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Full Length Research Paper

Rural livelihood diversification and agricultural household welfare in Ghana

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Sufficient time has elapsed since agricultural sector reforms got underway in Ghana and so this study examined how some selected proxies of the reforms have changed overtime and evaluated their relative importance in influencing rural livelihood diversification and household welfare. In doing this, data was pooled from the 1991/1992 and 2005/2006 Ghana Living Standards Survey (GLSS) and the endogenous switching regression technique was employed. Diversified households and less diversified households differed significantly in terms of variables related to household assets, markets and institutions. Both household welfare and rural non-farm diversification decisions are mostly driven by household assets including good health, education, and household age composition. Households who live in communities with access to fertilizers, public transports and local produce markets are more likely to engage in non-farm diversification and enjoy improved welfare. The importance of access to TV and radio as effective mass media tools in influencing household behavior is underscored in the analysis. Targeting interventions that enhance livelihood diversification would ultimately have a positive impact on household welfare.

Key words: Rural, diversification, agriculture, household welfare, switching regression.

INTRODUCTION

Ghana has for over the past two decades been involved in a wide-range of economic reforms aimed at creating an enabling environment for sustainable growth and development. These reforms which began under the framework of the Structural Adjustment Program marked the beginning of the deregulation of the economy and its transformation from an inefficient and import-dependent economy to one that is diversified, dynamic, efficient and export-oriented with a greater role for the private sector (Aryeetey et al., 2000). Within the agricultural sector, the reforms were implemented within the context to the Medium Term Agricultural Development Program (MTADP, 1991-2000). Agricultural policies were supported by a massive rural development scheme, designed to provide the basic infrastructure of roads, water and electricity that would encourage people to stay in the rural areas rather than migrate to the overpopulated urban areas. In the cocoa sub-sector, the multiple buying systems, involving several companies, was re-established to replace the monopoly enjoyed by the United Ghana Farmers Co-operative Council. As part of the liberalization program, the guaranteed minimum prices for maize and rice were abolished and all subsidies were removed including those for agricultural inputs, notably fertilizers, insecticides and fungicides (Seini, 2002). In addition, the procurement and distribution of these inputs (which was hitherto the responsibility of the MOFA and COCOBOD) were privatized in order to enhance competition and efficiency in agricultural input marketing.

Even though the reforms seem to be paying off on many aspects of the economy, a number of structural challenges still remain. For example, the agricultural sector continues to be characterized by low levels of productivity. Farm yields per hectare in Ghana are among the lowest in the world. Cocoa yields for example in Ghana are much lower than in neighboring Cote d'Ivoire at 350 kg per hectare compared with 800 kg per hectare (Africa Growth Initiative Report, 2010). While advanced economies are using more than 100 kg of fertilizer per hectare and producing thousands of kilograms of cereal per hectare, Ghana's use of fertilizer is about 20 kg per

ha (ISSER, 2009). The traditional dependence on rain-fed agriculture is still prevalent in Ghana and weather patterns are increasingly unpredictable and unreliable. The sector continues to be dominated by small holder farms (less than 3 hectors) with low use of new technology.

Given that agriculture is a large sector in Ghana's economy and provides livelihood for over 60% of the population, it is also reasonable to suspect that the sector's lack of transformation may be a significant contributory factor to the food security and poverty challenges in the country. According to a USAID (2010) report, Ghana currently has nearly two million people still vulnerable to food insecurity and food remains a serious concern in many parts of the country. Analysis of poverty trends in Ghana based on the results of the Ghana Living Standards Survey, though impressive also leaves much to be desired. Significant intra-regional differences in poverty levels exist and the speed of the reduction in poverty still remain a source for concern. Poverty levels have remained strikingly high (at between 52-88%) in the three northern - Northern, Upper East and Upper West (GSS, 2007).

While recognizing the urgent need to maintain a robust agricultural sector, it is increasingly becoming clear that the agricultural sector alone cannot be relied upon as the core activity for rural households as a means of improving livelihood and reducing poverty. One phenomenon that is gaining prominence in the rural development literature is the promotion and support for nonfarm diversification opportunities (Stifel, 2010). Non-farm economic activities include seasonal migration off the farm to engage in wage employment, handicraft production, trading and processing of agricultural produce, provision of agricultural services, etc. Such non-farm activities provide a way of off-setting the diverse form of risks and uncertainties (relating to climate, finance, markets, etc) associated with agriculture and creates a way of smoothing income over years and seasons. The relative importance of non-farm activities in rural areas is well documented in Reardon (1997), Reardon et al. (2001) and Barret et al. (2001).

Already, there is evidence that non-farm activities in both the rural and urban areas are widespread in Ghana. The fifth round of the Ghana Living Standards Survey (GLSS 5) estimates that approximately three million, two hundred thousand households representing about (46.4%) of households in Ghana operate non-farm enterprises. A case study of four rural communities in three ecological zones of Ghana by Oduro and Osei-Akoto (2007) gives further credence to this observation. Residents in the villages were found to be employed in a number of non-farm activities, such as hairdressing, carpentry, tailoring, trading, 'pito' brewing, food processing, charcoal trading, masonry, sewing, teaching, and nursing. Lay and Schuler (2008) analyzed changes in income portfolios of rural households and found that asset-poor households, which account for an important share of the rural population, are likely to be pushed into activities off the farm to meet subsistence needs. Al-Hassan and Poulton (2009) document a study by the Ministry of Food and Agriculture (MOFA) which disaggregates households in 16 households in the three northern regions (12), Brong Ahafo 3) and Ashanti Region (1) according to their livelihood strategies as shown in Table 1.

These micro level evidences of diversification in Ghana are also mirrored at more aggregate sectoral levels. The agricultural sector which has for long dominated economic activity has in recent years given way to the services sector (GOG, 2010).

While some analysts see the growing trend of non-farm activities as a natural progression from a predominantly agrarian economy into a diversified and productivity economy dominated by manufacturing and services ('push' factors), others (Ellis and Freeman, 2004) attribute the signs to a distressed agricultural sector that is losing its labor force not as a consequence of agricultural growth triggering growth in other sectors of the economy, but as a consequence of lack of growth or income opportunities in agriculture ('pull' factors). Whichever way one looks at it, policy makers ultimately have a role to play either by way of providing the necessary incentives for agricultural households to maximize on existing opportunities or try to minimize the constraints households face in their effort to construct viable livelihood activities. Sound empirical information on issues at the household and community level that require attention would be necessary in this regard.

Even though some extensive literature already exists on the causes and consequences of livelihood diversification, the evidence is somewhat mixed and ambiguous (Stifel, 2010; Bezabiw et al., 2010). The multitude of constraints and incentives faced by a largely heterogeneous households engaged in a multiple set of heterogeneous non-farm activities makes broad generalizations problematic (Reardon et al., 1994; Barrett et al., 2002; Haggblade et al., 2007). Attractive livelihood opportunities, according to Barret et al. (2002) are normally accessible to those households who have better endowments in terms of human, financial and physical assets. And even where households have similar endowments, production techniques, preferences, constraints and incentives attached to particular livelihood activities may be different (Iiyama, 2006).

In order to have a deeper understanding of the micro-economic constraints and incentives that influence livelihood diversification and the welfare implications of such decisions by agricultural households, this study examines and evaluates the importance of some selected proxies of the reforms in Ghana. Following the 2007 World Development Report framework for thinking about an agriculture-for-development agenda, the study specifically focuses on variables related to (i) assets (for

Table 1. Livelihood strategies of households in Northern Ghana.

Group	Characteristics	Assets	Activities
Vulnerable (5%)	High proportion of orphans, school drop-outs, youth economic migrants, widows with children, elderly, handicapped, sick	0-0.5 acres of land per active member; no livestock except 0-5 poultry; basic house & cooking equipment, clothes	Sale of firewood, making baskets or ropes, collecting wild products, sheanut gathering, buy & sell foodstuffs
Poor (35%)	High proportion of widows with children, youth semi-permanent migrants, migrants creating farms outside their tribal areas, small-scale farmers with weak labour capacities	0.3-2.5 acres per active member; 0-5 sheep/goats, 0-3 cattle (per household); Bicycle, roofing sheets	Food crops and livestock farming, petty trading, collection/processing/sale of NR products, seasonal and semi-permanent migration
Medium (51%)	Large family and high labour capacity (that is, low dependency ratio)	1.5-4 acres per active member; 10-40 sheep/goats, 3-30 cattle; (semi-permanent house; modest education and assets (e.g. sewing machine, shop, TV)	Farm and non-farm activities
Well-off (9%)	Large family and high labor capacity, higher proportion of skilled labor	1-25 acres per active member; 0-120 sheep/goats; 0-1000 cattle; larger, permanent house with water, electricity, kitchen, toilet, fridge; tractor, car/truck. May have two houses-one in town, more modest on farm	Agricultural: perennial (cocoa, rubber, mango), non-traditional or food crops (all on commercial scale); livestock (including commercial poultry). No-agric: tractor or transport services, medium-large-scale trading, shop/house rental, salaried positions

Source: Al-Hassan and Poulton (2009).

example, access to land, education, finance, etc), (ii) markets (for example, access to local markets, motorable roads) and (iii) institutions (for example, extension services, producer organizations, sharecropping, access to radio, TV, etc). To implement these objectives, data from the 1991/1992 and 2005/2006 Ghana Living Standards Survey (GLSS) were used to first describe the changes that have taken place among the chosen variables between the two periods. Second, based on the suspicion of unobserved heterogeneity and possible endogeneity in establishing the econometric relationship between livelihood diversification and household welfare, the endogenous switching regression approach was employed for the analysis. This technique, following Lokshin and Sajaia (2004) relies on joint normality of the error terms and allows us to simultaneously estimate the binary and continuous parts of the model in the binary and continuous equations in order to yield consistent standard errors. By doing this, the paper provides additional insights to related studies on Ghana such as Oduro and Osei-Akoto (2007), Owusu and Abdulai (2009), Knudsen (2007) and Anriquez and Daidone (2008). The results provide guidelines that are helpful for governments in their effort to define concrete plans to reduce poverty and vulnerability as well as to enhance household well-being..

MATERIALS AND METHODS

Study framework

The framework (Fc helps in conceptualizing the causes and consequences of rural livelihood diversification in Ghana.

The basic framework is predicated on the assumption that a household's portfolio of non-farm activities and how they impact on welfare is decided based on selected micro-economic constraints and incentives created through access to public and private resources embodied in assets, markets and institutions. By assets, we are referring to the natural, physical, social, financial and human resources of value to the household. Changes in the portfolio of assets, their productivity and the extent to which households have access to them are the attributes that are critical in determining livelihood diversification and ultimately household welfare (Dorward et al., 2003). The limitations from access to credit and lack of education, for example, have been highlighted by Bezabiw et al. (2010) in their case study on Ethiopia.

For small and marginal farmers, the importance of well-functioning markets helps in reducing transaction costs and risks

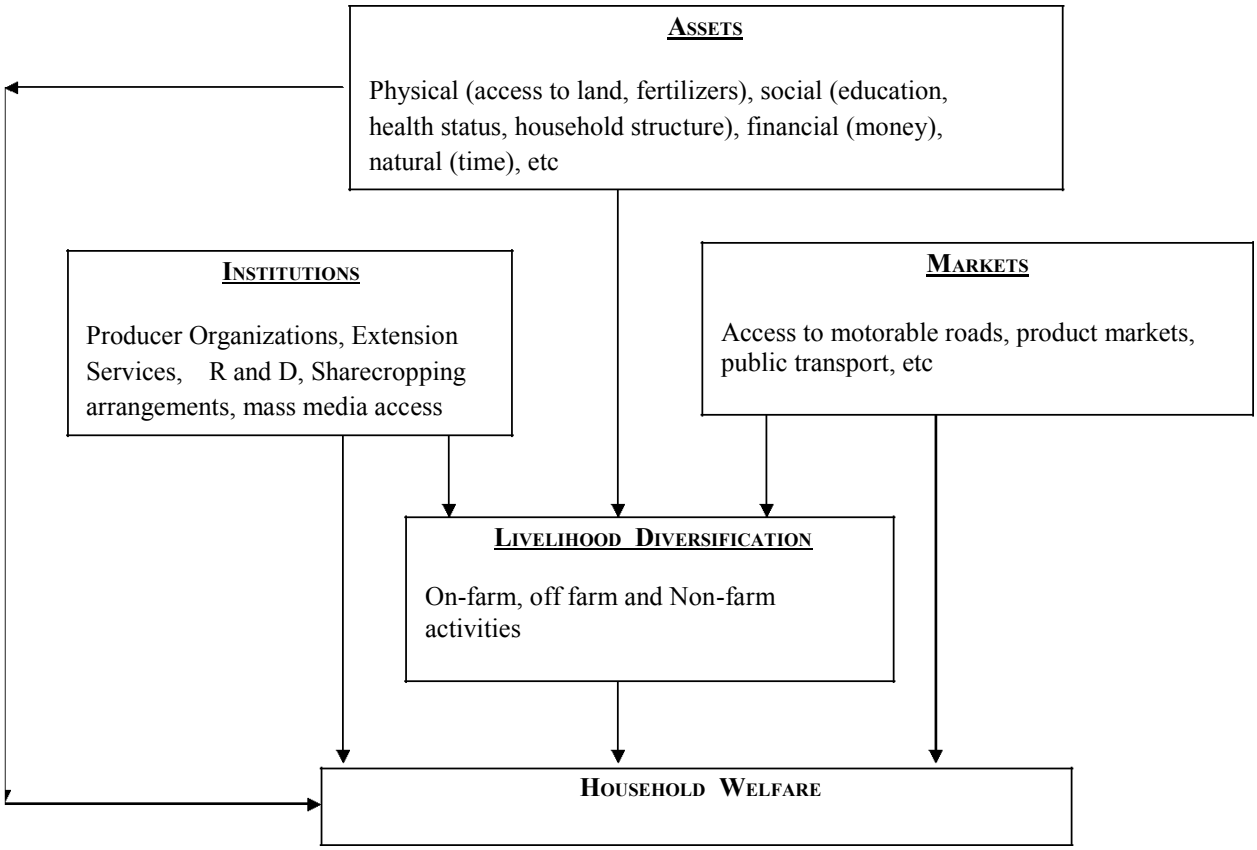

Figure 1. Study framework: Causes and consequences of livelihood diversification. Source: Author.

involved in acquiring inputs and profitably selling outputs. For example, access to rural infrastructure including the presence of local markets, motorable roads, electricity, telecommunications, etc provide important means of intervening directly in market transactions in order to change costs or returns of economic activities. This creates direct and indirect non-farm employment and income opportunities for the poor to improve welfare. The acknowledgement of the role of institutions in non-farm diversification is derived from the recognition that much of human interaction and activity is structured in terms of overt or implicit rules that define the incentives and sanctions households face (Hodgson, 2006). While the idea of institutions could be defined to include many components, the study examines three of these that are particularly important for rural farm households namely, producer cooperatives, extension services and sharecropping (Figure 1).

Estimation technique

The endogenous switching regression analysis, also known as the Mover or Stayer model, is applied to situations where one wishes to establish the effect of being in one of two different positions (status, regimes or states) on desired outcomes and the possibility of moving or staying in that particular position, regime or state (Tauer, 2005). In this study, the outcome of interest is household welfare and the two regimes or decision states are whether or not households are more or less diversified. The endogenous switching regression approach is used because the decision whether or not to engage in livelihood diversification is voluntary and may be based on individual self-selection, causing a biased sample with non-probability sampling. Self-selection makes it difficult to determine causation. For example, one might notice a significantly higher welfare among those participate in off-farm participation and credit this difference to the off-farm participation decision. However, farm households that engage in non-farm activities may have systematically different characteristics from households that do not due to self selection. Those who choose to participate in off-farm activities might be more hard-working, studious and dedicated than those who did not participate, explaining the difference between the two groups. Neglecting these effects is likely to give a false picture of the relative welfare status among the diversified and non-diversified farm groups. These reasons warrant estimating distinct regressions for the two different groups (diversified and less diversified) instead of a homogenous and single welfare function. Doing this however leads to observations that are no longer random draws from the population which makes the use of ordinary least squares not appropriate.

Following Lokshin and Sajaia (2004), the first step in the switching regression model is to determine the factors influencing livelihood diversification among the farm households based on a probit function is specified as:

$$D_I^* = \alpha' Z_I + \varepsilon_{0I} \quad (1)$$

Where D_I^* is the latent dependent variable which we observe through the decision to engage in livelihood diversification activities

and $D_I = 1$ if $D_I^* > 0$ (diversified) and $D_I = 0$ if $D_I^* \leq 0$ (less diversified). Diversification is defined as participation in the local non-farm sector through wage or self-employment. The subscript I denotes farm-households, Z_I is a vector of exogenous variables gender, age, level of education, number of dependants, land size and selected community infrastructure variables that account for community differences in income generation that may affect diversification as well as the level of household expenditures. Also, α_I' are vectors of unknown parameters and ε_{0I} is the disturbance term.

The second step in the switching regression model is to define separate welfare functions for the two groups of farm households. Their welfare functions are expressed as:

$$W_{1I} = \beta_1 X_{1I} + \varepsilon_{1I} \quad \text{If } D_I = 1 \tag{2}$$

$$W_{2I} = \beta_2 X_{2I} + \varepsilon_{2I} \quad \text{If } D_I = 0 \tag{3}$$

Where W_1 and W_2 represent welfare functions for households engaged with non-farm activities and those who do not. Household welfare is defined here as a household's command over market and non-market goods and services at the household level. The proxy used to measure household welfare is the log of household consumption expenditure adjusted by adult equivalent units. X_1 and X_2 are vectors of weakly exogenous variables; β_1 and β_2 are vectors of parameters; and ε_1 and ε_2 are random disturbance terms. The underlying assumption here is that diversification is endogenous to household welfare. Also, by splitting the sample into two, the problem of sample selection bias may arise. In order to deal with these challenges, the switching regression technique relies on joint normality of the error terms in the binary and continuous equations. The error terms, ε_{0I}, ε_{1I} and ε_{2I} are assumed to have a trivariate normal distribution with zero mean and non-singular covariance matrix specified as:

$$Cov(\varepsilon_1, \varepsilon_2, \varepsilon_0) = \begin{matrix} \sigma_1^2 & \sigma_{12} & \sigma_{10} \\ \sigma_{12} & \sigma_2^2 & \sigma_{20} \\ \sigma_{10} & \sigma_{20} & \sigma_0^2 \end{matrix} \tag{4}$$

where σ_1^2 and σ_2^2 are variances of the error terms, ε_1 and ε_2, in equations (2) and (3); σ_0^2 is the variance of the error term, ε_0, in equation (1); σ_{12}, σ_{10} and σ_{20} are the covariance of ε_1 and ε_2, ε_1 and ε_0, ε_2 and ε_0, respectively.

The simultaneous estimation based on the full information maximum likelihood (FIML) estimation of the Equations 1- 3 corrects for the selection bias in the household welfare estimates. This is implemented using the move-stay command in STATA. The estimates generated through this technique include the inverse Mill's ratio, which measures the ratio of the ordinate of a standard normal to the tail area of the distribution and reflects the probability that an observation belongs to the selected sample (Heckman, 1979). Other estimates from interaction of the error terms show the correlation of the 'unobservables' of the diversification equation with the 'unobservables' of household welfare equations.

Data

Data for the study are derived from the nationally representative multi-purpose Ghana Living Standards Survey (GLSS) for 1991/1992 and 2005/2006. These surveys provide a valuable source of detailed data including socio-economic situation of individuals, households, communities, and regions in Ghana. It includes data on demographic characteristics, health, education, economic activities and migration. The survey consists of both a household questionnaire and a community questionnaire, and data from either of these are combined for this paper. In order to also analyze the role of media access (TV, radio, newspapers) on diversification and welfare, additional data was sourced from the Demographic and Health Surveys (DHS) for the years 1993 and 2003.

RESULTS AND DISCUSSION

Descriptive statistics

The first part of the results provides a description of how the household, community and institutional variables for the sample households have changed between 1991/1992 and 2005/2006 in terms of the percentage of distribution of the survey and t-tests. As shown in Table 2, significant increases in household welfare, measured as household consumption expenditure adjusted by adult equivalent units were found.

Similar significant increases were also observed in the percentage of farm households engaged in non-farm diversification. No significant difference is observed in the education of the head of household and members aged above 60 years. Significant increases were found in the age structure of household members within the two periods.

For the 242 community variables surveyed in 1991 as against 328 in 2005, the results showed that the increases in access to motorable roads, farmers' use of fertilizers and insecticides were not significantly different from zero. Noticeable and significant reductions were however observed for the practice of sharecropping and the existence of local markets. With regards to communities with access to land markets, extensions services and where existence of agricultural cooperatives, no meaningful changes were found between 1991 and 2006. Given that rural households are spread over large areas and that information transmission to farming communities was problematic, the study decided to explore the role of access to TVs and radios on welfare and livelihood diversification. Data obtained from the Ghana Demographic and Health Surveys over a 10 year period between 1993 and 2003 showed significant increases in the proportion of households who listen to radio and watch television at least once a week.

Table 2. Characteristics of surveyed households and communities.

Variable	1991/1992	2005/2006	Significance of change
Welfare	1,061,975	1,438,117	***
Non-farm diversification	0.81	0.85	**
Total acres of land	251.72	211.73	*
Remittances	0.58	0.51	**
Disease burden	0.07	0.08	*
Gender of household head	1.25	1.22	**
Age of household head	45.43	46.82	**
Education of household head	0.65	0.68	increase not significant
Size of household	4.84	4.99	*
Members aged 5-14	1.55	1.45	**
Members aged 15-24	0.77	0.87	**
Members aged 25-39	0.76	0.85	**
Members 40-59	0.63	0.72	**
Members aged above 60	0.32	0.35	increase not significant
Motorable road in community	0.81	0.84	increase not significant
Bank in community	0.09	0.05	reduction not significant
Local community market	0.39	0.29	***
Extension worker in community	0.25	0.24	Decrease not significant
Agric cooperative in community	0.29	0.31	Increase not significant
Farmers use fertilizer	0.55	0.68	***
Farmers use insecticide	0.58	0.70	***
Land Market	0.11	0.12	increase not significant
Sharecroppers in community	0.66	0.55	***

*Means difference is significant at 10%, ** means difference is significant at 5% and *** means difference is significant at 1%.

The endogenous switching regression results

The full information maximum likelihood estimates of the endogenous switching model based on pooled cross-sections data are reported in Table 3. The first and second columns present the estimated coefficients of the welfare functions of the less diversified and diversified groups respectively whiles the probit selection equation for the off-farm diversification equation is shown in the third column. A Wald test of whether the estimated coefficients as a group are different between the more diversified and less diversified equations produced a chi-squared value of 184.08 with 25 degrees of freedom. This means that the coefficients are statistically different. The likelihood ratio test for joint independence of the three equations rejected the null hypothesis that all slope coefficients are equal to zero at the 1% level (chi-squared value was 71.77). The simultaneous modeling coefficients are equal to zero at the 1% level (chi-squared value was 71.77). The simultaneous modeling based on the switching regression technique was justified given the highly significant off-diagonal values of the error covariance matrix and the error correlations.

The correlation coefficients rho_1 and rho_2 are both positive and significant. This means both observed and unobserved factors influenced the decision to participate in off-farm employment and welfare resulting from those decisions. This also indicates that self-selection occurred in the off-farm participation decision and welfare given the participation decision. In other words, farm households who participate in off-farm employment have higher welfare than random households from the random sample who have not participated in non-farm work. Engaging in off-farm diversification had a significant impact on welfare among those who participated in it.

Household assets and composition

The findings from for variables related to household assets and composition are quite interesting. The age structure of the household which attempts to capture the life-cycle effects was found to be significant correlates of household welfare and livelihood diversification. The coefficient of household head's age is positive and significant which means that a farm household's welfare is improved as age increases. This coefficient was however significantly negative in the probit selection equation, implying that the likelihood to engage in non-farm diversification decreases as the head of household grows in age. Furthermore, households where there are members aged 5 or older have a greater probability to

Table 3. Full information maximum likelihood estimates of the switching regression model based on pooled data for 1991 and 2005.

Variable	Welfare =0 Less diversified	Welfare =1 Diversified	Non-farm diversification (select equation)
Education of household	0.2382**(0.0489)	0.1528*** (0.01445)	0.1902** (0.05256)
Age of household head	0.0739**(0.0036)	-0.00125 (0.0013)	-.01445*** (0.00422)
Gender of household head	0.4986**(0.1044)	0.1266 *** (0.02986)	0.8656*** (0.1064)
Size of household	-0.0139 (0.0508)	-0.1239*** (0.01233)	Dropped
Members aged 5-14	0.1257* (0.0761)	0.0354** (0.0155)	0.65586*** (0.0486)
Members aged 15-24	Dropped	0.0655** (0.01693)	0.50343*** (0.04848)
Members aged 25-39	0.2415**((0.0629)	0.09044*** (0.02413)	0.85054*** (0.06303)
Members aged 40-59	-0.0995 (0.08103)	0.05255** (0.0255)	0.43886*** (0.07436)
Members aged above 60	-0.1685 (0.1241)	0.0755** (0.0323)	0.55888** (0.1175)
Sector of employment of head	-0.0911 (0.0656)	-0.03031** (0.0080)	-0.19631*** (0.03613)
Access to remittances	0.00912 (0.0605)	0.0008 (0.02099)	-0.05868 (0.07096)
Acres of land owned	0.01916 (0.0138)	0.01048 ** (0.00474)	-0.02113 (0.01544)
Agricultural land sales	0.02513 (0.0863)	0.0307 (0.0303)	0.05455 (0.10318)
Access to motorable ROADS	0.0784 (0.0977)	-0.07156 * (0.03688)	-0.08697 (0.11655)
Access to banking center	-0.0282 (0.1415)	0.00132 (0.04449)	-0.00244 (0.16449)
Access to produce market	0.12156* (0.06706)	0.06706** (0.0238)	0.04126 (0.07999)
Member of agric cooperative	-0.0406* (0.06415)	-0.04821** (0.02242)	-0.0665 (0.07463)
Access to public transport	0.1997**(0.07175)	0.17969** (0.02742)	0.18464** (0.08584)
Agricultural sharecropping	0.06995 (0.0732)	0.1213**(0.0259)	0.02327 (0.08681)
Access to extension service	-0.03022 (0.0747)	0.00418 (0.0258)	-0.00805 (0.087777)
Households use fertilizers	0.1089* (0.0667)	0.0.07252** (0.02399)	0.07172 (0.07796)
Listens to radio at least once a week	-1.1431* (0.60843)	-0.87463** (0.22954)	-0.8596*** (0.27064)
Watches TV at least once a week	0.3956 (0.3631)	0.61385*** (0.12974)	0.17891 (0.40968)
Read newspapers at least once a week	1.5548** (0.76699)	1.3685*** (0.27167)	-0.37409 (0.79786)
Time dummy (2006)	0.6284***(0.1818)	0.53607*** (0.07078)	Dropped
Constant	14.1017***(0.48165)	13.8454*** (0.13764)	-0.87211** (0.31743)

Rho_1 = 0.80906 *** (0.0531), Rho_2 = 0.59552 *** (0.054255), Number of Observations = 3264, Wald chi 2 (25) = 184.08, Prob > chi2 = 0.00000, LR test of independent equations: chi 2 (2) = 71.77 Prob > chi2 = 0.0000. *Means difference is significant at 10%, ** means difference is significant at 5% and *** means difference is significant at 1%. Also standard errors are shown in parenthesis.

engage in non-farm work with the likelihood for positive dividends on welfare. This could be due to the fact that participation in off-farm work is critically dependent on labor availability. But in terms of the size of the household, we find that the coefficient of household membership size appeared to be negative but statistically insignificant for the welfare of non-diversified households. This means that, holding all other variables constant, each additional child decreases the probability of increased household welfare and puts a greater burden on the household. The gender dummy variable represents the gender segregation between men and women household heads. The estimated sign of the gender variable is positive for all the models, which indicates that relative to female-headed households, the level of welfare and non-farm diversification is likely to be high for male-headed households.

The level of education and the health status of household members in the model represent human capital endowment. The results from Table 3 show that education of the head of the household has a significant and positive effect on household's non-farm diversification as well as household welfare.

The higher the level of education, the greater the probability that households will engage in non-farm work and ultimately have improved welfare. With regards to the health status variable, the study find from the analysis that the tendency to engage in non-farm work reduces when the burden of disease is high, which is what was generally expect in theory. Owning land is an important asset in improving the welfare of households who engage in non-farm work. We surprisingly find no significant effect of land ownership on the selection decision whether or not to participate in non-farm work. Applying fertilizers is shown in the results to be justifiable as the study find out that those farming households who use fertilizers (specifically, those who engage in non-farm diversification) have a greater likelihood of enjoying

improved welfare. The impact of access to insecticides was statistically insignificant and was dropped from the model. The problem of the exclusion of rural populations from financial services is widely acknowledged. It was therefore not too surprising we uncovered no significant impact of access to remittances and banking services on welfare and the non-farm participation decision. The importance of the sector of employment of the household head is clearly underscored in the analysis. The results show that relative to other jobs other than agriculture, the level of welfare and non-farm diversification is likely to be lower for household heads who work in the agricultural sector.

Market access

For small and marginal farmers, having access to markets helped in reducing transaction costs and risks involved in acquiring inputs and profitably selling outputs. Having access to local community markets was found to be positive and significant in promoting welfare of diversified households. This was not the case for less diversified households. We also find that access to local markets has no direct correlation with the livelihood diversification decision. As was expected, households who live in communities with better access to public transport have a higher probability to engage in non-farm work and also enjoy higher welfare. Access to public transport facilitates movement of persons, farm inputs and outputs in a cost effective way. We realized that this finding was robust for all the groups studied. Strikingly, however, we find that access to motorable roads turns out to be negative and significant at 10% in the welfare function of diversified households and insignificant in the case of the selection decision and welfare of less diversified groups.

Institutions

Transfer of information and knowledge to small farm households working in diverse settings, remote locations and some of whom are illiterate is very challenging task. The traditional models of transferring knowledge in Ghana are largely based on extension activities and agricultural cooperatives. In this last set of results, how traditional and non-traditional sources of obtaining agricultural information affect non-farm diversification and household welfare are discussed. No significant effect of access to extension services on non-farm diversification and also household welfare was found. This may not be too surprising considering the fact that agriculture extension departments in Ghana lack the resources and state-of-the-art technologies to deliver the required services to farming communities. With regards to the importance of agricultural cooperatives, a negative and significant likelihood effect on the welfare of diversified households was observed. The effect of agricultural co-operatives on the diversification decision and the welfare of less diversified households are insignificant. Looking at the history, culture, type and structure of co-operative organizations in Ghana and elsewhere in Africa, this result may not necessarily be surprising. Traditional agricultural cooperatives are normally sees as disinter-grated stand alone groups promoted through collective ownership with minimal capital investment who are unable to see problems of their members in terms of solutions generated by the co-operative movement as a whole, but rather, they look to the government when seeking co-operative solutions (Chambo, 2009). One aged-long risk-sharing institution in Ghana that turned out to have a positive and significant effect on household welfare is the idea of sharecropping. This is the system where a landowner allows a tenant to use the land in return for a share of the farm produce. The likelihood impact of sharecropping in the selection equation and in the welfare of less diversified households was however not significantly different from zero.

Beyond the traditional knowledge institutions that are typically available to rural farmers, access to TV and radio networks are important channels through which various kinds of information can be transmitted to farm households. After controlling for other variables in the model, some interesting results were found when mass media variables were included. Households who listen to radio at least once a week were found to have a greater likelihood to engage in non-farm work. With regards to promoting household welfare, instead of a positive effect, we found a significantly negative effect of access to radio for both diversified and less diversified groups. In the case of households who watch television at least once a week, a positive and significant welfare impact was found for the more diversified group. Though difficult to interpret, these findings underscore the significance of such mass media tools to either positively or negatively influence household behavior (Appendix).

Conclusions

Since the implementation of the market-oriented agricultural sector reforms in the late 1980s, there has been a remarkable diversification trend in rural Ghana characterized by developments of non-agricultural rural enterprises. The paper draws from the 1991/1992 and 2005/2006 Ghana Living Standards Household Surveys to also throw light on how selected elements of the agricultural sector reforms impact on non-farm diversi-fication and household welfare. The study finds that non-farm diversification activities and household welfare are mostly driven by household assets and compositions including household age structure, education level and gender. The role of market access, fertilizer use and

public transportation are also critical dimensions of rural livelihood diversification and household welfare and merits attention by policy makers. The idea of sharecropping as a risk-sharing mechanism is also not misplaced and needs to be supported. Among the information variables, listening to radio and providing access to televisions are effective tools in influencing household livelihood diversification and welfare, conditional on other relevant variables. All in all, the paper supports the emerging consensus that the livelihood diversifications are important means of enhancing welfare and deserves attention.

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APPENDIX

Definition and measurement of variables

i) Household welfare: This is defined as a household's command over market and non-market goods and services at the household level. The proxy used to measure household welfare is the log of household consumption expenditure adjusted by adult equivalent units.

ii) Non –farm diversification: It is defined as participation in the non-farm sector through wage or self-employment. We use a dummy variable which is 1 if households engage in non-farm activities and 0 if otherwise.

iii) Gender of the household head: A dummy variable with male = 1 and female = 0.

iv) Remittances: A dummy for access to remittances.

v) Total acres of land owned: Value of land owned.

vi) Size of household: Number of members in the household

vii) Age of the household head: Age of the household head (in years)

viii) Education of the household: Highest level of education completed by household head where 0 is defined for those with no education, 1 = Primary; 2 = Secondary, and 3 = Higher.

ix) Disease burden: It is defined as the number of days (over a two week period) individual falls sick plus the number of days (over a two week period) individual does not work. This is then expressed as an index between 0 and 1 where lower indices represent good health or low disease burden and higher indices mean poor health status or high disease burden.

x) Access to motorable roads: 1 for respondents who have access or 0 otherwise,

xi) Access to a bank: 1 for those who said yes and 0 for those who said no.

xii) Access to community market: 1 for those who have access and 0 for those who do not.

xiii) Access to fertilizers: 1 for respondents who use fertilizers or 0 otherwise.

xiv) Agricultural sharecropping: 1 if sharecropping exists in community or 0 otherwise.

xv) Access to extension worker: 1 if respondents have access or 0 otherwise.

xvi) Agricultural cooperatives: 1 if farmer belongs to cooperative, 0 otherwise.

xvii) Access to public transport: 1 if farmer has access to public transport or 0 otherwise.