants.
4. Income differences between households can be because of differences in households' characteristics. Thus, the first estimate should be between the difference in earnings of migrants and non-migrants. This is the rationale behind specifying the income equations for the migrant and non-migrant households.
5. The vectors of explanatory variables in Equations 13 and 14 do not necessarily consist of the same elements as those appearing in Equation 12.
6. The Common Sampling Frame (CSF) approach, where different units of observation are hierarchically linked, is employed for the selection of survey sites and data collection. The advantage of CSF is that it can make use of prior information for stratification and therefore tends to increase precision and reliability as compared to pure random sampling. This hierarchical sampling frame permits the extrapolation ('grossing-up') of sample measurements to the universe. This CSF approach offered advantages for the interdisciplinary research teams by providing a maximum overlap of biophysical and socio-economic field observations.
7. The social capital variable indicates the participation of household members in local associations for mutual co-operation, in self-help groups or committees for development; in the form of payment for development projects or even participation in communal projects.
8. The results are in a clear contradiction, especially when viewed in terms of the fact that the studies by Caldwell (1969); Nabila (1974); Gbortsu (1995); and Litchfield and Waddington (2003) are all on Ghana.
9. Plane and Rogerson (1994), for example, remarked that 'migration is a lot like sinning – if you have done it once, you are more likely to consider doing it again'. Additionally, Yang (1992) revealed that high mobility is often associated with a high frequency of repeat migration.
10. To avoid identification problem, in the Heckman two-step selection model, there needs to be at least one variable in the selection model which is not included in the main model (Greene, 2000; Web information from STATA website (http://www.stata.com)).

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APPENDIX

TABLE A1
SAMPLE DESCRIPTION

Group	**Destination**			**Total**
	Urban	**Rural**	**Missing**	
Migrant households	154	43	24	221
Non-migrant households	–	–	–	280
Total				501

Source: Computed from GLOWA-Volta survey (2001).

TABLE A2
ETHNIC GROUP OF SAMPLE HOUSEHOLDS

Ethnic group of household	**Number of households**	**%**
Akan	199	39.7
Dagbani	30	6.0
Ewe	29	5.8
Nankani	27	5.4
Gonja	26	5.2
Guan	17	3.4
Kassena	16	3.2
Konkomba	15	3.0
Bulsa	13	2.6
Other	124	24.8
Missing system	5	1.0
Total	501	100

Source: Computed from GLOWA-Volta survey (2001).

TABLE A3
SOURCES OF INCOME

Main source of income	% of households
Farm activities	64
Non-farm self-employment activity	12
Off-farm activities	9
Migration activities	7
Actual and imputed renting	2
Other activity	6
Total	100

Source: Computed from GLOWA-Volta survey (2001).

TABLE A4
SPECIFIC SAMPLE CHARACTERISTICS

Specific groups	Predicted probability of migration
Average household	0.44
High education (with at least secondary school)	0.49
Female headed households	0.52
High remittances (households with remittances of more than 20–100% of their income)	0.71
Non-farm self-employment (households with 20–100% of their income from non-farm self-employment)	0.39

Source: Computed from GLOWA-Volta survey (2001).