NON-FARM INCOME DIVERSIFICATION IN RURAL GHANA

Determinants and Implications for Income Distribution and Welfare

By

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DECLARATION

Apart from references to other people's work which have been duly acknowledged, this thesis is the author's own work produced from research undertaken under supervision.

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To
Ivy, Nyanyuie, A wo and those yet to come

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ABSTRACT

Rural households in developing countries have for a long time been perceived as farm households, and that they receive their income predominantly from agriculture. There is growing evidence however in the rural livelihoods literature to show that rural households in developing countries derive a significant proportion of their incomes from non-farm activities, and income from this source is growing. In addition, non-agricultural activities constitute the main occupation of an increasing number of rural households. National level household survey data indicates that Ghana is not different in this regard. This study investigates the patterns as well as the determinants of non-farm income diversification (participation, income and portfolio of income activities) among rural households in Ghana using GLSS 5 data. It also examines the effect of non-farm income on income distribution and household welfare.

Results show that non-farm activities constitute an important source of employment and income for rural households in Ghana. Non-farm income accounted for 41 percent of rural household income in 2005/06, with more than 50 percent of rural households having at least one non-farm income activity. Education and land are important for the type of income strategy adopted by households. Education is important for a purely non-farm wage employment income strategy or combination of non-farm wage and other strategies. For a purely non-farm wage income strategy, the effect of education is evident only after the mean years of education of the household exceeds six years. Households with land above 20 hectares derive income from three main strategies: on-farm only; on-farm and non-farm self-employment only; and on-farm and non-farm self- and wage-employment only.

Overall the study obtains robust results for participation (number of non-farm activities), income shares and income strategies regressions. Education, household size and composition, wealth status (poorest 40% relative to richest 20%), access to credit, electricity and markets are main the determinants of non-farm income diversification in rural Ghana. On the effect of non-farm income on income inequality, the study finds that in aggregate, non-farm income worsened income inequality. In terms of its components, while non-farm self-employment income reduced income inequality, non-farm wage income on the other hand, worsened income inequality in rural Ghana. The results of the effect of non-farm income diversification on welfare indicate that participation in non-farm activity has a positive effect on household welfare. For instance, participation in non-farm activity increases welfare by approximately 10% above that of a household that does not participate in non-farm activity. The welfare level of households with two non-farm activities is 21% above that of households that do not participate in non-farm activity . The results also indicate that households combining on-farm activities with other off-farm activities or are engaged in purely non-farm activities are better off than households deriving income purely from on-farm activities.

The findings call for a rethinking of strategies that have traditionally focused on improving agriculture as the solution to rural poverty. Strategies to promote rural economic activities need to take into account the heterogeneity in the asset positions across rural households and the multiplicity of activities in which they are engaged to generate income. A key determinant of non-farm income diversification is education. Enhancing better access to education and narrowing education inequality among rural households would go a long way to create opportunities for effective participation in

non-farm activities and to alleviate rural poverty. Access to credit and electricity are important for non-farm self-employment (small and micro enterprises) activities. Policy should therefore aim at enhancing access to small credits to bridge the gap in physical assets endowments between asset-rich and asset-poor households. The policy of rural electrification must also be effectively implemented to promote village/ cottage industries. Improving the physical infrastructure like roads and markets would help in the growth of non-farm employment opportunities. Policy should aim at promoting access to well developed infrastructure. This study however does not advocate for a promotion of non-farm activities as a substitute for agriculture, but rather highlights the potential complementarities that may exist between the two.

CHAPTER ONE

INTRODUCTION

/. / *Background*

Rural households in developing countries have for a long time been perceived as farm households, and that they receive their income predominantly from agriculture. There is growing evidence however in the rural livelihoods literature to show that rural households in developing countries derive a significant proportion of their incomes from non-farm activities as well, and income from this source is increasing. In other words, rural households do not depend on only a single source of income but rather on a diversified set of income sources. Haggblade et al. (2005), report that rural non-farm activities constitute a significant proportion of rural employment, and that income from this source accounts for between 30 and 45 percent of total rural household incomes across the developing world. On regional basis, Reardon et al. (1998) reviews a number of studies based on rural household surveys conducted between the mid 1970s and the late 1990s and finds that non-farm income as a share of total household income averaged 42% for Africa, 32% for Asia and 40% for Latin America. In terms of employment, a significant percent of households reported non-farm activity as their primary activity in Asia (44%) and Latin America (25%) (Reardon et al., 1998).

There is also evidence to show that the share of non-farm income in total rural incomes is rising overtime. Hossain (2004) for instance, reports that in Bangladesh. 42% of rural incomes came from non-farm sources in 1987. and by 2000. the non-

farm income share had increased to 54%. In Tanzania, the non-farm income share rose from 20% in 1980 to 46% in 2000 (Ellis and Freeman, 2004). In Ecuador, the non-farm income share increased by 6 percentage points over a period of one year, from 33% in 1994 to 39% in 1995 (Winters et al,, 2006; Elbers and Lanjouw, 2001).

The above evidence demonstrates that rural households (and individuals) generally do not derive all their incomes from only one source. In the same vein, rural households do not hold all their wealth in the form of a single asset, neither do they deploy their assets (human, physical, financial, etc.) in just one income generating activity. To most rural households (and individuals), diversification is the norm (Barrett and Reardon, 2000). There are several factors that lead households and individuals to diversify assets, incomes, and activities. These factors are usually classified as either "push factors" or "pull factors" in the literature. Under push factors, diversification is usually embarked on as a risk reduction strategy, precipitated by diminishing factor returns to family labour supply due to land constraints often driven by population pressure and landholdings fragmentation, or as a reaction to crisis or liquidity constraints (Barrett et al., 2001). Pull factors on the other hand have to do with the realisation of strategic complementarities between farm and non-farm activities, and specialisation according to comparative advantage accorded by superior technologies, skills or endowments (Barrett et al, 2001).

1.2 Problem Statement

Majority of Ghanaians live in rural communities. The predominant economic activity for these households is agriculture or farming. These households, as the case is in many developing countries, do not only constitute the majority of the poor but also

have to contend with income variability. Many studies (Reardon et al., 1992; Alderman and Paxson, 1992; Morduch, 1995; Udry, 1995; Carter, 1997) have examined strategies used by rural households to smooth income and consumption. One way in which rural households deal with income variability is to engage in multiple income generating activities. Having a diversified portfolio of income generating activities (and hence a diversified set of income sources) is a way to minimize income variability and to assure a minimum level of income and consumption (Alderman and Paxson, 1992). Income diversification is usually undertaken as a risk reduction or risk management strategy and is expected to be adopted more by the poor who are often hardest hit by shocks (Barrett et al.. 2001). Income diversification is also undertaken by risk-averse households, a decision that entails a trade-off between higher total income with a greater probability of failure, and lower total income involving a smaller probability of failure (Abdulai and CroleRees. 2001). In other words, households that are risk-averse prefer lower income with certainty to an uncertain high income level.

Given its high incidence, reducing rural poverty has been a major concern for successive governments in Ghana. Many of Ghana's development plans and programmes have emphasised poverty reduction as an important goal, especially rural poverty. More recent plans such as the Vision 2020. Ghana Poverty Reduction Strategy (GPRS I) and Growth and Poverty Reduction Strategy (GPRS II) papers have also emphasised rural poverty reduction. As noted by de Janvry and Sadoulet (2001), the approaches towards rural poverty reduction in many developing countries have often been within an integrated rural development framework that focuses largely on raising productivity in agriculture. Non-farm employment and income are

often neglected in rural development debates (Lanjouw and Lanjouw, 1997). In general, rural development programmes, focusing on improvements in agriculture as a solution to rural poverty and on the role of the government in delivering services to enhance agricultural productivity, have met with limited success and have not been sustainable once government subsidies were removed (World Bank, 1997, in de Janvry and Sadoulet, 2001). In addition, rural development programmes often underestimate the great degree of heterogeneity in asset positions across rural households and the multiplicity of activities in which they are engaged to generate income (de Janvry and Sadoulet, 2001).

Results of national level household surveys report multiple income sources for rural households in Ghana (see Ghana Statistical Service, 2000, 2008). These surveys also show that non-farm activities are important in rural Ghana as evidenced by their contribution to household incomes and employment, although agriculture (own-farming) remains the dominant source of income and employment for the majority of rural households. For example. Winters et al. (2006) report that (local)[1] non-farm earnings as a share of total income in 1992 was 31 % and this increased to 42% in 1998. Rural households in Ghana are not only the poorest segment of the population, but also have to contend with the variability of income from agriculture. Given the seasonality of agriculture, the erratic nature of rainfall patterns, the low level of irrigation usage, and near absence of credit and insurance markets, income from non-farm activities could be a good source of income and consumption smoothing for rural households in Ghana. Yet not much work has been done on the determinants of non-farm income diversification in rural Ghana. While non-farm income may

[1] Kxcluding remittance income

contribute to minimizing the variability of household incomes, they may also have implications for income distribution. Non-farm income has been found to both reduce (Adams, 1994) and increase (Evans and Ngau, 1991) rural income inequality. Particularly, when non-farm income is predominantly earned by the relatively wealthy, it may worsen the distribution of income. Non-farm income diversification could also have a poverty reducing impact by raising the welfare levels of diversified households. Indeed, some studies (for instance, Babatunde and Qaim, 2009) have found this to be the case. Given that poverty reduction is central to government economic policy, the motivation for this study is to investigate the extent to which rural households in Ghana depend on non-farm activities for their livelihood.

The problem the study seeks to investigate therefore is: what factors determine the ability of rural households in Ghana to diversify their income sources? The research answers this question by ascertaining the nature of income diversification by rural households in Ghana. It examines the contribution of various income activities to employment and income using national level household survey data, and investigates the determinants of income diversification as well as to analyse the income distribution and welfare implications of non-farm income diversification in rural Ghana. The specific research questions being posed by the study are - 1) what is the pattern of non-farm income diversification in rural Ghana? 2) what are the determinants of non-farm income diversification? 3) how does non-farm ineome impact on the distribution of rural income? Does it improve or worsen income inequality? 4) what are the welfare effects of non-farm income diversification?

Addressing these questions will reveal the potential role non-farm activities can play in accelerated growth and poverty reduction, and hence lead to policy options that can help maximise the potential complementarities between agriculture and rural non-farm activities for poverty reduction and growth in rural Ghana.

Earlier work on rural non-farm incomes in Ghana have been done by Canagarajah et al, (2001) and Newman and Canagarajah (2000), focusing largely on the gender dimensions, income distribution and poverty reducing impacts of non-farm income. Canagarajah et al (2001) examine how the distribution of earnings in rural Ghana differs by income type and gender. They find that non-farm earnings contribute to rising inequality, but that lower income groups also benefit due to strong overall growth in non-farm earnings. They observe that the inequality-inducing effect of non-farm income is largely driven by self-employment income. Wage income, on the other hand, had an equalising effect on income. The Newman and Canagarajah (2000) study finds that for women in Ghana, non-farm activities play an important r®le in yielding the lowest and the most rapidly declining rural poverty rates. They find that rural poverty- declined fastest for female heads of households engaged in non-farm work (which tended to be a secondary activity for the majority of them).

One shortcoming of the Canagarajah et al. (2001) study is that it analysed the determinants of aggregate non-farm income without making a distinction between self-employment and wage employment income. Newman and Canagarajah (2000) also examined only participation in non-farm work without analysing the determinants of the income earned from these activities. The present study differs from these two studies not only because it makes use of more recent data but also

unlike the previous studies, distinguishes between various income components in the non-farm category and also analyses the determinants of participation and of income simultaneously. In addition, the present study uses analytical techniques different from those employed by the previous studies. For instance, given that there are several non-farm income sources, it may be important to investigate the determinants of involvement in a multiplicity of non-farm activities. This study therefore does not model participation in non-farm activities simply as a binary process but analyses the number of non-farm activities as a Poisson generating process. This approach, for example, brings to the fore whether a given household level factor or community characteristic is important for the household to engage in a multiplicity of non-farm activities. While most studies on non-farm income diversification have either estimated the determinants of participation or of income, seldom have studies focused on income diversification strategies of rural households. By income diversification strategies is meant the various combinations of activities rural households are engaged in to generate income. The study investigates the determinants of income diversification by modeling various income portfolios available to households. This exercise is expected to fill an important gap in the income diversification literature. This study goes further to analyse the income distribution and welfare effects of non-farm income diversification.

1.3 Objectives

The fundamental objective of the thesis is to examine the nature and determinants of non-farm income diversification in rural Ghana. The specific objectives are to:

1. Examine the patterns and trends in rural income diversification by ascertaining the shares of various income sources in total income and employment.

CHAPTER TWO

LITERATURE REVIEW, THEORETICAL FRAMEWORK AND DATA

2.1 Introduction

This chapter is devoted to a review of both the theoretical and empirical literature on income diversification as well as the theoretical framework for the empirical analysis and data source. The chapter begins by discussing some definitional issues in the diversification literature. A distinction is made between livelihood diversification and income diversification as well as the variables of interest in diversification studies. The "inconsistencies" in the classification of income sources is also discussed. The next task is a discussion of the conceptualisation of non-farm income diversification. A review of the empirical literature on non-farm income diversification and its income distribution and welfare effects are then discussed. The theoretical framework that sets up the stage for the empirical analysis in chapters 3, 4 and 5 is discussed next. The chapter concludes with a discussion of the data used.

2.2 Definitional Issues

Although sometimes used synonymously, income diversification and livelihood diversification are not the same. Income diversification is a subset of the broader concept of livelihood diversification. Income refers to the cash earnings of households plus any other payments (including in-kind receipts) that can be valued at market prices. A livelihood on the other hand "... encompasses income, both cash and in-kind (payments), as well as the social institutions (kin, family, village, etc), gender relations, and properly rights required to support and sustain a given standard of

living." (Ellis, 1998 p. 4). However, the majority of studies on economic diversification have focused on different income sources and their relationship to income levels, income distribution, household assets, and other variables (Ellis, 1998). This study like many others focuses on income diversification. Income diversity also differs from income diversification. Income diversity refers to the composition of household incomes at a given instant in time, while income diversification is an active social process whereby households are observed to engage in increasingly diverse and complex portfolios of activities over time (Ellis, 1998). This distinction is however rarely made in the literature.

Another definitional issue in the diversification literature relates to the variable(s) used as the parameters) of diversification. Households (and individuals) own productive assets (such as land and human capital) that may be deployed to various activities to generate "earned" income, while unproductive assets (household valuables, for instance) provide "unearned" income. Assets, activities, and income are thus complementary indicators in studying household diversification behaviours (Barrett et al., 2001). While the income variable presents itself as a measure of direct interest because of its clear interpretation as a welfare outcome, it can be difficult to distinguish (constrained) choice from chance in income draws (Barrett et al.. 2001). Assets are a store of wealth as well as sources of income, but they can be very difficult to value accurately, particularly in rural Africa, where secondary asset markets are often poorly developed, and the phenomenon of asset fixity (assets specific to certain activities, for example, ploughs for crop cultivation) results in highly variable returns to assets (Barrett et al., 2001). Activities, on their part, provide a link between assets and income flows and therefore help identify individuals'

explicit diversification choices (Barrett et al., 2001). However as Barrett et al. (2001) note, activities are of no direct theoretical relevance in themselves, can be likewise difficult to value, and in addition do not necessarily capture income generated from nonproductive assets, and are therefore imperfect measures of diversification behaviours of households. Barrett et al., 2001 therefore conclude that none of the three variables is unambiguously better than the others, and advocate the use of multiple indicators as cross checks on inferences based on any single indicator. The study uses income and activity as diversification measures.

The literature on diversification also distinguishes among different categories of income sources. The main categories often cited are farm, off-farm, and on-farm income sources (Saith, 1992). While Ellis (1998) notes that these distinctions are not arbitrary, Barrett et al. (2001), Barrett et al. (2000) and Barrett and Reardon (2000) contend that there is some inconsistency in terminology in the diversification literature. These authors argue that the terms “off-farm,” “non-farm,” and "non-agricultural” have been used synonymously in many studies. According to Barrett et al. (2001) the best approach to obtaining unambiguous definitions is to follow standard national accounting sectoral classifications in order to maintain a logical correspondence between micro and macro level analyses. They offer a "rule-of-thumb” three-way classification of earned income (i.e., income from productive assets) by sector (e.g., farm versus non-farm), by function (wage versus self-employment), and by space (local versus migratory). Table 2,1 summarises their classifications.

The first classification of activities in Table 2.1 is in line with the sectoral categorisations in national accounting systems, that is, primary (agriculture), secondary (manufacturing, mining, and other extractive activities), and tertiary (services). The sectoral classification leads directly to the distinction between "agricultural" or "farm" income (derived from the production or gathering of unprocessed crops or livestock or forest or fish products from natural resources) and "nonagricultural" or "non-farm" income (all other sources of income, including from processing, transport of trading of unprocessed agricultural, forest and fish products) (Barrett et al.. 2001). Their next categorisation, depicted as separate rows in Table 2.1. concerns functional classifications; wage-employment or self-employment. Thus households (or their members) may either be wage-employed or self employed across the three sectors. Finally, under the sectoral and functional classifications, an activity may be categorized spatially as "local" or "migratory".

Table 2.1 Three-way classification of activities: sectoral, functional and spatial

	Primary sector		Secondary sector				Tertiary sector	
	Agriculture		Mining & other extractive activities		Manufacturing		Services	
Wage employment	Local	Migratory	Local	Migratory	Local	Migratory	Local	Migratory
Self-employment	Local	Migratory	Local	Migratory	Local	Migratory	Local	Migratory

Soles'.

Farm or agricultural = all activities in the agriculture sector, regardless ofloeaiion or function (unshaded columns).
Non-farm or non-agricultural = all activities outside the agricultural sector, regardless ofloeaiion or function (shaded columns).
On-farm = activities on one's own property, regardless of sectoral or functional classification (almost always self-employment, i.e.. bottom row).
Off-farm = all activities away from one's own properly, regardless of sectoral or functional classification; can be wage- or self-employment.

Source: Barrett et al. (2001)

In this study and following Barrett et al. (2001) and other studies, we distinguish between two main categories of income: farm income and non-farm income. Farm

income is made up of two sub-categories; on-farm income[2] and farm wage income. On-farm income is made up of livestock and crop income, and comprises both consumption in kind of own farm output and cash income from sold output. Farm wage income is payments in cash or kind for working on other people's farms (within agriculture). Non-farm income is divided into four sub-categories, namely, non-farm wage income; non-farm self-employment income; remittance income; and other income.[3] Thus in all the study considers six sub-categories of income.

2.3 Why do Households Diversify

Households have various motives for diversifying. Some of the main determinants are seasonality of agriculture, differentiated labour markets, risk strategies, coping behaviour, credit market imperfections, and inter-temporal savings and investment strategies (Ellis, 1998). The rural household's or individual's decision to allocate labour to non-farm activities can be conceptualized as a specific application of the class of behavioural models of factor supply in general, and labour in particular (Barrett et al., 2000). A household's (say, household *i)* labour supply and capital investment into a given non-farm activity (say, activity *j)* can be modeled as depending on a set of *incentive* and *capacity* variables. The household's objective is to maximize its earnings subject to the constraints imposed by its limited resources and in trade off with its desire to minimize risk (Barrett et al., 2000; Barrett et al,, 2001; de Janvry and Sadoulet, 1996).

[2] That is, incomc earned from a household's own farm.
[3] Olher income Is the sum ofimputcd rental Incomc and other Income in the GLSS data set.

2.3.1 Incentive to Diversify

Two sets of "incentives" variables have been Identified: (1) the set of incentive "levels" facing the household, including relative prices of outputs from and inputs to the non-farm activity versus farm activities (or among non-farm activities), and (2) the set of relative risks of the activities. The incentive factors are often discussed in the literature in the context of "pull" and "push" factors.

Pull factors include higher payoffs or lower risk in rural non-farm activities than those from farm activities (given risk preferences) (Reardon et al., 2006; Barrett et al., 2001), Higher returns from non-farm activities may allow farm households to accumulate capital which they can reinvest in farming (tools and implements and newer technology), thereby raising farm incomes further. Thus pull factors may arise due to synergies between farm and non-farm activities. They may also result from comparative advantage accorded by superior technologies, skills or endowments (BarTett et al., 2001).

The push factors related to incentives are much more complex (Reardon et al., 2006), and the livelihood diversification literature has largely focused on them. Households arc "pushed" into non-farm activities by factors which can be idiosyncratic or covariate (Dercon, 2002). Thus households pursue "risk management strategies" that involve choosing income diversification strategies that permit income smoothing over time (Reardon et al,, 2006). Poorer households are often pushed to diversify into activities that have a low positive covariance with the returns to agriculture, implying choice of activities with low risk even if they are accompanied by lower returns (Reardon et al., 2006; Barrett et al., 2001; Abdulai and CroleRees, 2001). The push

factors include seasonal drops of income from farming to levels not sufficient for survival in the off-season, permanent (or inter-year) drops in, or chronic insufficiency of, farming income, say from physical reasons (such as environmental degradation, chronic rainfall deficit, and disease) or market/policy reasons, and credit or insurance market failures (Reardon et al., 2006).

2.3.2 Capacity to Diversify

While the incentive to diversify could exist, actual diversification may depend on the household having the capacity to do so. Given the incentive, capacity to diversify depends on capital assets such as human, social, financial, organizational, physical, and political capital. The capital can be public or private goods, and can be at the "meso" (regional) level (thus benefiting several households), or "idiosyncratic" (micro level) thus related to a household or a group of households (Reardon et al., 2006). The meso variables include access to roads, markets, electricity and water. Idiosyncratic variables on the other hand include human capital in general (quality and quantity), landholdings and other physical assets (Reardon et al., 2006),

2.4 Literature Review

2.4.1 Determinants of non-farm income diversification

Empirical studies on rural income diversification have identified several factors as the determinants of households' participation in and income derived from rural non-farm activities. These factors, broadly categorized into households' asset endowments (human, physical, social and their respective quantity and quality), infrastructural

assets and/or locational advantages (reflected in access to public goods and services), agro-climate assets (annual rainfall, elevation), and relative prices and risk, have been employed by many studies including Reardon et al. (1998), dc Janvry and Sadoulet (1996, 2001), Barrett et al. (2000), Escobal (2001) and Elbers and Lanjouw (2001), Canagarajah et al. (2001), Newman and Canagarajah (2000). The evidence regarding the importance of these factors in determining household participation in and income derived from non-farm activities is however mixed. The mixed results may be partly explained by the extent of disaggregation of the non-farm component of household income. As Escobal (2001) notes, particular assets may be important for particular non-farm activities. For example, for skilled jobs in non-farm wage or self-employment, education may be very important, but it may be less important in unskilled activities.

Household landholding is considered as important in the income diversification literature because it potentially affects both the incentives and capacity to undertake non-farm activity (Reardon et al., 2006). Apart from its influence on farm income, household landholdings have been found to be very important for household participation in non-farm activity in some studies (Abdulai and CroleRees, 2001) but to be insignificant or even negatively correlated to non-farm income in other studies (Barrett et al., 2000; Escobal, 2001; Abdulai and Delgado, 1999). The mixed findings may be attributable to the complex nature of the relationship between landholdings on the one hand, and participation in and earnings from rural non-farm activity on the other (Reardon et al., 2006). According to Reardon et al. (2006) this complexity may be due to the fact that, (1) land can be used as collateral where credit markets function properly and thus increase access to credit, which in turn can be invested in physical

capital needed for more remunerative non-farm activities; (2) landholding (compared with landlessness) can be the key to enter organizations and groups and thus have social capital which aids in rural non-farm activity; and (3) land can simply be the determinant of farm investment, access to working capital and income, and most non-farm activity investments are based on own-liquidity, Reardon et al. (2006) observes that studies that have tended to estimate separate regressions for participation in non-farm activity and income from non-farm activity, such as was done by Abdulai and Delgado (1999), have found the land effect to be insignificant in the second stage (income regressions) once assets such as education are controlled for. The insignificance of landholdings in non-farm activities may point to the fact that although the farm household might be more able to undertake non-form activity (due to the above three factors), they have less incentive to do so (as they are able to derive substantial income from farming activities).

Households with insufficient agricultural capital assets such as land and livestock on the other hand may be compelled to allocate their labour to off-farm or non-farm activities in the absence of complete and well-functioning markets in land and livestock (Barrett et al., 2000). Barrett et al. (2000) argue that given a fixed stock of household labour time and diminishing returns to on-farm labour, the share of household income derived from off-farm or non-farm sources should be declining in the amount of land a household cultivates because the share of household labour absorbed by on-farm activities is increasing in land holdings. Thus household landholdings have been found to be positively correlated with total household income and farm income but negatively correlated with farm wage income and non-farm wage income (de Janvry and Sadoulet, 2001; Escobal, 2001; Barrett et al., 2000).

While this relationship may generally be true for some types of off-farm income such as farm wage, it may not generally hold for other types of non-farm income sources (self-employment income, for instance) and over the income distribution scale. Wealthier households (with abundant land) may have sufficient liquidity to enter into high-retum non-farm self-employment activities. Thus while we expect income from low return activities such as farm wage labour and low skill non-farm income activities to be negatively related to household land holdings, non-farm income will be generally positively correlated with landholdings for better off households because they have sufficient capital (financial and other forms) to invest in high return non-farm activities. In other words, entry barriers exist that enable only relatively wealthy households to enter into high return non-fann activities, particularly self-employment, making it possible for non-farm income and landholdings to be positively correlated (for wealthier households) while at the same time being negatively correlated with non-farm income for land poor households. The existence of such entry barriers have been confirmed by Reardon et al. (1992), Dercon and Krishnan (1996), Dercon 1998, Carter and May (1999), Barrett et al. (2000), Abdulai and CroleRees (2001) for Burkina Faso, Cdte d'Ivoire, Ethiopia, Kenya, Rwanda, South Africa, Tanzania and Mali, Babatunde and Qaim (2009) for Nigeria, Olale and Nazli (2010) for Kenya.

The human capital endowment of households (proxied by education in many studies) also exerts an important influence on non-farm diversification (Evans and Ngau, 1991; Reardon, 2000). Education is a key source of human capital and offers a potentially important route into higher-return non-farm opportunities (Reardon et al., 2006; Yunez-Naude and Taylor, 2001). Lack of education can thus prevent entry into certain non-farm activities and influence the pattern of income diversification. As

noted by Barrett et al. (2001), these barriers manifest themselves in labour market dualism wherein the skilled and educated are self-employed or can secure stable long-term employment at relatively high salaries, while the unskilled and uneducated depend disproportionately on more erratic, lower paying casual wage labour, especially in the farm sector. This pattern of income diversification has been confirmed for Uganda (Smith et al., 2001) and Ethiopia (Woldehanna and Oskam, 2001). Abdulai and Delgado (1999) also confirm these findings for Ghana. They further disaggregated the data by gender and find the effect of education on non-farm participation and earnings to be even higher for women than for men. Other studies confirming the role of education in influencing the diversification patterns described above include Barrett et al. (2000) for Rwanda, Escobal (2001) for Peru, Corral and Reardon (2001) for Nicaragua, Yunez-Nuade and Taylor (2001) for Mexico, Lanjouw and Shariff (2002) for India, Hossain (2004) for Bangladesh, Canagarajah et al. (2001) for Uganda, but not for Ghana, and Babatunde and Qaim (2009) for Nigeria. The insignificant finding for Ghana may be due the use of aggregate non-farm income. In their study on income diversification amongst rural households in southern Mali, Abdulai and CroleRees (2001) introduced a multiplicative term between landholding and education to examine the marginal impact of education on wealth in participating in non-farm work and found this to be positive and significant. This means that more educated households are more likely to diversify' into non-farm activities compared to less educated households with the same level of landholding.

2.4.2 Non-farm income, income inequality and welfare

The empirical evidence on the effect of non-farm income on rural income inequality also shows mixed results. As noted by Canaganyah et al. (2001), this is not surprising

given the heterogeneity of the non-farm sector and the wide range of contexts in which the question has been posed. Studies such as Reardon and Taylor (1996), Reardon et al. (1998), Elbers and Lanjouw (2001) and Woldehanna (2002) find that non-farm income increased inequality because non-farm income is more unequally distributed in favour of the rich. On the other hand Adams (1994), Lanjouw (1998) and Zhu and Luo (2006) find that inequality decreased with non-farm income. Reardon (1997) notes that in Africa non-farm income constituted a greater share of total income for richer households compared to poorer households. This observed pattern has been explained in terms of entry barriers to participating in the non-farm sector. Successful participation in non-farm activities requires a minimum amount of capital and education (Canagarajah et al., 2001; Barrett et al., 2000) which the poor may not have and this results in them earning proportionately less from non-farm income sources.

However, Canagarajah et al. (2001) argues that very poor households may be pushed into non-farm activities, especially if they are landless and cannot work in agriculture. Thus non-farm income may not necessarily have a positive linear correlation with wealth status but rather a U-like pattern may emerge in the distribution of non-farm incomes whereby the very poor (landless) and the wealthy (land rich) receive proportionately more of their total income from non-farm sources. For example, Haze 11 and Haggblade (1993) find that both the poorest and the wealthiest had the highest shares of income from non-farm sources. The income sources however differed for the two groups; business income in the case of the rich and wages for the poor. Similarly, Barrett et al. (2000) find this relationship to hold in Cote d'Ivoire although the income received by the land-poor came predominantly from unskilled

off-farm activities (agricultural wage and low skill non-agricultural wage and self-employment), while the land-rich derived non-farm income from trades and skilled employment, again demonstrating the importance of entry barriers to successful participation in non-farm activities. The mixed finding on the effect of non-farm//^ income on rural income inequality suggests how important it is to examine the non-'® farm sector in different country contexts (Canagarajah et al., 2001). For instance, . K-Adams (2001) investigates the impact of different sources of income on poverty and inequality in rural Egypt and Jordan. He finds that while non-farm income reduces poverty and improves income distribution in Egypt, in Jordan non-farm income goes mainly to the rich and thus tends to increase rural inequality. He attributes the difference in findings to land. In Egypt land is highly productive, but the poor lack access to land and are thus "pushed" to work in the non-farm sector. However, in Jordan land is not very productive and so the rich are "pulled" by more attractive rates of return into the non-farm sector.

Analysing aggregate non-farm income may hide a lot of detail regarding its effect on income inequality. Some studies (Adams, 2001; Canagarcyah et al., 2001; Zhu and Luo, 2006) using disaggregated non-farm income data reveal that the different components of non-farm income contributed to inequality differently. Zhu and Luo (2006) find that in China, self-employment income worsens income inequality, while wage employment had an equalizing effect on the income distribution. Adams (2001) obtains similar results for Egypt, so did Canagarajah et al. (2001) for Ghana and Uganda. These findings confirm the existence of entry barriers in some types (for instance, self-employment) of non-farm activities. Because the poor lack the needed capital to venture into lucrative non-farm activities, they predominantly engage in

wage employment, particularly lower skill casual wage activity, hence the inequality-reducing effect of wage income.

Empirical evidence shows that households that derive Income fVom non-farm sources ei\joy higher welfare (Reardon et al., 1992; Dcrcon and Krishnan, 1996; Reardon et al., 1998; Barrett et al., 2000; Block and Webb, 2001; Canagarajah et al., 2001). In other words, non-farm income diversification is associated with higher income and food consumption as well as more stable income and consumption over time. De Janvry and Sadoulet (2001) note that non-farm income diversification is an effective way to combat poverty and inequality. Rahut (2006) finds that the welfare level of diversified households is unambiguously higher than that of non-diversified households for the Lower Himalayas of Eastern India. More recently, Babatunde and Qaim (2009) also obtain similar results for Nigeria. Stifel (2010) finds that high-return non-farm activities provide an important pathway out of poverty, but barriers such as lack of education, formal credit and access to telecommunications restrict participation in such activities. Kaur et al. (2010) also find that non-farm activities have the potential for consumption enhancement in times of crises in rural areas in India. They however observe that the opportunities for increasing consumption by diversifying into rural non-farm activities may be limited for poor households due to their lack of assets (human and physical) required for starting a new activity, limited access to credit and lack of entrepreneurial ability.

2.5 Theoretical Framework

2.5.1 A Model of Rural Household Incomc Diversification[4]

Rural households typically pursue multiple sources of income. The assets (capacity variables) that determine the choice of income generating activities and the levels of income derived from such activities are quite diverse (de Janvry and Sadoulet, 1996). Income generation from agriculture depends on land, livestock and other capital assets. Wage employment depends on the number of adults in the household who can participate in the labour market and the quality of human capital they posses. Engaging in self-employment activities requires some form of capital (financial, physical or human) as well.

The rural household model of income diversification developed by de Janvry and Sadoulet (1996), assumes that households allocate their total time endowment to a set of productive activities, both farm and off-farm, in a competing manner. The activities are agriculture, non-farm self-employment, wage employment, and migration. Each of these activities uses specific assets owned by the household. Agriculture, for instance, requires land and other fixed agricultural capital assets. In addition, the household may have to purchase other (variable) inputs and also hire labour. Non-farm self employment requires some fixed capital assets and a stock of accumulated experience in crafts or trade. Wage employment depends on human capital (number of household workers, their educational levels, etc). Migration relies on social capital assets such as the accumulated stock of kin with migratory experience (migration capital).

‘ See dc Janvry and Sadoulet (1996) for farther details.

The allocation of the household's labour endowments and assets to the various income generating activities is summarized in Table 2.2.

Table 2.2 Assets and labour allocation to income generating activities

Income generating activity	Fixed assets	Household time	Hired labour	Purchased inputs
Agriculture	$*_a$	*la*		{-?«< }
Non-agricultural self-employment	*2 na*	*1 na*		
Non-agrfcutural wage employment	Z_v	/,,		
Migration	*2m*	*In,*		
Home time		*hi*		
Total household time		*E,*		

Source: de Janvry and Sadoulet (1996)

Household productive activities depend on the following technological specifications:

i) Agricultural production, with imperfect substitution between family and hired labour:

where

qj> 0 for agricultural commodities produced

qj< 0 for purchased variable inputs, including hired labour

ii) Other activities (non-farm self-employment (no), wage employment (u>), migration(m)):

q, = *qi(L,* z.), for *i* = *na,* w, *m*

In the above equations, *I,* measures units of family labour time with opportunity cost w* (reservation wage) equal to the marginal productivity of labour in agriculture, while *q,* measures the effective units of family labour devoted to the corresponding

activity, with a price equal to the hourly income in that activity. For example, if the activity is non-agricultural wage employment, z/ is capital assets devoted to this activity. *I,* is family labour time allocated to this activity, and *qt* are units of non-agricultural wage employment time with a wage $p_t > w^*$ equal to the hourly income of wage earners.

Household consumption is a vector *c* that includes food consumed, purchased goods, and home time (/>,).

The price regime includes both prices for tradables and shadow prices for non-tradables as follows:

- Prices are equal to market prices p_k for tradables (T). Products and factors under this price regime are:
    i. Food bought and sold by the household at prices *p,* [b] and p_f' respectively
    ii. Hired labour in agriculture, labour sold on the labour market, migration wages and purchased inputs. We denote by {T*} this set of commodities with prices $p_k = p_k$, k e T
- Pricesare equal to shadow prices for non-tradables (NT). This includes:
    i. Food, if the household is self-sufficient in food. In this case, the shadow price of food, p'_f, is determined by $q_f = c$,

« Family labour allocation over the various activities under the time constraint gives:

$$\sum_{I} T/, + h, = E,, /' = a, na, \text{w}, m,$$

which determines the shadow wage w*. This shadow wage is measured as the effective unitary family labour cost in agriculture. Family labour is thus treated as homogeneous, measured in number of adults, with opportunity cost *w**. Total labour time is allocated to the various activities /,,, l_m, /,,., $l,,,$ Through the specialized assets z, and transformation functions $q, = q,\{l,, zi),$ this homogenous labour is transformed into units of effective self-employed (ho), wage *(w)* and migrant labour (w) with activity specific prices *p,* (/ = *na,* w, *m).* Units of effective labour receive different remunerations in the activities *na,* w, *m.* However, the household cannot specialize in the most profitable of these activities because it has limited given endowments in each of the corresponding assets *z,* (asset fixity).

The household also faces a cash constraint of the form:

$$£/?,(?, +\text{S},-c,) + G = 0$$

where

Si are changes in stocks

G are exogenous cash transfers

Given household characteristics zj,, the household's problem is to maximize its utility, that is;

$$\underset{Cj/J}{Max}\, u(c,z_h)$$

subject to the following constraints:

a) $\sum_{I} T\, p, (q, + 5, - c,) + G = 0$ (cash constraint)

b) $g(\{Qj\}./«.?«) = 0.\ J$ e A, (production technology for agriculture),

c) = ?,(/,.*,).no,w,m, (production technology for non-agricultural activities,

d) $p_t = p_t keT$, (exogenous effective prices for tradables),

c) -c» =0.<re AT, (equilibrium condition for self-sufficiency in farm production), and

0 £/,+/», = $E_n i = a,na,w,m$, (equilibrium condition for family labour).

The first-order conditions of this model give a system of factor supply and demand functions, which in tum permit the determination of labour allocation among the various activities (Escobal, 2001). Following Escobal (2001), the model has the following reduced form:

$$S,J = f(p;\ ,z_k,z_h,\ Z_{pu}\ ,z_g) \qquad (2.1)$$

where *So* represents the incomc share[5] from income generating activity / (farm, non-farm self-employment, wage-employment, etc) for household *j; p* is the vector of exogenous input and output prices; and the *z* vectors are the different fixed assets that are available to the household. Z_{ag} represents the fixed farm assets (such as land, livestock and equipment); *Znag* represents fixed non-farm income generating assets such as experience in crafts or trade; Z* represents other key financial assets that facilitate access to credit; *Zu* is the vcctor of human capital including family size and

[5] The dependent variable need nol be Incomc shares. It could be Income levels, number of activities, income portfolio or It could take a binary farm when one Is estimating participation regressions.

composition (age and gender), as well as education; Z_{pu} is the vector of key public assets such as electricity, roads, markets, or water; and $Z_{,,}$ includes other key assets related to characteristics of the area (agro-climate, land quality, etc.)- Equation 2.1 is used to estimate participation (number of non-farm income activities), income shares and income strategies regressions in chapters 3 and 4.

2.S.2 Non-farm Incomc and Income Inequality

2.5.2.1 Decomposition of Gini Coefficient

There are several ways of measuring inequality. However some measures of inequality behave in a perverse fashion (Litchfield, 1999). Any reliable measure of inequality must meet five basic properties. They are: (1) Pigou-Dalton transfer sensitivity; (2) symmetry or anonymity; (3) mean independence; (4) population homogeneity; and (5) decomposability.

Pigou-Dalton transfer sensitivity principle requires the inequality measure to rise (or at least not fall) in response to a mean-preserving spread. In other words, the Pigou-Dalton transfer principle holds if the measure of inequality increases whenever income is transferred from a poorer person to a richer person and decreases when income is transferred from a richer to a poorer person. Symmetry (also referred to as anonymity) requires that the inequality measure be independent of any characteristic of individuals other than their income. Thus symmetry holds if the inequality measure remains unchanged when individuals switch places in the income order. Mean independence requires the inequality measure to be invariant to uniform proportional changes. In other words, proportionate change in all incomes must leave the measure

of inequality unchanged, Population homogeneity means that the inequality measure must be invariant to replications of the population. Thus increasing (or decreasing) the population size across all income levels must have no effect on the measured level of inequality.

Decomposabllity is the property that requires overall inequality to be partitioned into its constituent parts, either over sub-populations or sources. This section focuses on the decomposability of the inequality measure. An inequality measure can be regarded as source decomposable if total inequality can be broken down into a weighted sum of inequality by various incomc components.

One popular measure of income inequality that meets all the above properties is the Gini coefficient. The income equalizing or dis-equalizing effect of non-farm income can be ascertained by decomposing the Gini coefficient of total income into its component parts.

yi< yi< yt, represent the *K* components of household income and *y* the total household income, where,

$$y=Zy, \quad \text{I}^{k} \qquad (2.2)$$

Following Pyatt, Chen and Fel (1980) and Stark, Taylor and Yltzhaki (1986), the Gini coefficient for total income, *G,* can be decomposed as follows:

$$G = \sum_{k=1} R_k G_k S_k \qquad (2.3)$$

Where, *Sk* is the share of income component *k* in total income, G* is the Gini coefficient measuring the inequality in the distribution of income in component *k,* and *Rt* is the Gini correlation of income component *k* with total income defined as:

$$\frac{\text{covin, F(X)]}}{\text{covin, wji}} \qquad (2.4)$$

Using this Gini decomposition technique, it is possible to find out how much of the overall incomc inequality is attributable to a particular income source, and whether an income component contributes to increasing or decreasing overall inequality. We can thus measure the relative concentration coefficient of income component *k,* which determines whether the income source worsens or improves overall income inequality. This measure is given by:

$$g_k = R_k \frac{G_k}{G} \qquad (2.5)$$

where g_k is the relative concentration coefficient of income component *k* in overall inequality. Income component *k* worsens overall income inequality if $g_t > 1$ and it has an equalizing effect if $g_t < 1$.

2.S.2.2 Regression-based Approach to Inequality Decomposition

The Gini decomposition technique applied in the previous section answers the question of how much does each income component contribute to overall inequality and which income components increase or decrease total inequality. It is not enough to know whether an income source increases or decreases income inequality. It might also be useful to ascertain what factors contribute to the inequality in a given income component. The regression based approach to inequality decomposition quantifies the

relative contribution of the various income determinants to the inequality in a given income component.

Following Morduch and Slcular (2002), the regression based approach begins with the income equation:

$$Y = X0 + e \qquad (2.6)$$

where .Vis an *nxM* matrix of independent variables with the first column given by the *n*-vector? = (1,1,.... 1), *p* is an *M* -vector of regression coefficients, and eis an «-vector of residuals. The *M* coefficients can be estimated using appropriate econometric techniques with specification corrections as required (Morduch and Sicular, 2002). Predictions of per capita income from each income source

Yt can be formed using information from the entire data set. The econometric results yield estimates of the income flows attributed to various household variables, and this allows for decomposition by income source. Decomposition by income source basically apportions inequality to the various income components, where the sum of these components equals total income, $Y, =]T\ Y_{llt}$.

Let $\hat{Y''} = Xp^{m}$ represent income contributed by various household level factors such as age, education, land, location etc., as given by the regression results. By construction, total income from a given income source is the sum of these flows (plus the regression residual).

That is

= W-1 for all/,

where

$$\hat{Y}_{ik}^{m} = \hat{\beta}_{m} X_{ik}^{m} \qquad \text{for } m \sim M$$

$$\hat{Y}_{ik}^{m} = \epsilon_{it} \qquad \text{for } m = M+1$$

These estimated Income flows can then be used to determine the contribution of all regression variables to inequality in an income source or component. The shares take the form

$$s^{m} = \hat{\beta}_{m} \left| \frac{\sum a_i(y) x_i^{m}}{} \right| \qquad \text{for } \#i = 1 \; hi.$$

This formula can be applied to the decomposition of any inequality index that can be written as a weighted sum of income (Morduch and Sicular, 2002).

2.6 Data

Data for estimating non-farm income diversification in rural Ghana is from the fifth round of the Ghana Living Standards Survey (GLSS 5)[6] conducted in 2005/2006. The Ghana Living Standards Survey is a nationally-representative survey of households and individuals, designed along the lines of the World Bank's Living Standards Measurement Surveys (LSMS). The GLSS is conducted by the Ghana Statistical Service with technical assistance from the World Bank. The GLSS is a probability sample survey. The Ghana Statistical Service maintains a complete list of enumeration areas (EAs), together with their respective population and number of

[4] Both GLSS 4 and 5 data arc used In chapter 3 In annexing pattern and trends in household income shares and participation rates in various inoome activities.

households. This information was used as the sampling frame for the GLSS 5. A two-stage stratified random sampling design was used. The EAs were designated as primary sampling units (PSUs) while households within each EA constituted the secondary- sampling units (SSUs). The EAs were first stratified into ten administrative regions and within each region the EAs were further subdivided according to rural and urban areas of location. The EAs were also classified according to the three ecological zones (coastal, forest and savannah). A total of 580 EAs were obtained made up of 8,700 households. The survey achieved a 99.85 percent response rate, giving a total of 8,687 households containing 37,128 household members. The data was collected from September 2005 to September 2006. Detailed information was collected on demographic characteristics of respondents and all aspects of living conditions including health, education, housing, household income, consumption and expenditure, credit, assets and savings, prices and employment (GSS, 2008). Out of the 8,687 households surveyed, 5069 (58%) were rural households. Four observations were single-person unemployed households. These were dropped from the data leaving 5065 observations for analysis.

CHAPTER THREE

NON-FARM INCOME DIVERSIFICATION

3.1 Introduction

The majority of studies on rural non-farm activities focus on the diversification of income sources over the rural space, or over groups of households within the rural space (Davis et al., 2007). Rural income data for many developing countries show high levels of diversification (Davis et al., 2007). Diversification however does not necessarily mean a complete substitution of on-farm (crop and livestock) activities for ofT-farm activities, as most rural households do maintain on-farm activities, despite participation in other off farm activities (Davis et al., 2007). The objective of this chapter is three-fold. First, section 3.2 of the study presents descriptive statistics on the patterns and trends in rural income and activity diversification in Ghana using GLSS 4 (1998/1999) and GLSS 5 (2005/2006) data. The section begins by looking at the share of total rural income contributed by different income sources and the degree of households' participation in the different rural income generating activities. To ascertain in greater detail the pattern of rural non-farm income diversification, the study looks more closely at rural non-farm activities using the 2005/2006 data to investigate which industries rural households are engaged in. We also investigate participation rates in various income generating activities by individual household members to understand the patterns of diversification more clearly. The second objective of the chapter is to empirically investigate the determinants of participation in non-farm activity. A factor that enables a household to participate in non-farm activity may not necessarily be significant in affecting the returns from that non-farm

activity. The third objective of this chapter thus is to ascertain the determinants of non-farm income (shares).[7]

3.2 Patterns of Income Diversification

3.2.1 Rural Income Shares

One way to examine the level of rural income diversification is to ascertain the relative shares of the different income sources in total household income. Table 3.1 shows the mean share contributed by the various sources to total rural household income for 1998/1999 and 2005/2006. It is unsurprisingly evident from Table 3.1 that on-farm income dominates rural household income, but the non-farm[8] component is quite significant and shows a rising trend over the period. In 1998/1999, farm income[9] accounted for about 65 per cent of total household income but this dropped by 6 percentage points to 59 per cent in 2006. Taken as an aggregate, therefore, the non-farm income share increased from 35 per cent in 1998/99 to 41 per cent in 2005/06. an increase of six percentage points over the period. Fifty per cent of the fall in the share of farm income was reflected in the non-farm self-employment income component, which increased from 16.5 per cent to 19.5 per cent. The remainder of the fifty per cent was accounted for by remittances and other income. Farm wage income is a very small component of rural household income, an indication that many households do not deploy their labour supply in such activity. Table 3.1 reveals that

[7] In fact, ihc study uses three approaches (variables) in estimating the determinants of non-farm income diversification. Two of the approaches use activities and models diversification as (1) the number of non-farm activities the household engages in, and (2) the income generating portfolio the household adopts, and here we dorlve various combinations of torn and/or non-farm strategies (sec chapter 4 for this analysis). The third diversification variable is the non-farm Income share (i.e., the share of noH-fflim incomc in total incomc). As noted above, a factor that significantly affects participation in non-farm activity may not necessarily be significant In affcctlng non-farm income.

* Broadly defined as income other than own-farm and farm-wagc Incomc

[9] That Is. the sum of on-farm and farm-wagc Income

form-wage income aeeounts ter less than % per Boat of rural household Income, and Its share has remained largely stable over the period 1998/99 to 2005/06.

Unlike in Utln America and Asia, where non-form wage income is relatively more important, in rural Ghana (just as is the case in many sub-Saharan countries), non-farm self-employment income is more important relative to non-farm wage income for ail households, even more so for households headed by women (Table 3,1), households in the coastal and savannah belts (Table 3.2) and the poorest 20% (Table 3,3). This means that in rural Ghana, there are more opportunities for self-employment than wage employment.

Table 3.1 Percent share of income source in total Income, by gender of household head

	1998/1999			2005/2006		
		Male	Female		Male	Female
Income source	All	head	head	All	head	head
On farm	63.1	58.4	77,4	57.1	60.0	45.5
Farm wage	1.5	1.7	0.7	1.8	1.8	1.6
Non-farm self-employment	16.5	17.8	12,4	19.5	18.3	24.0
Non-farm wage employment	7.9	9.4	3.7	7.8	8.5	4.9
Remittances	8.6	7.6	11.6	7.8	4.8	19.7
Other	2.4	5.1	-5.8	6.1	6.5	4.3
Total	100.0	100.0	100.0	100.0	100.0	100.0

Source: Author's computation based on GLSS 4 and 5 data.

Table 3.2 Percent share of income source in total income, by geographical location

	1998/1999			2005/2006		
Incomc source	Coastal	Forest	Savannah	Coastal	Forest	Savannah
On farm	40.4	64.9	76.5	45.4	58.6	60.8
Farm wage	3.0	1.6	0.2	3.6	2.4	0.2
Non-farm self-employment	30.2	12.5	12.9	22.3	17.6	20.4
Non-farm wage employment	9.8	10.1	3.5	10.8	9.6	4.2
Remittances	11.6	6.7	9.3	11.6	8.8	4,7
Other	5,1	. 4,1	-2.3	6.2	3.0	9,7
Total	100.0	100.0	100,0	100,0	100.0	100,0

Source: Author's computation based on GLSS 4 and 5 data,

	1998/1999					200J/2006				
Income source	1st	2nd	3rd	4th	3lh	hi	2nd	3rd	4lh	5th
On Hmn	62.0	37.4	13.0	49.9	61.7	626	64.2	60.8	38.6	44.7
Farm wage	0.9	1.3	1.4	2.1	2.1	0.7	1.7	28	2.0	2.5
Non-farm iclf-cmployment	10.J	22 3	4.4	229	27.7	144	13.3	187	347	21 5
Non-ltom uage employment	2.1	6.2	12	13.9	13.9	3 5	7.6	64	12.2	166
Kemumncei	18.2	7.6	-0.6	7.4	76	7.4	69	68	8.3	125
Other	6,3	4.9	36	3.8	-129	11.4	42	4.4	43	2-2
TOWI	100.0	IW'P	100.0	100 0	100.0	100 0	1000	100 0	1000	1000

Source: Author's computation based on GLSS 4 and 5 data.

There are important gender differences in income shares. While in 1998 the share of income from own-farm production was higher for female-headed households than for male-headed households, the pattern was reversed in 2006 (Table 3.1). The reverse pattern also obtained for non-farm self employment income share. Geography plays an important role in the relative contributions of various income sources to total rural household income. Table 3.2 presents the patterns and trends. The trend depicted in the figure is that non-farm income is more important in the coastal belt than in the forest and savannah belts, although its share declined between 1998 and 2006 from 40 percent to 33 per cent. Again, self-employment income accounts for the bulk of the non-farm share, although the decline in non-farm share over the period was due to an 8 percentage point drop in the self-employment share. Over the period, both the forest and savannah belts witnessed significant increases in their respective non-farm self-employment shares. The increase was particularly significant for rural savannah. The non-farm wage employment share has largely remained stable over the period, as was the case of remittances and other income.

Table 3.3 ascertains the pattern of income shares by household wealth status.[10] The general pattern in both 1998 and 2006 is that the share of own-farm income decreases with household wealth" while the share of non-farm self-employment income and non-farm wage employment income increases with household wealth. In the case of farm wage income, a positive correlation obtains between it and household wealth status. No clear pattern emerges in terms of remittances and other income.

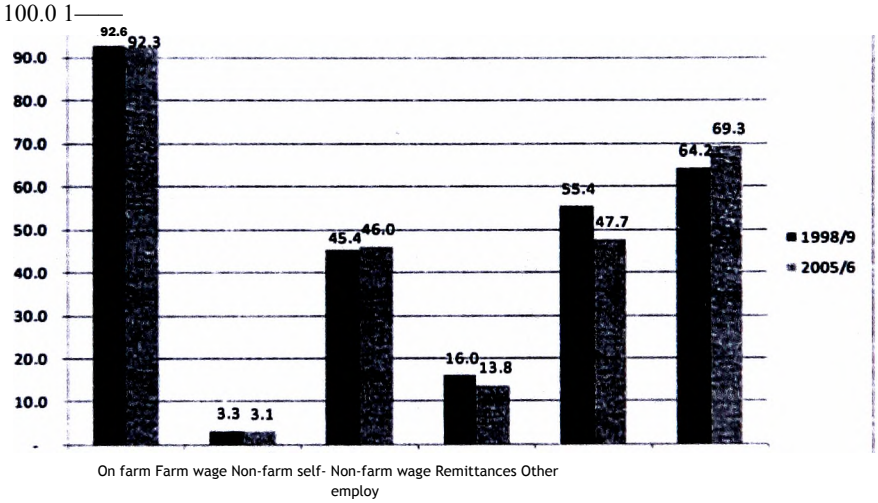
3.2.2 Sources of Rural Household Income[12]

Rural households derive income from multiple sources. While rural non-farm activities may be increasing in importance, the vast majority of rural households continue to rely on on-farm income as Tables 3.1, 3.2 and 3.3 portray. Figure 3.1 shows the trend in the proportion of rural households deriving income from various sources between 1998.99 and 2005/06. As Figure 3.1 reveals, there has not been any significant change in proportion of households relying on on-farm, farm wage, non-farm self-employment and non-farm wage employment income sources between the two periods. In both 1998/1999 and 2005/2006, more than 90 per cent of rural households derived income from on-farm activities. This high participation rate in on-farm production may imply that although rural households may be participating increasingly in non-farm activities, they are not substituting on-farming activities for non-farm activities, but rather complementing their farming with non-farm activities. Apart from on-farm activities (and remittances and other income sources), non-farm self employment activities arc the next most important source, and participation in this activity increased marginally from 45 per cent in 1998/1999 to 46 per cent in

[10] Household wealth status is defined using expenditure quintiles.
" A significant aberration is the third income quintlle in 1998/1999.
[12] Defined as a household earning Income, negative or positive, from u particular source.

2005/2006. Participation in non-farm wage employment is lesser than self-employment, and between 1998/1999 and 2005/2006, participation in non-farm wage employment fell by 2 percentage points from 16 percent to 13.8 percent.[13] As was reflected in its share in total income, participation in farm wage activities is less than 5 per cent, again confirming the possibility that most rural households do not deploy their labour supply on other people's farms. The relatively high participation rates in agricultural and non-agricultural activities are indicative that rural households in Ghana have a diversified income portfolio.

Figure 3.1 Percent households participating in various income activities, 1998/99 and 2005/06



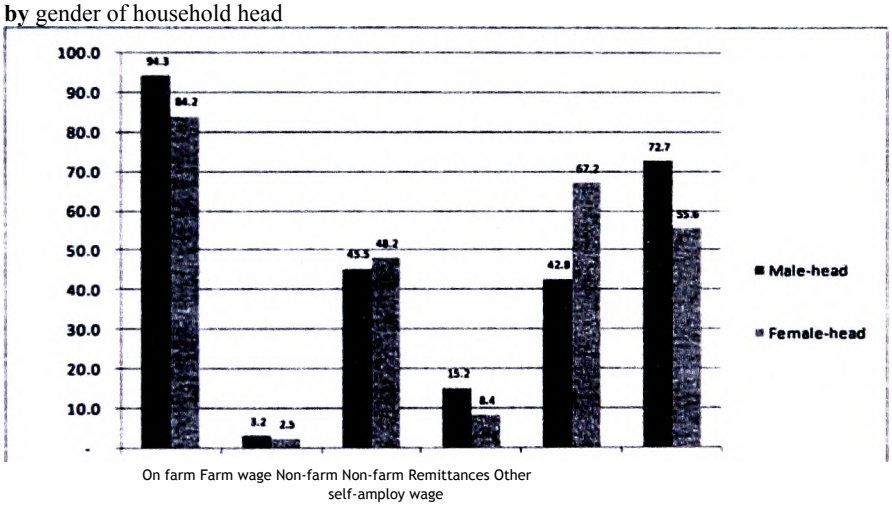
Source: Author's computation based on GLSS 4 and 5 data.

In terms of gender of household head, geographical location and wealth status[14], the pattern of participation in rural income generating activities has not changed very

[11] Crosi-counlry comparisons by Davis el al. (2007) indicate that non-farm wage employment is less important in Africa than in Latin America and Asia. While participation rates for Africa range IVom 10 to 20 percent, It ranges between 20 and 40 peroent In Latin America and Asia.
[14] Household wealth status (quintllc) is proxled by expenditure qulntlles.

much between 1998/1999 and 2005/2006 (Appendix A3)[15]. The study therefore focuscs on the relative importance of participation rates in the various activities for 2005/2006. Figures 3.2, 3.3 and 3.4 respectively present participation rates in the various income generating activities by gender of household head, ecological zone and expenditure quintile in 2005/2006. Participation rates were higher in own-farm, farm wage, non-farm wage and other income generating activities for male-headed households than female-headed households in 2005/2006. The reverse holds for non-farm self-employment and remittances (Figure 3.2).

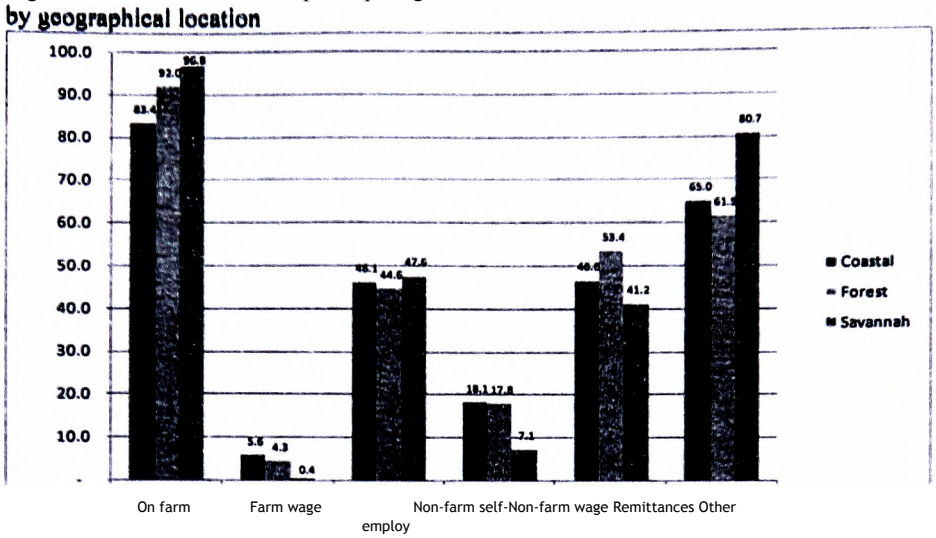
Figure 3.2 Percent households participating in various income activities in 2005/06, by gender of household head



Source: Author's computation based on GLSS 5 data.

" A slight exception is in Ihc non-farm self-employment category whore between I998/1VW and 2005/2006 participation in the savannah bell Increased by 17 percentage points and the coastal belt where participation decreased by)) percentage points.

Figure 3.3 Percent households participating In various income activities in 2005/06, by geographical location



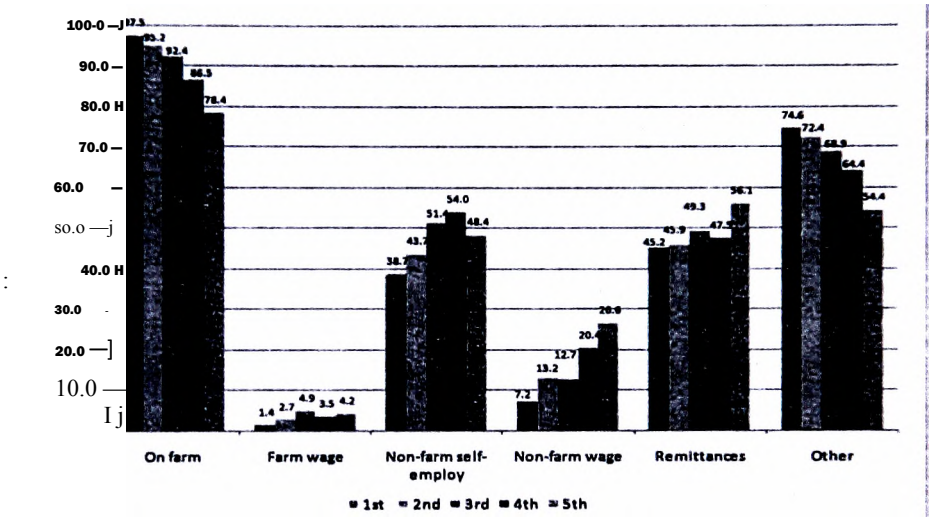
Source: Author's computation based on GLSS 5 data.

Geographically, participation in own-farming activities increases as one moves from the coastal belt to the savannah belt (Figure 3.3). On the other hand, participation rates in farm wage activities decreases as one moves away from the coast. Participation rates in non-farm self-employment is virtually equal for all three ecological zones, while non-farm wage employment activities are more important in the coastal and forest belts compared to the savannah belt. This may not be surprising given the relatively more developed nature of the coastal and forest zones of the country compared to the savannah belt. Households in the forest belt are the major beneficiaries of remittances. For other income activities, it is households in the savannah belt who are the major beneficiaries.

In terms of household wealth status, some very general patterns can be discerned in household participation rates. Participation in own-farming and other income

activities decreases with household wealth status, while it increases with farm-wage, non-farm self-employment, non-farm wage and remittances. Since participation in own-farming by richer households is lower but their mean income from this activity (see Appendix A3) is higher compared to poorer households, it implies that wealthier families are more productive on the farm than poorer households.

Figure 3.4 Percent households participating in various income activities in 2005/06, by expenditure qulntllc



Source: Author's computation based on GLSS 5 data.

3.2.3 Participation by Type of Non-farm Activity

In this section, the study focuses more closely on non-farm activities, i.e., self- and wage employment, and investigates which industries or sectors households tend to participate in more in order to understand the non-farm diversification patterns more clearly. Empirical evidence indicates that poorer households participate in low skill activities because of entry barriers such as lack of human and physical capital (Abdulai and CroleRocs, 2001; Woldcnhanna and Oskam, 2001; Barrett ct al.. 2000;

Dcrcon and Krishnan. 1996). In all eleven non-agrlcultural sectors were obtained.[16] Seven of the sectors are aggregated and named "others" in order not to make the tables loo unwieldy,[17]

Table 3.4 shows that for rural households, manufacturing and wholesale/retail trade arc the most important sectors for non-farm self-employment, while public services offer the most opportunity for wage employment. More female-headed households (24%) participate in wholesale/retail trade than do male-headed households (19%), while the reverse is the case for manufacturing (16% and 21% respectively). Hotel and restaurants (capturing mainly chop bars) are also more important for households headed by women. Male-headed households however dominate the public services sector. In the other category, the most important activities are in the mining & quarrying and transportation services for wage employment, and construction and private & other services sectors for self-employment. Geographically and for households engaged in self-employment, participation in manufacturing increases as one moves from the coast (17%) to the savannah (22%), while participation decreases for wholesale/retail trade activities as one moves from the coastal belt (24%) to the savannah (19%).

[16] The study uses the ISIC industrial classifications, excluding the agriculture, forestry and logging sector, with some slight modifications

[17] These are (I) mining &. quarrying, (2) construction, (3) electricity & water. (4) transportation, storage & communication. (3) real estate. (6) financial & insurance services, and (7) private & other services

Table 3.4 Sector participation in non-farm activities by gender of household head (%)

	Self-employment			Wage employment		
		Male	Female		Male	Female
Manufacturing	19.7	20.6	16.0	1.4	1.7	0.7
Wholesale/retail trade	20.0	19.0	24.0	1.3	1.5	0.5
Motel & restaurant*	3.6	3.4	4.3	0.2	0.2	0.1
Public service*	0.5	0.6	0.3	3.9	4.5	1.9
Other'	.....M	3.8	3.2	4.9	5,5	2.3

t sec fool note 11

Source: Author's computation based on GLSS 5 data.

	Self-employment			Wane employment		
Sector	Coastal	Forest Savannah		Coastal	Forest Savannah	
Manufacturing	17.4	18.6	22.1	2.0	2.1	0.5
Wholesale/retail trade	23.6	19.5	19.0	1.6	1.8	0.6
Hotel & restaurants	5.2	3.8	2.6	0.3	0.1	0.2
Public services	1.2	0.5	0.3	4.7	4.2	3.2
Other'	3.8	4.3	2.6	7.0	6.5	1.9

t see foot note 11

Source: Author's computation based on GLSS 5 data.

Table 3.6 Sector participation in non-farm activities by expenditure quintile (%)

	Soll'-cmDloyhiuHt				Wage employment		
Sector	1st	2nd	3rd 4th	5th	1st 2nd	3rd 4th	5th
Manufacturing	20.0	19.9	20.5 20.6	14.6	0.9 1.6	2.0 1.8	1-2
Wholesale retail trade	14.2	! 8.1	21.4 27,4	27.4	0.2 1.0	1.8 1.2	4J
Hotel * restaurants	2.0	3.6	4.9 4.5	3.9	0.0 0.0	0.2 0.2	0.5
Public services	0.3	0.2	0.2 1.1	1.8	2.4 3.1	2.3 7.4	8.8
Other'	2.4	3.1	3.6 6.0	5.1	2.5 5.3	4.3 7.7	8.2

* *see* foot note 11

Source: Author's computation based on GLSS 5 data.

Participation in wholesale/retail trade self-employment increases with household wealth status (Table 3.6). Rural wholesale/retail trade requires some form of start-up capital, which richer households can readily provide (and hence their greater participation), thus indicating the presence of entry barriers. For manufacturing, there

is no clear pattern, but participation is relatively lower for the richest 20 per cent, and this may be explained by the kind of manufacturing activities available, rhe very wealthy may not find the returns from these manufacturing activities very attractive. Participation in public service wage employment also is positively correlated with household wealth status, with the participation rate of the richest 20% being more than three times that of the poorest 20%. Provision of such public social services, such as education and health requires some level of education, and wealthier households seem to be better educated than poorer households.[1]*

3.2.4 Individual Participation Rates

Aggregate household participation rates do not allow for determining who in the household participates in what activity. This section analyses individual participation rates in the various rural income generating activities in terms of position in the household. Six categories of individuals are considered, namely, (1) household heads; (2) male household heads; (3) spouse of head of household; (4) non-student male household members less than 40 years; (5) non-student female household members less than 40 years; and (6) other household members aged 40 years and above. Both the main occupations and secondary occupations of these categories of household members are considered. The results are presented in Table 3.7. Table 3.7 shows that 71 percent of household heads' main occupation is in on-farm. However participation in on-farm[19] as main occupation is four percentage points higher if the household head is male.

'* The mean household years of education for the poorest 20% Is 1,9 years while that of the richest 20% is S.4 years.

'* On-farm or own-farming or own-farm are being used synonymously.

Main nativity unless otherwise indicated	Number	-ran activity (%)	seeontJary activity (%)	Woiffl age (yrs)	Kleufl education (yrs)
Head or household	4448			44 8	52
Oii-fimn	3304	71 2		467	43
On-farm (sccond activity)	328		129	41.4	7 1
Farm wage (second activity)	17		04	397	64
Non-firm wage (second activity)	62		16	42 6	86
N'on-furm self-employment (second activity)	446		96	43 2	3 1
Farm wage	114	3.1		364	63
Non-farm wage	348	9.0		397	102
Non-farm self-employment	6IS	14 9		41.8	57
Head of household is male	3407			43.8	56
On-farm	2660	74,8		43.2	4.7
On-farm (second activity)	379		12.3	409	7.9
Farm >vagc (sccond activity)	15		04	39.2	7.1
Non-farm wage (second activity)	39		2,0	376	29
Non-farm self-employment (second activity)	280		7.9	42.1	5.6
Form wage	102	3.6		36.8	64
Non-farm wage	312	10.8		398	I0J
Non-famt sclf-cmploymcnt	276	8.7		41.6	69
Spouse of head of household	3092			37 8	29
On-farm	2310	72.8		383	24
On-farm (sccond activity)	224		8 1	36.8	4.6
Non-famt wage (second activity)	2		0.1	35.3	21
Non-farm self-employment (second activity)	450		13 8	380	27
Finn wage	12	0,4		334	34
Non-farm wage	26	1.0		39.2	118
Non-farm self-employment	700	24 1		366	39
Other non-student male hh members < 40 years	1305			194	38
On-farm	1128	82 3		189	3.1
On-farm (second activity)	33		32	224	64
Non-farm wage (sccond activity)	2		02	196	99
Non-farm self-employment (second activity)	19		1.2	22.1	4.2
Farm wage	20	2.3		21.2	6.0
Non-farm wage	48	4.3		24.6	81
Non-famt self-employment	45	4.0		20.7	5J
Other non-student female hh members < 40 yean	976			19.8	36
On-farm	714	67.S		186	25
On-farm (sccond activity)	40		3.0	24 7	67
Non-farm wage (second activity)	1		02	32	too
Non-farm self-employment (second activity)	80		7.0	24 2	46
Farm wage	10	I.S		187	29
Non-farm wage	14	1.5		22.7	114
Non-farm self-employment	146	17.7		24 3	57
Other household members 40 years & above	297			35 8	1 7
On-farm	248	81.5		55,9	15
On-farm (sccond activity)	8		23	49.9	49
Non-farm self-employment (second activity)	30		9.S	S0.8	2 5
F ai m w age	1	0.4		41	90
Non-farm wage	3	1.0		53.4	39
Non-farm self-employment	42	160		54.7	1 9

A significant proportion of household heads have non-farm activities as their main occupations as well (24%) but the participation rate varies with the gender of

household head depending on the type of non-farm activity. Male household heads participate less in non-farm self-employment (8.7% compared to the aggregate of 14.9%) but more in non-farm wage employment (10.8% in comparison to 9% in aggregate). The fact that only 11% of household heads have non-farm activity as their secondary occupation can be read as an indication that while households may be diversified in terms of the income activities they pursue, individual household members may be specialising in specific activities. About 73% of the spouses of household heads have farming as their main occupation while another quarter is engaged in non-farm self-employment as main occupation. Twenty two percent engage in secondary occupation either as non-farm self-employed or farm-wage employees, an indication that less than a third of the spouses of household heads whose main occupation is fanning engage in supplementary income activity. More than four-fifths of males below 40 years who are not household heads engage in own-farming as main occupation, while less than 2% have secondary occupations outside own-farming, again portraying specialization across activities within households. Overall, less than 10% of young males are employed in non-farm activities cither as their main or secondary occupation. The situation is much different for females less than 40 years who are not household heads. More than 26% engage in non-farm activities either as their main occupation (19%) or as their secondary occupation (7%). For young women in the household, non-farm self-employment is an important occupation (18%) compared to young males (4%). The reverse is the case for non-farm wage employment but the difference is less dramatic. For other household members aged 40 years and above, apart from on-farm (82%), non-farm self-employment is the most important activity, either as a main occupation (16%) or a secondary occupation (10%).

Education plays an important role in non-farm wage employment either as a primary or secondary occupation, and its importance cuts across almost all the classifications of household members.[20] The importance of education in securing non-farm as against farm wage employment is also quite clear across all categories of household members.[21] Among heads of households, their spouses, male household heads and female household members less than 40 years who have non-farm wage employment as their main occupation, not only are they better educated on average compared to other members in their respective groups but they are also better educated than their counterparts who engage in non-farm wage activities as secondary occupation. Moreover, household heads, male household heads and other household members aged 40 years and above in non-farm wage employment are younger, indicating that younger adults are better educated than older adults. The opposite is the case for spouses of household heads, and young males and females in the household.[23] Non-farm self-employment also shows a positive relationship with the level of education, although it is not as strong as is for non-farm wage employment. One may therefore conclude that there is a strong positive association between education and non-farm employment in Ghana, as has been found in other developing countries.

[20] Exception* are male household heads and spouses of household heads whose main occupation is on-farm but alw engage In non-farm wage employment as secondary activity. In the former case, the result it not surprising because the mean education (4.7 years) for the group (on-farm as main occupation) is less than for the entire group of male household heads (J.6 years). Moreover these men may be engaged in low-sklll activities that do not require higher education qualifications. For spouses of household heads, it Is rather the relatively more educated among those who have on-farm as their main occupation that arc employed In secondary activities as wage labour.

[31] The only puzzling cxccptlon is among older adults (40 years and above) who are not household heads, where the mean years of education for those engagod In farm wage main occupation (9 years) Is greater than for those engaged in non-farm wage employment as main occupation (3.9 years).

For young males and females, this should not be surprising. The mean age In these two groups are 19.4 years and 19.8 years respectively, and most young people around these ages who potentially can secure wage employment outside farming will still be In school.

3.3 Determinants of Participation in Non-farm Activities

3.3.1 Introduction

A household's deoision to diversify Its incomc sources away from farm income depends on the incentive and the capacity to diversify (Reardon, 1997; Reardon et al., 2006). The incentive to diversify may be necessitated by low yields from and/ or the risky nature of the household's farming activities as well as the higher returns posted by non-farm activities. The capacity to diversify on the other hand rests on the assets available to the household. These assets may be at the household level (micro level assets) and includes household size and composition, and educational attainment or be at the community/ regional level (meso level assets) and entails assets such as access to credit, roads and markets.[23] Thus apart from deriving income from farming activities, a household may also allocate its labour and other productive assets to non-farm income generating activities. This allocation decision then generates a stream of income for the household either from self-employment or wage employment or both. Apart from on-farm activities, households may also allocate labour to other people's farm and earn wage income. Some households however may be unable to secure income from any of these non-farm sources.[24] The objective of this section is to investigate the determinants of households' participation in non-farm income activities in rural Ghana.

[21] A* Reardon et al. (2006) notes, the meso level assets arc typically (but not always) public goods, and may be eluted us hard and soft Infrastructure.

" For these households, Income may largely be earned from own-farm activities plus unearned Income sources such as remittances.

3,3.2 Estimating Non-farm Activity Participation

3.3.2.1 Economctric Approach

The rural household income diversification process discussed above can be modeled using categorical dependent variable regression models. One of these models is the event count data models. An event count is the realization of a non-negative integer valued random variable (Cameron and Trivedi, 1998). The number of non-farm income activities a household engages in is thus an event count data generating process.

Count data generating processes can be modeled using the Poisson regression model. Let *y,* represent the number of non-farm income activities a randomly chosen household is involved in. The Poisson regression model specifies that the number of non-farm activities (*y*,) is drawn from a Poisson distribution with parameter A, (mean number of non-farm activities), which is related to *a* set of regressors X/.[25]

The density- function of the Poisson variable (*y*,) is

$$f(y,\backslash x,) = \text{—f-}.\ \frac{e'^{*l}\ X^{y}{}'}{y,\ \mathrm{I}} \qquad *=0,1,2.... \qquad (3.1)$$

with mean

$$Ely,\ \mathrm{IX},\ ] = X, = \exp(\mathrm{X};/?) = \exp(0_O + /?,*_{,,} + \qquad + frx_b) \quad (3.2)$$

$$\text{In } Ely,\ |\ \mathrm{X},\ ] = \text{In } X, = Xj = p_a + \qquad +.....+p_kx_k, \qquad (3.3)$$

" Thus the Poisson regression model incorporates observed heterogeneity Into the Poisson distribution function.

The estimation form of the regression model for the Poisson variable is:

$$y, = \exp(X;/?) + e, = \exp(/?,, + P,x_u + \ldots\ldots\ldots\ldots + p_k x_h) + e, \quad (3.4)$$

In log-linear form, equation (3.4) becomes

$$\ln,Vi = \quad "*\blacksquare \sim 09 * P\backslash X\backslash ! \; "*\blacksquare \; Pk\hat{}tu \quad (3.5)$$

where the X, is the set of independent variables determining household *i's* participation in a number of non-farm income activities.

In this study, two types of non-farm income activities have been identified, namely, non-farm wage employment and non-farm self-employment. Thus *y,* = 0 if the household does not participate in any of the two non-farm activities; *y*= 1 if the household participates in only one of the two non-farm activities; and *y,* = 2 if the household participates in both. The set of independent variables used in the study are those that have been theoretically and empirically identified as influencing households' participation in non-farm activities and they include: household characteristics such as size, education, gender and age of household head, receipt of remittances; household agricultural assets such as land and livestock; location; wealth status; infrastructure such as electricity, markets, roads and access to credit.

The coefficients of the Poisson regression model are interpreted differently from those obtained in OLS regression (due to the exponentiation). From equations (3.2) and (3.3), we obtain

$$Pj \; Bx, \; E[y, \backslash x,\} \qquad d*,,$$

which is the proportionate change[26] in the conditional mean for a unit change in the/*[1] regressor.[27]

The Poisson model uses the maximum likelihood estimation (MLE) method. The Poisson MLE has robustness to distributional misspecification similar to OLS in the linear regression model under normality. If£[$y_{(}$ |X,] = exp(Xj/?), the conditional mean is correctly specified so that the Poisson MLE estimate is consistent even if *y,* is not Poisson distributed (Cameron and Trivedi, 1998). The Poisson model restricts the conditional variance to equal the conditional mean, an assumption referred to as equi-dispcrsion. However, if in the data the variance exceeds the mean, we have what is termed over-dispersion. There is under-dispersion, on the other hand, when the variance is less than the mean. If count data are not equi-dispersed the Poisson MLE coefficient estimates are unbiased but the standard errors are wrong (Cameron and Trivedi, 1998; Long 1997; Greene, 2003). However this can be corrected by generalizing the White-heteroskedastic consistent estimate of standard errors from OLS to the Poisson (Cameron and Trivedi, 1998).[28] One major improvement to correct for over-dispersion is the negative binomial regression model.[29] The negative binomial however is inappropriate if the data is under-dispersed. For under-dispersed data, estimating the Poisson with heteroskedastic robust standard errors leads to reliable results (Cameron and Trivedi, 1998).

$$\text{Smcc}\frac{3\pounds i>,\ \backslash x, VE[y,\ -}{OXj,} = fi,$$

[27] From equation 3.2 therefore the exported number of non-farm activities changes b.v exp(*P.*) for each unit change In the corresponding regressor.

[2‘] 111 is Is done using the Poisson command with the robust option In STATA econometric software.

[”] A likelihood ratio lest tests the null hypothesis of no over-dispersion. The likelihood ratio has a Chl-squared distribution with one degree of freedom, Lk-2*(ln/$_{N}$,, - lni_{ro}i) - x’(')• If'the null Is rejected, the negative binomial model Is preferred to the Poisson model.

Another problem that has to be contended with in count models is when the data generating process produces a larger number of zeros than would be expected under distributional assumptions, a situation where the data is said to contain “excess zeros”. In the particular case of rural non-farm income diversification, the number of households without any non-farm income generating activity may be very large. Models such as the zero-inflated Poisson and the zero-inflated negative binomial have been developed to deal with the problems of over-dispersion and excess zeros. Zero-inflated models handle over-dispersion by changing the mean structure to explicitly model the production of zero counts (Long, 1997; Long and Freese, 2003). The zero-inflated Poisson model assumes two data generating processes for the zero counts. The first is the “certain zero” or “always zero” category, and the second is the “sometimes zero" or “not-always zero” group. Zero counts come from the former group and some from the latter group with a certain probability (Park, 2005).

In modeling household non-farm income diversification, when the number of zeros are inflated the number of households without non-farm income activity cannot be explained in the same manner as households with one or more non-farm activities. While a group of households may have zero non-farm activities for the same reasons other households have one or two non-farm activities, another group of households may have zero non-farm activities for a different set of reasons. When such a situation prevails, the standard Poisson model does not distinguish between the two processes causing the excessive number of zeros. The zero-inflated model however does. The zero-inflated Poisson regression generates two separate models and then combines them. First, a logit model is generated for the "certain zero” cases, predicting whether or not a household belongs in this group. Second, a Poisson model is generated to

predict the counts for those households who are not certain zeros. Finally, the two models are combined Into one.[30]

3.3.2.3 Estimated Model of Non-farm Activity Participation

As indicated above, two non-farm income sources are available to households. A household therefore can have zero, one or two non-farm activities. Table 3.8 presents the distribution of the number of non-farm activities among the households. Table 3.8 shows that 53 percent of rural households participate in at least one non-farm income earning activity.

Table 3.8 Distribution of the number of non-farm activities

No. of non-farm activities	No. of households	Percent households
0	2.369	46.70
1	2.359	46.58
2	337	6.65
Total	5,065	100.00

Source: Author's computation based on GLSS 5 data.

Table 3.9 presents the descriptive statistics of the variables used for estimating non-farm activity participation, and their expected signs. The explanatory variables are put into five different categories, namely, household characteristics, wealth status, geographical location (or ecological zone), agricultural assets, and other factors. One striking feature of Table 3.9 is the highly unequal distribution of household agricultural assets. For instance, the mean land size is 4.4 hectares, but with a standard deviation that is about five times the mean.

[w] In mojt econometric software such as STATA, this procedure Is carrlcd out In one command. When this is done with the Vuong option, a Vuong test lor excess *eros is simultaneously produced at well.

Table 3.9 Descriptive statistics of variables and expected signs

Variable	Mean	Std. Dev.	Uxpeoted sign
Number of nun-fann activities Indimmknl!	0.599	0.611	n.a.
HoustMold di anctcristla:			
A# of household hood	47.037	14.301	+ / •
Gender of household head (mole-1)	0.801	0.399	■♦• /-
Number of household members	6.321	3.531	4
Number of miles IS yean and above	1.578	1.232	+
Number of females IS yeas and above	1.793	1.222	+
Avg yean of tch. of household members	3.278	2.745	+
Yean of schooling of household head	4.570	4 869	+
Household received remittances (yes-1)	0.477	0.499	+ /-
*Weml** m»j:			
First expenditure quintile	0.281	0.449	
Second ependiiure quintile	0.254	0.435	-
Third expenditure quintile	0.213	0.409	-
Fourth expenditure quintile	0.158	0.364	-
Fifth quint de expenditure (reference group)	0.095	0.293	n.a.
*EaolojicMl ton**			
Coastal bell (reference group)	0.175	0.380	n.a
Forest belt	0.450	0.498	+ /-
Savannah belt	0.374	0.484	+ /-
Agricultural UNO!			
Land owned (hectares)	4.360	25.2S8	+ /-
Fvmsuc (hectares)	7.944	83.359	+ /-
Livestock owned (TLU)'	2.097	11.073	+ /.
Value of farm equipment (GHC)	44.950	519.982	+ /-
Infrurm aura i other factors:			
Access to credit (yes-1)	0.333	0.471	+
Access to electricity (ycs-l)	0.255	0.436	+
Distance to market (km)	5.192	8.463	-
Distance to main road (km)	0.775	3.727	-

' TLU means tropical livostock uniis

Source: Author's computation based on GLSS 5 data.

Table 3.10 Mean test of independent variables for non-diversified and diversified households

Variable	Not diversified (N - 2624)		Diversified (N " 2441)		Mean test	
	Mean	S.D.	Mean	S.D.	l-stal	p-value"
llouuhold ckamctfriatov						
Age of household head	48.627	16.968	44.537	14.391	9.217	0.000
Gender of hh head (male" 1)	0.758	0.429	0.752	0.432	0452	0.651
Number of hh members	4.301	2.810	5.054	3.211	-8 901	0.000
Number of males 15 years and above	1.237	0.996	1.301	1.046	-2.246	0.025
Number or females 15 y ears und above	1.291	0.955	1.553	1 129	-8947	0.000
Avg yrs ofsch ofhh members	2.899	3.079	4.070	3401	-12.851	0000
Yrs of schooling of hh head	3.516	4.423	5.388	5.022	-14.105	0.000
Received remittances (yes-1)	0.528	0.499	0.516	0.500	0.885	0.376
Wealth mtus:						
First expenditure quint Qe	0.303	0.459	0.226	0.418	6.212	0.000
Second expenditure quintile	0.221	0.415	0.209	0.407	1.015	0.310
Third expenditure quint ile	0.191	0.393	0.208	0.406	-1.528	0.127
Founh expenditure quint ile	0 148	0.355	0.193	0.394	-4.242	0 000
Filth quint ile expenditure (reference group)	0 138	0.345	0.165	0.371	-2.657	0.008
Bcolotlcel zone						
Coastal beh (reference group)	0.167	0.373	0.177	0.381	-0 946	0.344
Forest belt	0.413	0.493	0.434	0.496	-1 465	0 143
Savannah belt	0.420	0.494	0.390	0.488	2.201	0.028
Airiailmnl tattx						
Land owned (hectares)	3.150	17.116	3.382	23.242	-0.405	0.685
Farms tze (hectares)	3.300	II.III	5.776	70.006	-1.787	0.074
Livestock owned (TLU)'	2.108	22.685	1.772	7.646	0.697	0.486
Value of farm equipment (Q 1C)	37.279	492.730	26.977	212.094	0.954	0.340
Infnutmavre & other radon:						
Access to credit	0.235	0.424	0.356	0.479	-9.586	0.000
Access to electricity	0.165	0.372	0.291	0.454	-10790	0.000
Distance to market (km)	6.310	9.426	4.320	7.540	8.260	0.000
Distance to main road (km)	1.193	5.090	0.672	3.104	4.353	0.000

[1] Tropical livestock untti conversion used it as follows: I cattle - I TLU; I draught * I TLU; I pig" 25 TLU; I »hoep - .2 TLU; I goal - .15 TLU, 1 rabbit - .005 TLU; 1 poultry - .005 TLU

" p < 0.01. p < 0 05, p < 0.10 indicates significance al 1%, 5% and 10% respectively

Source: Author's computation based on GLSS S data.

A comparison of the characteristics (explanatory variables) of households that are diversified[31] and those that are not is presented in Table 3.10. In terms of household characteristics, Table 3.10 shows statistically significant differences between these two groups of households in terms of age of household head, number of household

[31] Diversified households are households with al least one non-farm income sourec

members and education levels of household heads/members. The two groups however do not differ statistically in terms of the gender of household head or the proportion of households that received remittances. Within the various expenditure quintilcs, differences exist between the two groups of households across the first, fourth and fifth quintilcs. Geographically, only households in the savannah belt differ over the two groups, while in terms of agricultural assets, the two household groups do not differ statistically. The two groups of households are also statistically different in terms of access to infrastructure and other assets.

The rural non-farm activity participation model (Equation 3.4) is estimated using the Zero-Inflated Poisson (ZIP). The choice of the ZIP is based on the results of statistical tests for over-dispersion and excess zeros (see bottom half of Table 3.11). As noted above, the Poisson model assumes equality between the conditional variance and the conditional mean of the dependent variable. If this condition is violated, however, the standard errors and /-statistics of the regression are wrong. If there is evidence of over-dispersion in the data, then the Negative Binomial regression model is preferred to the standard Poisson regression model. The likelihood ratio test for over-dispersion results in a chi-squared statistic of zero (p-value = 1.00) and fails to reject the null hypothesis of no over-dispersion (Table 3.11). The lack of evidence of over-dispersion means that the model can be estimated using the standard Poisson. The Vuong test[32] for excess zeros however results in a test statistic of 3.91 ($p<0.0000$), suggesting that the ZIP is preferred to the standard Poisson. The log likelihood ratio test for the goodness of fit (Wald chi-squared = 914.48; $p<0.0000$) indicates that all the explanatory variables are jointly statistically significant in explaining households'

[J] The Vuong lest compares the zero-inflated Poisson model to a standard Poisson model. If the z-value it both positive and significant, the Vuong lust shows that the /.cro-lnlluiod Poisson Is u better Hi than the standard Poisson.

participation in non-farm activities. Most of the variables confirmed their expecte signs in relation to non-farm activity participation.

Tabic 3.11 Zero-inflated Poisson estimates of non-farm income diversification

	Mudtl pndtcimg (LogU)	:e«wr		*Modal prt dieting caunu (Poisson)*			
Variable	CoefY	S-StltiBtK	p-vslue"	CoefT.	z-statistic	p-value"	Marginal cffect
UsM&sH eAjnwertrfew							
Age of household head	0 1664	2.09	0.036	-0.0058	-4.55	0000	-0.0029
Household head is mole'	27 7016	4 05	0.000	¤0.0954	-2 37	0018	•00486
No. of household members	-9.3031	-1 88	0.060	0.0554	651	0000	0 0275
No. of mala 13 y rs & above	-11.2237	-3 78	0 000	0.0013	007	0 947	0 0007
No. of females 1J yrs & above				0.0745	3.9	0.000	0.0370
Avg yn of sch of hh members				00263	3 63	0.000	00131
Years of schooling of hh head				0.0275	5.66	0 000	0 0137
Household received renmianocs*	-0 7995	-0.43	0665	-0.0200	-0 65	0 517	-0 0099
1*Vtml** mow							
First *exp* quint dc'	11.7295	1 85	0064	-0.2935	-4 93	0000	-0.1367
Second ejq> quint de*	2 881 1	0 92	0 355	-0.1520	-2.88	0 004	-0 0724
Third of) quint tie'	-0 4352	-0 12	0 905	-0.0576	-1.15	0 251	-0 0281
Fourth *exp.* quintdc'				00366	0 81	0420	00184
Ctotrapkicml zone							
Forest*	0 9264	0 71	0477	-0 0516	-1.23	0 218	-00256
Savannah'	-1 1.3438	-2.05	0.041	0.0272	0.59	0.558	00135
AtrlailBiml «n*c							
Land owned (hectares)	0 1258	1.94	0.053	-0.0005	-0 87	0 385	-0.0002
Lond'household wealth status				0.0012	0.60	0.546	0.0006
Farms iie (hectares)	0.0311	1.75	0 079	0.0003	5 73	0000	0.0001
Livestock owned (TLU)	0.0671	I 79	0.073	-0.0009	-0.42	0 672	-0.0005
Value of (arm equipment	0.0030	1.98	0.048	0.0000	-0.57	0 568	0.0000
fifnmaani *oik tr factor*:*							
Access to credit'	2.4312	1 54	0.123	0.1909	6.25	0.000	0.0989
Access lo clectricny,				0.2032	6.12	0 000	0.1070
Distance to market (km)				-0.0139	-5.66	0 000	•0 0069
Dmsnse to mam road (km)	-0 3588	-069	0.493	-0 0045	-0.84	0 403	-0 0022
Constant	-3.2929	-1 31	0 192	-0.8188	-9.8	0 000	
Number of observations		5065			5065		

		sialtsilc	*p-value*
Log likelihood Test for gaodnass of fit	-4295 61	914 48	0 0000
l.R test NegBive Binomial vs Poisson		0 00	1 0000
Vuong lest ZIP vs Standard Poisson		3 91	00000

' M orgmal cfleet it for discrete change or (dummy) variable from 0 to I

M p < 0 01, p < 0 05, p < 0 10 indfcaica significance at 1%. 5% and 10% respectively

Source: Author's estimation based on GLSS 5 data

The coefficients of the two regression results in Table 3.11 are interpreted as follows: In the first regression *(model 1 - Logit),* a positive coefficient implies a high likelihood of the household not having a non-farm income source (i.e., zero participation or being a 'certain zero'). In the second regression *(model 2 - Poisson),* a positive coefficient means participation in non-farm activity increases with the variable in question.

The results in Table 3.11 show that household characteristics, wealth status and access to infrastructure and other factors are the main determinants of participation in non-farm activities. The results of *model 1* (logit) indicate that the probability of non-farm income diversification depends on the age and gender of the household head, household size, the number of males above 14 years, wealth status of household (being among the poorest 20%), and household agricultural assets (land size, farm size, livestock and value of farm equipment). Households headed by older persons and men, the poorest 20%, and households endowed with agricultural assets or cultivating larger farms are less likely to diversify into non-farm activities. On the other hand, households with larger number of persons and males above 14 years as well as households located in the savannah belt of the country are more likely to diversify into non-farm activities. Only half of the ten variables that are significant in *model 1* are also significant determinants of the number of non-farm farm activities households arc engaged in (i.e., *model 2),* namely, age and gender of household head, household size, the poorest 20% of households and the household's farm size. Access to credit was not a significant determinant of the probability of participation, but is significant in determining the number of non-farm activities. In addition, variables such as the number of female household members 15 years and above, education level

of the household (head and the average for household), access to electricity and distance to the nearest market, which were not included in the logit model *(model I),* are significant factors determining the number of non-farm activities.

3J.2.4 Discussion of Results

Household characteristics and diversification

All the household characteristics included in the model are statistically significant at the 1% level except for the adult-male and remittance variables which are insignificant. The number of household members (household size), number of adult females, average years of schooling of household members and the years of schooling of the head of household are all correctly signed. Thus larger households and households with a greater number of adult females are more diversified. The same holds for households that are more educated. More educated households may be able to secure more lucrative non-farm wage jobs and also have greater opportunity to engage in self-employment outside farming. For households with larger number of persons, it affords them a greater opportunity to diversify' into non-farm activities even though individual household members may be specializing in specific activities. Adult females seem to add an extra impetus to diversification, as majority of households are engaged in non-farm self-employment rather than wage employment and many more adult females are engaged in non-farm self-employment than adult males as was shown in section 3.2.4. The negative correlation between the number of adult males and participation in non-farm activity, though insignificant, may be explained by the concentration of adult males in on-farm activities either as a primary

or secondary occupation.[33] Age of head of household is negatively correlated with diversification, meaning households headed by relatively younger people are more diversified. In terms of gender of the household head, the results of Table 3.11 show that female-headed households participate more in non-farm activities than their male counterparts. This finding confirms that of Newman and Canagarajah (2000) for Ghana based on GLSS 1 and 3 data. Women (and female headed households for that matter) participate more in non-farm activities because self-employment activities constitute a greater proportion of non-farm activities in rural Ghana and women dominate this activity (see section 3.2.2). The implication then is that male-headed households (and men generally) are more likely to be engaged in agriculture (on-farm and farm wage), as the results of Tables 3.1 and 3.7 and Figure 3.2 indicate.[34] Receipt of remittances is positively correlated with diversification, but the effect is insignificant.

Household wealth and diversification

The level of household wealth is a significant determinant of income diversification among rural households in Ghana. As the results of Table 3.11 indicate, diversification generally increases with household wealth status. Households in the bottom 40% are statistically significantly less diversified compared to the richest 20%. In comparison with households in top 20%, households in the third quintile are also less diversified while households in the fourth quintile are more diversified, but both effects are not statistically significant. These results also confirm the bivariate

[11] For instance, in section 3.2.4 the data revealed that about 86% or adult males aged 40 years and above Have on-farm as their main or secondary activity (see Table 3.7).
[M] In Tabic 3.1 the agricultural income share (own-farm and farm wage) Is higher for households headed by males. In Table 3.7, participation In on-farm for males (households headed by males and adult males less than 40 years) is higher than for females. Figure 3.2 shows that participation in on-farm and farm wage is higher for male-headed households.

analyses of section 3.2.2 which showed that the wealthier households generally participated more in non-farm activities.[35] This finding confirms those of Reardon et al (1992), Dercon and Krishnan (1996), Dercon (1998), Carter and May (1999), Barrett et al (2000), Abdulai and CrolcRees (2001) for Burkina Faso, C6te d'Ivoire, Ethiopia, Kenya, Rwanda, South Africa, Tanzania and Mali. The usual explanation for this pattern of wealth-differentiated diversification is that entry barriers exist in non-farm employment activities that tend to limit the participation of poorer households. For instance, wage employment requires education while self-employment requires initial capital investment. Therefore, entry- barriers may be present that limit the ability of poorer households in rural Ghana to participate effectively in non-farm activities.[36]

Geography and diversification

Geographical location docs not seem to play any mtyor role in non-farm income diversification in Ghana. Relative to the coastal belt, households in the savannah belt are more likely to participate in non-farm activities, but in terms of the number of non-farm farm activities, there is no statistically significant effect between households in the coastal belt on the on hand and households in the forest and savannah belts on the other. There is therefore no conclusive evidence on the effect of geography on non-farm income diversification. The result that savannah households are more likely to participate in non-farm activities contradicts the findings of Newman and Canagarajah (2000) who find that the coastal and forest belts are more likely to participate in non-farm activities. Newman and Canagarajah (2000) contend that the

" The only exception in that ease was with self-employment activities where the 4.h quintile had a higher participation rate than the rlcheat 20 percent.

[14] It is worthy to note that earlier studies by Canagarajah et al (2001) and Newman and Canagurajuh (2000) on Ghana did not Investigate this kind of wealth Impact on Income diversification.

coastal region is closest to trade routes and urban areas and therefore must have the most non-farm participation and the least agriculture participation. Our findings however may indicate that while diversification in the coastal belt (and to some extent the forest belt) may be due to pull factors, diversification in the savannah belt might be triggered by push factors. Thus the three regions may be equally diversified but for difTerent reasons.

Agricultural assets and diversification

Table 3.11 reveals that household ownership of agricultural assets increases the probability of non-participation in non-farm activities. However the effects are not significant for any of the variables. On the number of non-farm activities, apart from farm size, household agricultural assets (land, livestock and equipment) do not affect non-farm income diversification. While household farm size positively and significantly affects non-farm income diversification, the size of land owned by household is negatively correlated with non-farm diversification but is insignificant. This perhaps, not too surprising finding warrants further elaboration. Some studies (de Janvry and Sadoulet, 2001; Escobal, 2001; Barrett et al, 2000) have found household landholdings to be positively correlated with total household incomc and farm income but negatively correlated with farm wage income and non-farm wage income. While this relationship may generally be true for non-farm wage income, it may not generally hold for other types of non-farm incomes such as self-employment incomc and also over the income distribution scale. Wealthy households with abundant land may have sufficient liquidity to enter into high-rctum non-farm self-employment activities. Thus non-farm incomc diversification may increase with household landholdings. To examine this effect, we introduce an interaction between

landholdings and wealth status. Even though the coefficient turns out to be positive, it is still statistically insignificant. Land-owning households may be less diversified because apart from income derived from the farm these households may also be deriving income from other (and perhaps quite stable) sources such as the renting land or that they have better mechanisms for dealing with seasonal fluctuations in agricultural income. This then gives them a lesser incentive to diversify. The positive and significant effect of farm size on non-farm diversification, however, may indicate that land-scarce households do rent land in order to cultivate larger farms but may have a greater incentive to diversify because of land tenure insecurity.

Infrastructure and diversification

Households with better access to credit are more diversified, so are households with access to electricity. These facilities enable households to invest in the more lucrative non-farm sector. Distance to the nearest market is negatively correlated with diversification, and is statistically significant, a result that also confirms the findings of Newman and Canagarajah (2000) for Ghana using GLSS 3 data. The nearer households are to market centres, the more diversified they arc as this affords them the opportunity to engage particularly in self-employment. Nearness to markets tends to raise the profitability of non-farm activities. Distance to a main road, though correctly signed does not significantly affect diversification.

3.4 Determinants of Non-farm Income

3.4.1 Introduction

The previous section analyzed the determinants of participation in non-farm activity, where the dependent variable was the number of non-farm activities. In this section, we investigate the determinants of aggregate non-farm incomc as well as its individual components, namely, non-farm self-employment income and non-farm wage income, which is a rn^jor point of departure of this study from Canagarajah et al. (2001). In addition, we model the determinants of farm and farm-wage incomes to allow for a comparison of the respective determinants. These five income categories are expressed as a proportion of total income

3.4.2 Econometric Approach

A household's decision to participate in a given non-farm activity' in addition to farming activities can be modeled as depending *ex ante* on a set of *incentive* and *capacity* variables (Reardon et al, 2006; Barrett et al, 2001). The household's objective is to maximize its earnings subject to the constraints imposed by its limited resources and in trade off with its desire to minimize risk (Barrett et al, 2000, Barrett et al, 2001; de Janvry and Sadoulet, 1996). As was discussed in chapter 2, given the household's asset endowments z», the household's problem is to maximize its utility subject to a number of constraints (de Janvry and Sadoulet, 1996).

For the purpose of this study, we estimate the determinants of five income categories as follows: (1) aggregate (or total) non-farm income; (2) non-farm self-employment

incomc; (3) non-farm wage employment income; (4) on-farm income;[37] and (5) farm wage income. These income categories are expressed as fractions of total incomc (income shares). The regressors include household human capital assets and characteristics (size and gender composition, age, and education), household wealth status (proxied by expenditure quintiles), household agricultural assets (landholding, livestock and value of equipment owned), and locational characteristics (geographical location distance to the nearest market, distance to the nearest road, access to electricity, access to credit).

We estimate the income share equations (equation 3.6) using the tobit (double censored) method. The tobit model hypothesizes the existence of a latent (unobservable) variable, which is assumed to be a linear function of independent variables.

The tobit model is specified as follows:

$$s' = 0Z, + s, \qquad (3.6)$$

where s' is the unrestricted unobservable (latent) income share from activity /', and *2* is avector of explanatory variables. Theobserved income share *s,* ishowever restricted to fall in the [0,1] interval, according to the following rule (Greene, 2003; Barrett et al, 2000):

j, = 0 if $s' \pounds 0$

$s, = s'$ if $0 < s' < I$

$s, —$ I if $s' Z$ 1

" That is, incomc earned from the household's own farm.

A household is therefore assumed not to derive income from the non-farm source (meaning zero participation in non-farm activity) if its (observed) income share is censored from below at zero. If the income share lies between 0 and 1, the household only participates partially. Household income share is censored from above at one and the household is assumed to derive all its income from non-farm activities (full participation).

3.4.3 Estimated Determinants of Non-farm Income Shares

Table 3.12 presents the results of the tobit regression model predicting income shares for total non-farm income, non-farm self-employment income and non-farm wage income.[3]* The significant log likelihood ratio chi-squared for the three regressions indicates that the independent variables are jointly statistically significant in predicting non-farm incomc shares. The results of the determinants of on-farm income and farm wage income shares on the other hand are report in Table 3.13. The results in Table 3,13 also indicate that the independent variables do a fairly good job in predicting farm- and farm-wagc income shares. In both Tables 3.12 and 3.13. a significant proportion of observations are either left censored or right censored, hence justifying the estimation method.

In the total non-farm income shares regression *(model I),* all the household characteristics variables arc statistically significant at the 1% level except for the number of adult males above 14 years. For self-employment income share *(model 2),*

" In order to account for the possibility of selection bias arising from the fact that the characteristics of households engaged In non-farm activities differ IVom the overall population In a non-random way, which could lead to selection bios, we initially estimated a Heckman self-selection model. The results (Inverse mills ratio) reported In Appendix A3, reject the possibility of sample selection bias.

except for the number of adult males and average years of schooling of household members, all the household characteristics are also significant at the 1% level. In the non-farm wage income shares regression *(model 3*), all variables except household size, number of adult females and receipts of remittances are significant. The insignificance of household size as a determinant of non-farm wage income share may be explained by the fact that wage employment depends on the quality of human capital (education) rather than sheer numbers (quantity). It is not surprising therefore that the two education variables - average years of schooling of household members and years of schooling of the household head - are statistically significant in both total non-farm income and non-farm wage income share regressions ($p<0.01$). While average years of schooling of household members does not significantly influence self-employment income, education as a determinant of self-employment income is significant for household heads, an indication perhaps that self-owned businesses require some entrepreneurial ability or skills that higher education can offer.

What is clear however is households' educational attainment is a key factor determining income diversification. In order words, the higher the household's education level, the lower is the incentive for it to obtain income from farm sources only, and the greater the incentive to deploy its labour resources to non-farm activities. This assertion is confirmed by the significantly negative effect education has on household on-farm income shares (see Table 3.13).

Table 3.12 Tobit Estimates of the Determinants of Non-fann Incomc

	Total N un-form Income		tfon-famt Half' employ. Income		Nan-IWm Wiigc Incomc	
Vuriablo	CoulT p-voluu		CoeO'.	p-vulue	Coe IT.	p-value
Hsunkald dumtoHrta:						
Age of household head	-0 0051	0 000	-0 0044	0000	-0 0086	0 000
Household head it male	-0.1091	0.000	-0 2000	0000	02757	0.000
No. ofhousehold members	0 0278	0 000	0.0304	0000	00199	0 204
No. of males 15 yra <fc above	-0.0155	0.242	-0.0161	0.212	0.0721	0029
No. of females 15 y rs & above	0 0395	0.004	0 0454	0 001	0 0535	0.116
Avg yn of sch of hh members	0.0122	0000	-0 0029	0 584	0 0846	0 000
Years of schooling of hh head	00147	0.000	0 0103	0.003	0 0405	0 000
Household received remittances	-0.0716	0.000	¤0.0617	0002	-0 0271	0 569
U'talik tmmt;						
First op quintile	-0 1318	0.001	-0.0962	0015	-0.1922	0 045
Seconder quintile	-0 0781	0.024	•0.0361	0 313	-0.0508	0.530
Third c>p quintile	-0 0390	0,243	0.0318	0.357	-0.1350	0081
Fourth 09. quintile	0 0406	0222	0 0699	0044	-0 0116	0 874
Geographical location:						
Forest	-00768	0004	-0.0541	0 051	-0 0847	0 160
Savannah	-0 0114	0 705	0 0080	0 798	-0.1779	0014
AiHailmnl asua:						
Land owned (hectares)	-0.0003	0 596	-0 0002	0.689	-0 0116	0 076
Land*household wealth status'	-0 0014	0 321	0.0002	0908	0.0121	0 087
Fvmsize (hectares)	0 0001	0.399	0.0002	0 331	0 0002	0 572
Livestock owned (TLU)	-0.0007	0 360	-0.0004	0.572	-00120	0 091
Value of form equipment	-0.0001	0.099	-3.8E-05	0.242	-0.0006	0.048
InfmMwaur A oihtr factom*						
Access to credit	0 0816	0.000	0.0938	0.000	0.0664	0 180
Access to electricity	0.2122	0.000	0.1394	0.000	0.2933	0000
Distance to market (km)	-0 0078	0.000	-0.0067	0.000	-0 0082	0 007
Distance to main road (km)	-0 0017	0.540	-0.0008	0 784	-00060	0 490
Constant	0 0967	0.071	0.0229	0.678	-1 6254	0 000
Number of observations	5065		5065		5065	
Left-censored observations	2641		3039		4429	
Right-censored observations	153		83		46	
Unoensored observations	2271		1943		590	
Log likelihood	-3837 74		-3506.29		-1815 29	
LR chi^)	850.10		410 34		80S 97	
Prob > chiJ	0 0000		0.0000		0 0000	
Pseudo R*	0 0997		0 0553		0 1817	

' household wealth status it a dummy with the upper 60% being the reference group

" p < 0 01, p < 0 05, p < 0.10 indicates significance al l%, 5% and 10% respectively

Source: Author's estimation based on GLSS 5 data

Tabic 3.13 Tobit Estimates of the Determinants of Farm Income

	On flinn Income		Farm wage Income	
Variable	Coe IT	p-value	Coe IT	p-voluc
MMwMtfo&»p«cf«rMcr				
Age of household head	•0 0002	0 598	*0.0197	0.000
Household head is male	0 1)16	0 000	03862	0.025
No. of household members	0.0121	0.001	0.0034	0,931
No. of males 15 yrs A above	0.0146	0 002	*0.0038	0967
No. of females 15 yn & above	-0 0094	0 259	-0.0177	0.84V
A vs yrs of seh of hh members	-0 017*	0 000	0.0024	0.932
Yoon of schooling of hh head	-00068	0 001	-0.0211	0 284
Household received remittances	-0 1051	0000	*00206	0855
Wealth status:				
First op qutntilc	-0.0226	0 329	-0.2448	0.288
Second csp quintile	0 0415	0.052	•0.0608	0 746
Third e>q> quintan	00576	0.005	-0.2672	0.133
Fourth esp. quint ilo	00124	0 556	-0.3166	0.074
Gmtmpklcal location:				
Forest belt	0 1711	0 000	-0.3923	0.002
Savannah belt	0 1340	0.000	-1.2627	0.000
Atriculninl assets:				
Land owned (hectares)	0 0002	0.606	-0.0485	0 311
Land*household wealth status'	0 0023	0.012	0.0433	0.370
Farms lee (hectares)	0 0007	0 072	*0.0198	0.585
F«mstte*household wealth status'	-0 0008	0 061	0.0201	0.579
Livestock owned (TLU)	-0 0001	0856	-0.0001	0.983
Value of farm equipment	-2.5E-05	0.096	-0.0001	0.778
Infrastructure & other factors:				
Access to credit	0 0038	0.768	0.1823	0.116
Access to electricity	-0.2165	0.000	0.0537	0.680
Distance to mnkot (km)	0.0031	0.000	0.0243	0.000
Distance to main road (km)	00014	0.347	-0.0989	0.087
Constant	0.3963	0.000	-1.4676	0.000
Number of observations	5065		5065	
Left-censored observations	815		4922	
Ri^it-censored observations	142		13	
Uncensored observations	4108		130	
Log likelihood	-3059.59		-640.26	
LR ctu·(23)	1174.78		160 92	
Prob > chi¹	0 0000		0 0000	
Pseudo R¹	0 1611		0.1116	

household wealth status is a dummy with the upper 60% being the reference group

" p < 0 01, p < 0.05, p < 0.10 indicates significance at l%. 5% and 10% respectively

Source: Author's estimation based on GLSS 5 data

While the number of adult females, and not males in the household determines the self-employment income share (Table 3.12), the reverse is the case when it comes to

wage income, and this again might be attributed to education.[39] Being a male household head lowers the predicted total non-farm and self-employment income shares by 0.11 and 0.2 units respectively, but raises the wage income share by 0.28 units compared to being a female household head (Table 3.12). Table 3.13 indicates that male-headed households also earn relatively more from on-farm income and farm wage income compared to female-headed households. Thus there is evidence of differences in income diversification strategies in rural Ghana in terms of the gender of the household head. Households headed by older persons also have lower non-farm income shares. Households that received remittances have a significantly lower total non-farm income and non-farm self-employment income shares relative to households that did not receive remittances. There is however no significant difference in the non-farm wage income share between the two groups.

There are also wealth-differentiated effects on income shares. Relative to richest, the poorest expenditure quintile of households consistently have significantly lower total non-farm, self-employment and wage income shares of 13.2%, 9.6% and 19.2% respectively. The same is the case comparing the upper and second quintiles. However the effect is significant only for aggregate non-farm income (Table 3.12). When the fifth and third quintiles are compared, the wealth difference effect is only significant for non-farm wage income share. The results of Table 3.12 also indicate that households in the fourth quintile earn a higher proportion of their income from self-employment (about 7 percentage points higher) compared to the fifth quintile of households and it is significant at the 5% level. When it comes to on-farm income, it is the second and third quintiles that have a significantly higher share compared to the

[39] The data shows that the mean years of education for male household members aged 15 years and above i* greater than thal for their female counterparts by 1.92 years and this difference Is statistically significant at the 1% level.

fifth quintile (Table 3.13). Thus, although the richest 20% of households may have the highest mean on-farm income levels, the equally higher absolute non-farm incomes results in a lower on-farm income share,

Geographical location also has an effect on household non-farm Income shares. Table 3.12 shows that households located in the forest belt have significantly lower total non-farm and self-employment income shares relative to coastal belt households, while savannah belt households have a significantly lower non-farm wage income share compared to households in the coastal belt. This is not very surprising given the generally better opportunities for wage employment in the coastal belt.[40] The higher non-farm self-employment income share for the coastal belt relative to the forest belt may be on account of its nearness to major urban centres, trade routes and ports. When it comes to on-farm income, however, forest and savannah belt households earn significantly higher shares (17% and 13% respectively) compared to households in the coastal belt. Coastal belt households however have the upper hand with farm wage income. This might be due to the fact that the farm labour wage along the coastal belt may be higher than the reservation wage thereby attracting households to this activity. It however might not be the case in the forest and savannah belts.

While household agricultural assets are largely negatively correlated with non-farm income, they are generally not statistically significant except for non-farm wage income (Table 3.12). Households that own agricultural assets (and therefore derive larger income shares from on-farm activities) do not engage much in non-farm wage

[40] Also, given the insignificant difference between the coastal and forest belt for the non-farm wage income share, but a lower negative coefficient Tor the forest boll compared to the savannah belt, one can infer a significant difference between the forest and savannah bolt In terms of non-farm wage Income shares, and the reason might be due to the better wage employment opportunities In the forest belt compared to the savannah belt.

snpteHasQii it is *mmted* iliai eM&in atBWIsutal *mm* would *hm* a aasiii«

effect on the share of on-farm inoame, thereby reducing the incentive for engaging In wage employment In the fawn and non-farm sector*. However land ownership per se does not seem to lead to significantly higher on-farm income shares. It depends on the wealth status of households. As li evident from Table 3.13, it it only wealthy land-owning households (and perhaps households that have larger farm sizes) that are able to derive a significantly higher on-farm Income share.

Access to credit, aeeess to eleetrieity and nearness to market centres have emerged as key determinants of non-farm income shares. While all three factors are important for total non-farm income and self-employment income, access to credit has no significant effect on non-farm wage income share, and understandably so. As Table 3.12 shows non-farm wage employment depends on human capita! factors, particularly the level of education of the household than on its ability to access credit. Households that have access to credit have 9 percentage points higher non-farm self-employment income share and it is significant at the 1% level. Access to credit is generally poor in rural Ghana, and It is the poor that arc hardest hit by the credit constraint. Thus to raise the incomes of the poor and reduce poverty will require measures for improving access to credit. The role of access to electricity in affecting non-farm incomes is evidently clear from Table 3.12, perhaps partially reflecting some of the benefits of rural electrification. Households that have access to electricity have income share premiums of 21%, 14% and 29% for total non-farm, self-employment and wage income, respectively, relative to households without access to electricity. The results demonstrate the role that rural electrification can play in raising non-farm Incomes and reducing rural poverty. The nearer an economic activity

is to the source of demand, the more likely is It that It will be patronized. Distance to market centres is negatively correlated with non-farm income share and is significant at the 1% level for the three categories of non-farm income. A kilometre reduction in the distance to the market raises the shares of each of the three categories on non-farm income by approximately I percentage point. Distance to a main road, while negatively correlated with non-farm income, is not a statistically significant factor affecting non-farm incomes.[41] The impact of the two key public (meso level) assets - electricity and roads - on non-farm income shares is thus quite evident - they increase the profitability of non-farm activities. Access to credit is not a significant determinant of farm income (Table 3.13). This might be as a result of non-farm income acting to relax the cash constraint as a substitute for credit or the credit constraint (Escobal, 2001).

[41] This may not be too surprising a result as the data shows that for 90% of households, the distance to a main road is less than two kilometres.

CHAPTER FOUR

INCOME DIVERSIFICATION STRATEGIES

4.1 Introduction

Livelihood diversification among rural households has engaged the attention of development researchers in recent decades (Chambers and Conway, 1992; Davies, 1993; Ellis, 1998; Bryceson, 1999). This is based on the fact that livelihood diversification is important for food security among rural households (Ellis, 1998; 2000). Sustainable livelihoods research views diversity as an intrinsic attribute of rural livelihood strategies (Warren, 2002). A sustainable livelihood is one that is resilient to shocks and stresses and can maintain and enhance its capabilities and assets both now and in the future, while at the same time not undermining the natural resource base (Carney et al., 1999 in de Satage, 2002). In Ghana, many rural households consider a secure livelihood as being more important than the desire to maximise income (Norton et al., 1995).

Rural households pursue different types of livelihood strategies, with some households being able to access more remunerative strategies than others can (Barrett et al., 2000). While income diversification and livelihood diversification have been used synonymously in the literature, the two concepts are not the same (Ellis, 1998). A livelihood comprises income, both cash and in-kind (payments), as well as the social institutions, gender relations, and property rights required to support and sustain a given standard of living (Ellis. 1998). Income, on the other hand, is much narrower in definition and it refers to the cash earnings of households plus any other

payments (including in-kind receipts) that can be valued at market prices (Ellis, 1998). Assets, activities, and income are complementary indicators in studying household diversification behaviours. Barrett et al. (2001) notes that income presents itself as a measure of direct interest because of its clear interpretation as a welfare outcome, while activities provide a link between assets and income flows and therefore help identify individuals' explicit diversification choices. While some households depend entirely on their own farm for income, other households are able to source income from a combination of activities. The study now investigates the diversification strategies of rural households. By income diversification strategies is meant the various combinations of income generating activities households are engaged in.

The objective of this chapter is to investigate the factors that determine households' choice of income strategy. The chapter begins with a modeling of the income portfolios and then presentation of descriptive statistics on the income portfolios before investigating the determinants of the choice of income strategy.

4.2 Household Income Strategies

As noted above, rural households typically pursue a variety of income strategies, with some households being able to access more remunerative strategies. The pursuit of these various strategies leads to a portfolio of income strategies for the household. Based on the data, eight distinct mutually exclusive and exhaustive income strategies are identified for rural households in Ghana as follows:

a) *SI:* On-farm only

b) *S2:* On-farm and farm wage only

c) *S3:* On-farm and non-farm self-employment only

d) *S4:* On-farm and non-farm wage employment only

e) *S5:* On-farm and non-farm self- and wage-employment only

0 *S6:* Non-farm self- and wage-employment only

g) *S7:* Non-farm wage employment only

h) *S8:* Non-farm self-employment only

Tables 4.1, 4.2 and 4.3 present the results of the proportion of households pursuing the various income strategies by gender of household head, geographical location and wealth status (expenditure quintiles) respectively. The three tables show that on-farm only *(SI)* and on-farm & non-farm self-employment only *(S3)* are the dominant income strategies, with both strategies accounting for more than eighty percent of households. This is an indication that majority of rural households are either farm-based households or combine their farming activities with at least one non-farm income generating activity. Table 4.1 indicates that 47 percent of all households derive their income solely from cultivating their own farm *(SI),* while another 35 percent combine the on-farm strategy with self-employment outside farming *(S3).* Another 11 percent combine on-farm with either non-farm wage employment only *(S4)* or with both non-farm self- and wage employment *(S5).* Only about six percent of households pursue purely non-farm income strategies *(S6, S7* and *S8).* More male-headed households (47.4%) than female-headed households (45.4%) are engaged in the on-farm only strategy, while female-headed households (36.5%) edge-out male-headed households (34.9%) in the on-farm & non-farm self-employment only strategy. In other words, households headed by women tend to combine their farming

activity with non-farm self-employment than do male-headed households because of the greater inclination of women towards non-farm self-employment activities such as commerce and petty trading.

Incomc strategy	All	Mule head	Female head
On-farm only	47.0	47.4	45.4
On-farm & farm wage only	1.3	1.3	1.4
On-farm *SL* non-farm self-employ only	35.2	34.9	36.5
On-ftrm & non-farm wage employ only	5.3	5.7	3.9
On-firm with non-form self- & wngc-cmploy	5.3	6.1	1.8
Non-farm self- *St* wage employ only	1.3	1.4	0.8
Non-farm wags employ only	1.7	1.8	1.6
Non-farm self-employ only	2.9	1.4	8.5
Total	100.0	100.0	100.0

Source: Author's computation based on GLSS 5 data

Table 4.2 Income strategy by geographical location (percent households)

Income strategy	Coastal bell	Forest belt	Savannah belt
On-farm only	44.2	46.1	49.4
On-farm & farm wage only	2.7	1.7	0.2
On-farm & non-farm self-employ only	29.1	32.0	42.0
On-farm *Sc.* non-farm wage employ only	6.3	7.4	2.5
On-farm with non-farm self- & wage-employ	5.9	6.4	3.7
Non-farm self- & wage employ only	3.0	1.4	0.4
Non-farm wage employ only	2.7	2.4	0.5
Non-farm self-employ only	6.2	2.7	1.4
Total	100.0	100.0	100.0

Source: Author's computation based on GLSS S data

Table 4.3 Income strategy by expenditure quintile (percent households)

Incomc strategy	Ql	Q2	Q3	Q4	QS
On-farm only	56.8	48.0	45.7	36.8	35.1
On-farm *St* farm wage only	0.3	2,0	1.0	1.7	2.5
On-farm & non-farm self-employ only	34.8	35.0	37.8	36.4	294
On-farm 4 non-farm wage employ only	4.6	6.2	4 2	5.9	6.8
On-farm with non-farm self- & wage-employ	2.2	5.5	5.6	7.7	89
Non-farm self- & wag: employ only	0.2	0.5	1.4	3.8	23
Non-farm wage employ only	0.1	0.8	l.l	29	84
Non-farm self-employ only	l.l	2.0	3.2	47	6.7
Total	100.0	100.0	100.0	100.0	100.0

Source: Author's computation based on GLSS 5 data

In terms of geographical location, adoption of the two dominant income strategies, i.e. on-farm-only *(SI)* and on-farm & non-farm self-employment only *(S3),* increases as one moves from the coast belt to the savannah belt (Table 4.2). Thus more than ninety percent of households in the savannah belt are engaged in these two income strategies, an indication that other strategies, particularly, strategies that include an element of wage employment arc not very popular in the savannah or that wage employment opportunities are relatively scarce in the savannah. For instance, Table 4.2 shows that only 2.5% of savannah households combine on-farm activities with wage employment outside farming *(S4),* while the corresponding values for the coastal and forest belts are 6.3% and 7.4% respectively. The same trend obtains for other strategies that have the wage employment element.

The on-farm only *(SI)* income strategy is decreasing in household wealth status (Table 4.3). The proportion of the poorest 20% of households pursuing the on-farm only strategy is about 22 percentage points above the proportion of the richest 20% of households pursuing this same income strategy. This may be indicative that poorer households are less diversified than wealthier households. This is partially confirmed by the distribution of households among the remaining income strategies. Clearly from Table 4.3, the wealthier the household, the greater the proportion combining the on-farm only strategy with at least one non-farm strategy'[12] or pursuing a purely non-farm income strategy. For example the richest quintile is four times the proportion of the poorest quintile of households who derive their income from *(S5)* on-farm & non-farm self- and wage-employment only (Table 4.3). The respective ratios for the non-farm wage-employment only *(S7)* and non-farm self-employment only *(S8)* strategies

[42] The only cxccpiion Is the on-farm & non-farm self-employment only strategy, where an inverse u-■haped pattern emergen.

are 84:1 and 6:1. The above findings confirm the findings of Abdulai and CroleRees (2001) for Southern Mall, which led them to conclude that poorer households are less diversified. This sort of wealth-differentiated pattern of participation in on-farm & non-farm self-employment may be explained by the existence of entry barriers. To enter into non-farm self-employment in addition to own farming requires some level of investment capital, which richer households may be better placed to provide because of their greater asset base. For the non-farm wage employment only strategy, education is important as will be demonstrated in Table 4.4 below. While the least pursued strategy across all households is the on-farm & farm wage only (52) strategy[43] (Table 4.1), it is a relatively unpopular strategy among households in the savannah belt (Table 4.2) and surprisingly[44] wealthier households are more engaged in it (Table 4.3) although participation in this strategy is not monotonically increasing in wealth status.

As noted above, the income diversification literature notes that certain factors (such as human and physical capital endowments) act as entry barriers to participation in non-farm activities. The study therefore explores below the roles played by education and land in determining households' adoption of the various income strategies. Table 4.4 presents the results of the role played by education in households' pursuit of the various income strategies. Clearly education is an important factor in the pursuit of non-farm wage-employment strategy or income strategies that combine non-farm wage-employment with other activities. The more educated the household, the more likely it is that it will pursue a non-farm wage only *(S7)* strategy or an income strategy

° II is al par with the proportion of households pursuing the non-farm self- & wage-employment strategy.

[u] The reasoning is that farm wage employment is considered a low return activity in rural Africa and thorefore richer households arc less likely to participate In them (Barrett ot al, 2000).

that combines non-farm wage with on-farm *(S4 & S5)*. On the other hand, the less educated the household, the more likely it is that it will pursue an on-farm only strategy or combine on-farm with non-farm self employment. For the purely non-farm wage-employment income strategy, the effect of education begins to show up only after the mean years of education exceeds 6 years. This means that for poverty to be alleviated through wage employment, the minimum level of education for rural households should exceed the primary level.

Table 4.4 Income strategy by level of education of household (percent households)

	Level of education					
Income slracg,	No cduc	1-3 yrs	4-6 yrs	7-10 yrs	11-14 vrs	> 14 yrs
On-farm ont>	64.6	31.0	41.6	33.4	22.5	18.2
On-farm & farm wage only	0.8	0.6	2.1	1.6	3.9	1.8
On-form & non-farm self-employ only	29.6	40.2	356	27.2	13.8	56
On-farm *It* non-farm wage employ only	0.7	3.4	7.4	10.1	12.6	13.5
On-fvm with non-farm self- & wage-employ	0.5	2.1	7.8	12.6	15.1	9.2
Non-farm self- & wage employ only	0.0	0.5	1.9	3.3	6.7	00
Non-farm wage employ only	0.8	0.1	0.8	6.9	24.3	49.0
Non-farm self-employ only	3.0	2.2	2.9	5.0	1.2	2.6
	100.0	100.0	100.0	1000	100.0	100 0

Source: Author's computation based on GLSS 5 data

Table 4.5 Income strategy by land owned (percent households)

	Lund owned (hoaaro)						
Income sirs eg.	Landless	0< - SI	< ≤	5 < - s10	10< -s20	20< - s50	Over 50
On-farm only	4l"5	42.8	52.7	49.9	64.6	517	35.9
On-farm A farm wage only	1.7	2.1	1.0	0.0	03	1.4	00
On-farm &. non-farm self-employ only	337	34.8	35.9	41.3	31.4	33 4	433
On-finn & non-farm wag: employ only	5.7	7.4	4.8	4.9	1.9	2.8	2.6
On-farm with non-fann self- & wage-cmploy	3.8	9.8	5.3	3.9	1 9	98	18.2
Non-Tam lelf- & wage employ only	3 1	0.7	0.0	0.0	0 0	0.0	00
Non-farm wage employ only	3.8	1 2	02	0.0	00	0.0	00
Non-farm self-employ only	6.7	1.3	0.2	0.0	0.0	0.0	0.0
Pcrcenl household* owning land	394	13.9	31.1	9.0	3.8	2.1	0.8

Source: Author's computation based on GLSS 5 data

Table 4.5 shows that the proportion of households pursuing on-farm only *{SI)* generally increases with land assets up to 20 hectares. Beyond that point, adoption of the on-farm only strategy decreases with land size. This is an indication that

households owning land above 20 hectares are more diversified, that is, they are enticed by the pull factor to diversify into more lucrative non-farm activities. This assertion is somehow supported by the fact that a greater proportion of households that have land assets above 20 hectares derive income from three main incomc sources, namely, on-farm only *(SI),* on-farm and non-farm self-employment only *(S3)* and on-farm with non-farm self- and wage-employment *(S5).* Table 4.5 also supports the push hypothesis. Landless households do not have their eggs in one basket. The Table shows that landlessness pushes some 45 percent of landless households to combine on-farm with ofT-farm activities *(S2, S3, S4 & S5)* while another 13 percent engage in purely non-farm activities *(S6, S7 & S8)* due to landlessness. The Table also shows that for land-owning households[45], a purely non-farm strategy *(S6, S7 & S8)* is not an attractive income strategy, as none of these households are engaged in this strategy. For such households, non-farm activities are not a substitute for farming activities. At best they can only complement their farming activities.

4.3 Econometric Estimation Method

Given that the income strategies modeled above have no natural ordering, we employ the (generalized) multinomial legit model in analyzing households' choice of livelihood strategies.[46] As was demonstrated in section 4.2, a total of eight distinct income strategies are available to households. When a household faces multiple income choices then there is an associated random utility function for each choice (McFadden, 1973). Let $t/_{(/}$ represent the utility household j derives from choosing income strategy *j.* Then

[45] That is, households owning more than 5 hectares.

[46] In an unordercd logit model, the multiple response variable does not have an ordered structure.

$$U, = flfX, + s_t \qquad (4\text{-}‘)$$

for / = 1.....*N* households and *j*=1,..., *J*alternative income strategies.

For a household / faced by *J* alternatives in a choice set, let $?_v$ denote the probability that household *i* chooses alternative *j,* and let X_t represent the characteristics of household /. The household then chooses the alternative that provides the highest level of utility. The model is derived with the assumption that the covariance structure has an independent Type I extreme value distribution with a cumulative distribution function of the form $F(e_u) = \exp(-e^{\sim c''})$ (Greene, 2003).

For the eight income strategies outlined above, the multinomial logit model is then given by

$$P(Y, =]) = \frac{\exp(0.X.)}{, \quad -g}, \; 7 = 0.1\ 7- \qquad (4\text{-}2)$$

P\,...y0j are *J* vectors of unknown regression parameters which vary across alternatives and *X,* is a vector of household characteristics which is constant across alternatives (Greene, 2003). Since the probabilities for the *J* alternatives must sum up to unity, the *J* sets of parameters are not unique (Greene, 2003). A solution to this problem is to normalize the coefficients of the first set of alternatives to zero, that is, we assign/?, =0 (Greene, 2003). The vector of coefficients then represents the effects of the *X* variables on the probability of choosing the ^"'alternative over the first alternative. Thus one estimates *J* -1 sets (vectors) of regression coefficients. The model then yields the following probabilities

$$\text{Ptf} = 0) = \frac{}{1 +]\text{Texp}(\$X)} \quad (4.3)$$

$$P(Y' = j) = \frac{}{1 + £\exp(/U)} \quad \text{for } y = 1,2....7 \quad (4.4)$$

which can be estimated using the maximum likelihood method.

From equations 4.3 and 4.4, we can compute J-l log-odds ratios. If the first category is the reference, then, for j = 1,2,.., 7,

$$\text{In} \wedge = K(P_r P_k) \quad (4.5)$$

The relative risk ratio is then obtained by exponentiating the log-odds.

4.4 Empirical Results and Discussion

Table 4.6 presents the results of the multinomial logit estimations of household income strategics, and reports the relative risk ratios.[47,48] For a unit change in a regressor variable, the relative risk ratio of income strategy *j* relative to the reference income category is expected to change by a factor of the respective parameter estimate holding all other variables constant. More generally, the relative risk ratio coefficient is interpreted as follows: if the relative risk ratio is greater than one, then for a unit increase in the regressor, a household is more likely to pursue income strategy ***j*** as compared to the reference income strategy, and if the ratio is less than one, the reference strategy is more likely to be pursued. Thus for instance, the relative risk ratio coefficient of 0.7299 for male-headed households in pursuing Si (on-farm &

[47] Appendix A4 reports the coefficient estimates from the Multinomiul Logit regression.

[4,1] A test for Independence of Irrelevant Alternatives (11 A) was conducted to ascertain the independence of alternatives. The results reported In Appendix A4 Indicate a non-violation of this assumption.

non-farm self-employment only) means that a male-headed household is less likely to pursue this strategy relative to *S1* (on-farm only), and that the probability of a male-headed household pursing this strategy relative to *SI* (on-farm only) is 27% lower than for female headed households. Accordingly male-headed households are more likely to pursue the on-farm only strategy compared to on-farm & non-farm self-employment only strategy.

Age of household head

Table 4.6 indicates that households headed by older persons have a lesser likelihood of pursuing all income strategies relative to *SI* (on-farm only) except *S6* (non-farm self- & wage-employment only). It is only in *S6* that they are equally likely to be engaged. The implication is that households headed by younger persons are likely to be more diversified.

Head of household is male

Gender of household head plays a significant role in income strategies adopted by rural households. Compared to female-headed households, households headed by men are less likely to engage in *S3* (on-farm & non-farm self-employment only) and *S8* (non-farm self-employment only) relative to *SI* (on-farm only) but are more likely to pursue *S2* (on-farm & farm wage only), *S4* (on-farm & non-farm wage employment only), *S5* (on-farm combined with non-farm self- & wage-employment), *S6* (non-farm self- & wage-employment only), and *S7* (non-farm wage employment only). The fact that female-headed households are more likely to pursue strategies involving self-employment compared to male-headed households may be on account of their greater inclination towards commerce and petty trading.

Variable	Ml	SI	*K4*	VI	*U*	8?	us
Age of household head	0.9337*"	0.9861*"	0.9836"*	0.98 15"*	0 9880	09399*"	0.9817—
	(0.0104)	(0.0023)	(0,0050)	(00066)	(00108)	(0 0084)	(00052)
Household head is mole	26388"	0.7299"*	15342"	16 B8*	33449"	28776"*	0493"*
	(11000	(0.0711)	(03293)	(04606)	(20635)	(L0605)	(0 1287)
No. of household members	0.9908	11342*"	10780	U000"*	11324	09059	11044
	(0.0995)	(0.0254)	(0X1616)	(0.0496)	(O.W0)	(0*261)	(00778)
No, of males 1S yrs & above	0.9367	0.9257	L0690	L3039"*	12602	11321	09550
	(01336)	(0.0442)	(0.ID7)	(0.1134)	(04435)	(01787)	(01717)
No. of females 15 yrs & above	12871	11288"*	IM0	14903"*	16661*	13533	10816
	(02966)	(0.0630)	(0.1234)	(0.093)	(0.4991)	(03240)	(01654)
Avg. yrs of sch of hh members	0,9838	10175	L1384"*	L09D"	0J677*	IW9"	09920
	(0.0669)	(0.0*93)	(0.0411)	(0.0434)	(00727)	(0.07 0)	(0j0444)
Years of schooling of hh head	10491	10327"*	11161"*	11715—	12154—	10874*	10253
	(00528)	(0.0126)	(0.0287)	(0.0342)	(0.0727)	(00549)	(00344)
Household received remittances	10642	0.9375	L1193	0.9915	07237	07009	03708"*
	(01701)	(0.0654)	(0.1539)	(0 1645)	(01577)	(0.1598)	(0D70)
First exp. qumnle	0.15 *"*	0.6245"*	0.9000	01478*"	01855	01B5*	0406"
	(0.0856)	(0.0848)	(01442)	(0D909)	(03034)	(0.1788)	(0.1577)
Second exp quint lie	0.3750	0.7874*	L0372	0.6668	*ami*	0.6092	08049
	(01161)	(0.0992)	(01351)	(0 *922)	(0 4453)	(01648)	(01424)
Third exp. quint ile	0309*"	05960	0.7769	0.7476	□056	0.6999	10290
	(0.B7!)	(0.1227)	(0.1832)	(01043)	(06699)	(01600)	(01806)
Fourth exp quint ile	0.4946"	L1158	11158	11285	16808	0.9683	L3322
	(0.1718)	(0.1404)	(01414)	(01982)	(0.7260)	(01593)	(03260)
Forest	0.4808*"	L0785	0.9757	0.8461	0.9699	1301	0.9046
	(0.B46)	(0.1117)	(0.1774)	(0.1934)	(03747)	(03223)	(0.030)
Savannah	0.044—	158 IP*	0.8995	10282	1)643	010	11785
	(0.0631)	(0.1787)	(01104)	(01782)	(06818)	(03149)	(03064)
Land ovtned (hectares)	0.9290	0.9989	0.9991	10000	00 M0	1001	07067*
	(0.0882)	(0.0017)	(0.0043)	(0.0028)	(0.0531)	(00366)	(0 067)
Famtsize (hectares)	1003*	10020	0.9853	L0029*	0.0002"*	0.006"	00038*"
	(0.00 IT)	(0.0015)	(0.006)	(0.0015)	(0:0005)	(0.0262)	(00061)
Livestock owned (TLU)	0.9886	0.9986	09791	0.9734*	0 4079	0.9356	03652
	(0.0577)	(0.0016)	(0.0457)	(00144)	(01719)	(01119)	(018 W)
Value of farm equipment	0.9931	10000	0.994"	0.9992	0.8800	07415"	08939*
	(00043)	(10000)	(0,0024)	(0.0001)	(OD58)	(00883)	(00590)
Access to credit	L6258*	L6P9—	L7444"*	18119*"	12479	0.8811	1287®
	(0.4 B7)	(0 1208)	(01482)	(0.3038)	(05180)	(02176)	(02658)
Access to electricity	0.964}	12279-	LB30	2.0223—	2 0404*	2.Q79-	13937*
	(02858)	(0.1085)	(0.19D)	(03697)	(0 7758)	(04659)	(01639)
Distance to market (km)	10397—	0.9784"*	0.9907	0.9702"	0 9489	0.9806	09635"
	(00l»)	(0.0044)	(0.0085)	(0.0 HD	(0.0448)	(00201)	(00 M2)
Dtsancc to main road (km)	0.7010"	0.9859	0.9747	10012	19E-B4—	0.6P2	10440
	(0.1292)	(0.0086)	<?·°330	(0.0294)	(00000)	(0.078)	(00330)
Number of obwrvations	5065						
Log likelihood	-520980						
Pseudo R-squarcd	01092						
Wald Chi-squared	60648						
Frob > chi2	00000						

82-on-farm & form wage only; 83-on-fami & non-farm self-employment only; S4-on-ftvrm & non-farm wage employment only; SS»on-farm combined with non-form self- & wage-employment; S6«non-farm self- & wage-employment only; S7-non-farm wage employmenl only; SS-non-farm self-employment only; Sl"on-farm only Is the base strategy,

Source: Author's estimation based on GLSS 5 data.

Education

The average level of education of household members has no role in the *S2* (on-farm & farm wage only), *S3* (on-farm & non-farm self-employment only) and *S8* (non-farm self-employment only) strategies, whiles the education of household head does not play any role in *S2* (on-farm & farm wage only) and *S8* (non-farm self-employment only). By contrast, it is evident from Table 4.6 that education is a key factor in determining participation in strategies involving wage employment. A unit increase in average years of schooling of a household pushes it into *S4* (on-farm & non-farm wage employment only), *S5* (on-farm combined with non-farm self- & wage-employment) and *S7* (non-farm wage employment only) compared to on-farm only *(S1),* but the reverse is the case for *S6* (non-farm self- & wage-employment only), albeit being significant only at the 10% level. The level of education of household head pushes the household into adopting *S3* (on-farm & non-farm self-employment only), *S4* (on-farm & non-farm wage employment only), *S5* (on-farm combined with non-farm self- & wage-employment), *S6* (non-farm self- & wage-employment only) and *S7* (non-farm wage employment only) relative to *S1* (on-farm only). The econometric result confirms those obtained earlier in the bivariate analysis in Table 4.4 where more educated households tended to pursue wage employment income strategies relative to the others.

Household size

Household size has a significant effect on only two strategies, namely. *S3* (on-farm & non-farm self-employment only) and *S5* (on-farm combined with non-farm self- & wage-employment), with a unit increase in household size more likely to push the household into these strategies compared to *SI* (on-farm only). The number of adult

males is statistically significant only for *S5* (on-farm combined with non-farm self- & wage-employment) whiles an increase in the number of adult females makes a household likely to be engaged in *S3* (on-farm & non-farm self-employment only), *S5* (on-farm combined with non-farm self- & wage-employment) and *S6* (non-farm self- & wage-employment only). This is evidence that strategies involving self-employment activities require the presence of adult females in the household than adult males, again confirming the greater inclination of females to self-employment activities.

Remittances

Receipt of remittances only has a role to play in *S8* (non-farm self-employment only). Households receiving remittances are less likely to pursue this strategy compared to *SI* (on-farm only), and it is significant at the 1% level. This implies that remittances may not necessarily be used for investment in non-farm activities.

Wealth status

The effect of household wealth on pursuing various income strategies is largely significant for only the first quintile (poorest 20%). Compared to the richest 20% (reference category), the poorest 20% are less likely to pursue strategies *S2* (on-farm & farm wage only), *S3* (on-farm & non-farm self-employment only), *S5* (on-farm combined with non-farm self- & wage-employment), *S7* (non-farm wage employment only) and *S8* (non-farm self-employment only) relative to *SI* (on-farm only). Relative to *SI* (on-farm only), it is only in *S4* (on-farm *&* non-farm wage employment only) and *S6* (non-farm self- & wage-employment only) that the first and fifth quintile households are equally likely to be engaged. It is thus evident that the poor are less

capable of pursuing on-farm in combination with off-farm activities compared to the relatively wealthy perhaps due to barriers to entry (physical, financial and human assets) into the non-farm sector which the poor often lack. Households in the third and fourth expenditure quintiles are more likely to be engaged in *SI* (on-farm only) compared to the richest 20% of households, while the second expenditure quintile is less likely to be engaged in *S3* (on-farm & non-farm self-employment only) compared to the richest 20% of households.

Geography

For households located in the forest belt, it is only in *S2* (on-farm & farm wage only) that they are less likely to be engaged compared to households in the coastal belt. For the remainder of the strategies, they are equally likely to be engaged compared to households in the coastal belt. What this means is that households in the coastal belt either consider farm wage income an important addition to income from their own farms or that there are greater opportunities for engaging in farm wage employment in the coastal belt compared to the forest belt, Comparing the savannah and the coastal belts, households in the savannah are less likely to pursue *S2* (on-farm & farm wage only) relative to *SI* (on-farm only) compared to households in the coastal belt but are more likely to be engaged in *S3* (on-farm & non-farm self-employment only). The finding in Table 4.6 that households in the forest and savannah belts are less likely to pursue *S2* (on-farm & farm wage only) relative to *SI* (on-farm only) compared to coastal belt households, corroborates the results of Table 4.2 (proportion of households adopting S2 (on-farm & farm wage only) strategy across geographical space) and Table 3.2 (share of farm wage income in total household income across geographical location)

Agricultural assets

Landownership plays no significant role in the pursuit of all the income strategies relative to *SI* (on-farm only), except *S8* (non-farm self-employment only). Greater access to land reduces likelihood of participation in *S8* (non-farm self-employment only) relative to *SI* (on-farm only), and this is only significant at the 10% level. The results of Table 4.6 in relation to land ownership imply that owning land per se does not make a household less likely to pursue all other income strategies relative to the *SI* (on-farm only) strategy. What the finding perhaps signifies is that landowning households are able to complement their farming activities with other off-farm activities. The results are however slightly different with sire of farm owned. A unit increase in farm size makes a household less likely to pursue *S6* (non-farm self- & wage-employment only), *S7* (non-farm wage employment only) and *S8* (non-farm self-employment only), but more likely to pursue *S2* (on-farm & farm wage only) and *S5* (on-farm combined with non-farm self- & wage-employment) vis-a-vis *SI* (on-farm only). The value of agricultural equipment owned (or ownership of agricultural equipment) makes a household more likely to engage in *SI* (on-farm only) compared to *S4* (on-farm & non-farm wage employment only), *S7* (non-farm wage employment only) and *S8* (non-farm self-employment only), indicating the importance of agricultural assets (tractor, plough etc) in securing farm income.

Access to credit

The role that access to credit plays in securing incomc strategies other than a purely on-farm income strategy is quite evident from Table 4.6. Households with access to credit are more likely to pursue strategies that combine on-farm with non-farm activities (i.e. *S3, S4* and *SS).* Access to credit however is not a significant factor in

pursuing purely non-farm income strategies (Stf, *S7* and *S8).* This finding may indicate that accessing credit perhaps requires some form of collateral, say, farm output or some other form of physical assets related to farming.

Access to electricity

Electricity plays a significant role in pursuing income strategies other than purely on-farm. Households with access to electricity are more likely to be engaged in purely non-farm activities *(S6, S7* and *S8)* or combine on-farm with non-farm particularly self-employment (i.e. *S3* and *S5)* relative to on-farm only.

Distance to market

A unit increase in the distance to the market makes the household less likely to pursue *S3* (on-farm & non-farm self-employment only), *S5* (on-farm combined with non-farm self- & wage-employment), *S8* (non-farm self-employment only) relative to *SJ* (on-farm only) but more likely to pursue *S2* (on-farm & farm wage only). The attractiveness of pursuing non-farm activities, particularly self-employment activities, thus depends on access to markets.

Distance to main road

Distance to a main road is only significant is pursuing *S2* (on-farm & farm wage only) and *S6* (non-farm self- & wage-employment only) relative to *SI* (on-farm only). With coefficients less than unity, households are less likely to pursue these two strategics compared to the on-farm only strategy.

In summary, the results of Table 4.6 indicate that household and locational characteristics all play an important role in explaining income strategies adopted by households. The key determinants of pursuing non-farm income strategies[49] are gender of head of household (with lower participation for households headed by females), household size and composition (key for self-employment), education level of the household (key for wage employment), household wealth (i.e. richer households), access to credit, and access to electricity. The fact that most of the significant variables are for strategies that combine non-farm activities with on-farm activity may be indicative that households do not consider non-farm activities as a substitute for farming but rather a complement to it.

[49] In particular strategies that combine non-farm with on-farm activities.

CHAPTER FIVE

NON-FARM INCOME, INCOME INEQUALITY AND WELFARE

5.1 Introduction

The pattern of the distribution of non-farm income has implications for the overall distribution of rural income. The empirical evidence on the effect of non-farm income on rural income inequality is mixed. While some studies (for instance, Adams, 2001 for Jordan) find that non-farm income has the tendency to increase income inequality, others (Lanjouw, 1998 for Ecuador; Adams, 1994 for Pakistan; Adams, 1999 and 2001 for Egypt) find it to be inequality-reducing. Reardon et al. (2000) point out that the assertion that non-farm income reduces income inequality is premised on three empirical assumptions; (1) that non-farm income is large enough to influence rural income distribution; (2) that non-farm income is unequally distributed; (3) that this unequally distributed non-farm income favours the poor. Lanjouw and Feder (2001), however, emphasize that distinguishing between non-farm activities as either high-productivity or low-productivity is important in ascertaining the effect of non-farm income on income inequality. They argue that since high-productivity activities generally accrue to wealthier households, it tends to increase inequality because the poor usually do not have the skills, contacts and assets required for accessing such jobs (Lanjouw and Feder, 2001).

In the case of rural Africa, the majority of studies (for instance, Reardon and Taylor, 1996; Canagarajah et al., 2001) have found that non-farm income has a negative

effect on rural income distribution. Rationalising these outcomes, Barrett et al. (2001) notes that while reliance on non-farm income diversification is quite common among rural households it is the wealthier (landowning) households that tend to have easier access to attractive and high-return non-farm opportunities. Poor households on the other hand face significant entry barriers into these high-return activities and this causes the non-farm sector to have an inequality-increasing effect on rural incomes.

All things being equal, rural households that are able to secure additional income from non-farm sources may attain higher welfare levels than households that are unable to. The important question therefore is; what is the effect of non-farm income on household welfare? Do households that participate in non-farm income activities attain a higher welfare than households that do not?

The objective of this chapter is two-fold. First, the study examines the effect of non-farm income on income inequality by decomposing the Gini coefficient of total income into its component parts. Total household income may come from different sources, each of which can have its own contribution to overall income inequality. Aggregate inequality may therefore be expressed as the sum of the contribution from each income source. In addition, wc perform a regression-based decomposition of inequality which allows us to isolate which household level factors) drives the inequality in each income component. The second objective is to ascertain the effect of non-farm income on household welfare.

5.2 Non-farm Income and Income Inequality

5.2.1 Decomposition of the Gini Coefficient

The Gini decomposition technique provides two ways for ascertaining the contribution of any income component to overall income inequality. First, one is able to determine the relative contribution of any particular income component to overall income inequality. Second, the method allows one to determine whether or not a particular income component increases or decreases overall income inequality by computing what is referred to as the relative concentration coefficient. In analyzing whether a given income component increases or decreases overall income inequality, it is assumed that additional increments of the income source are distributed in the same fashion as the original units (Adams, 2001).

Table 5.1 reports the results of the decomposition of the Gini coefficient of per capita income[30] for all households in rural Ghana. The Gini coefficient for total income is 0.562, a value that lies within the range obtained for many other developing countries. Recent computations show that income Ginis range from a low of 0.420 for Bolivia to 0.601 for Brazil (Adams, 2001). The Gini coefficients for the various income components are much higher than that of total income because not all households derive income from each of the income sources. The Gini coefficients of the income components range from 0.667 for rental income to 0.995 for other income. Expectedly, on-farm income accounts for the largest share of total income (59%) and also contributes the largest to overall inequality (58%). As an aggregate. Table 5.1 shows that non-farm income increases income inequality among rural households in

[50] Adjusted by adult cqulvalcnce scale.

Ghana, thus confirming the findings of Canagarajah et al (2001). Adams (2001) obtained similar results for Jordan, and attributed it to land. He contends that in Jordan, land is not very productive so the rich arc "pulled" by more attractive rates of return in the non-farm sector where they earn proportionately more than the poor thereby leading to a worsening of income inequality.

Table 5.1 Inequality decomposition by income source for all rural households

Income source	Share in total incomc Sk	Gini coefnclent a	'tilnl correlation with total Income Ri	Absolute contribution to overall inequality	Relative contribution to overall inequality	Relative concentration cocflicient gi=Ri*Ck/G
Finn	0585	0.693	0.803	0.325	0.578	0989
Farm wage	0.021	0.984	0.687	0012	0.022	1 203
Non-faim self-employ	0.188	0.829	0.671	0.104	0 185	0 989
Non-farm wage employ	0.118	0.941	0.780	0.076	0 136	1.306
Rental	0.019	0.667	0.344	0.006	0.011	0408
Remittance	0.062	0.892	0.610	0.034	0.060	0 967
Other	0.007	0.995	0.864	0.005	0.009	1.530
Total incomc	1.000	0.562		0.562	1.000	
Total non-farm income	0.306	0.804	0.776	0.177	0.315	l.l 10

Source: Author's computation based on GLSS 5 data.

Aggregate non-farm income however may hide the effects of its respective components on income inequality. In Table 5.1 is also reported the individual effects of non-farm self-employment income and non-farm wage employment income on total income inequality. The table shows that while non-farm self-employment income reduces income inequality, non-farm wage income on the other hand, worsens income inequality in rural Ghana. This highlights the importance of distinguishing between self-employment and wage income when measuring the effect of non-farm income on income inequality. This finding however is the inverse of what was obtained by Canagarajah et al. (2001) for Ghana[51] and Uganda. While the tendency

[51] The Ghana study by Canngarajuh ct al. (2001) was based on GLSS 1 and 3 data.

for non-farm income to increase income inequality is sometimes attributed to entry barriers that prevent poor households from participating actively, especially entry into high return activities, the finding that non-farm self-employment reduces income inequality may be an indication that there may be no significant barriers to entry into non-farm self-employment in rural Ghana, perhaps due to the nature of the activities. The results however seem to suggest the existence of entry barriers into non-farm wage employment,[52] and here education may be a crucial factor. For instance, gaining employment as a "village" teacher requires a certain minimum level of education. Indeed, in chapter four of this thesis, it was demonstrated that the more educated a household, the more it participated in non-farm wage employment activities or combined this activity with on-farm activities.[53] One implication of this result is that for rural poverty and income inequality to be reduced through non-farm wage employment, the policy of free compulsory universal basic education must be taken seriously.

The results in Table 5.1 also show that farm wage income has a dis-equalizing effect on total income. On-farm income on the other hand decreases income inequality. One implication of this result is that even if land ownership is highly unequal, landless households and those households with very little land are able to rent land and cultivate their own farm. This assertion is plausible on the grounds that land inequality is higher than farm size inequality.[54]

" For instance, while in Table 3.3, the non-farm self-employment income share of the richest 20% in only 50 percent greater than thal of the poorest 20%, the non-farm wage employment income share for the richest 20% Is more than double that of the poorest 20%.

" Sec Table 4.4 of chapter four. In that table, it was found that for a purely non-farm wage-employment income strategy, the effect of education begins to show up only after the mean years of education exceeded 6 years.

M The data shows that the land Gini coefTicient Is 0.814 whiles form size Gini coefficient is 0.759.

Tables 5.2, 5.3 and 5.4 present the results of the Gini decomposition in terms of the geographical location of the household in order to ascertain any geographical differences in income distribution. Income inequality is lowest in the forest belt (Gini = 0.522), followed by the coastal belt (Gini = 0.563) and then the savannah belt, with an income Gini of 0.604. With a Gini of 0.563, the distribution of total income in the coastal belt mirrors closely the national distribution of income in rural Ghana.

Table 5.2 Inequality decomposition by income source for households in coastal zone

Income source	Share in total income Sk	Gini coefficient Ok	Gini correlation with total income Rk	Absolute contribution to overall inequality	Relative contribution to overall inequality	Relative concentration coefficient gi=Ri*Gk>G
Farm	0.485	0.770	0.768	0.285	0.507	I 050
Farm wage	0.043	0.971	0.653	0.024	0.043	1.126
Non-farm self-employ	0.203	0.787	0.633	0.099	0.176	0.885
Non-farm wage employ	0.175	0.928	0.784	0.116	0.207	1290
Rental	0.017	0.S99	0.098	0.003	0.006	0104
Remittance	0.072	0.873	0.530	0.032	0.057	0.821
Other	0.004	0.994	0.565	0.003	0.005	0996
Total	1.000	0.563		0.563	1.000	
Total non-farm income	0.378	0.768	0.780	0.212	0.376	1.063

Source: Author's computation based on GLSS 5 data.

: for households in forest zone

Income source	Share in total incomc Sk	Gini coefficient *Qk*	Gini correlation with total incomc Rk	Absolute contribution to overall Inequality	Relative contribution to overall inequality	Relative concentration coefficient gk=Rk»(k/G
Farm	0.512	0.662	0.745	0.250	0.479	0.947
Farm wage	0.024	0.976	0.583	0.012	0.023	1.092
Non-famt self-employ	0.228	0.826	0.664	0.127	0.244	1.052
Non-farm wage employ	0.137	0.921	0.727	0.082	0.157	1.284
Rental	0.017	0.719	0.361	0,006	0.012	0.497
Remittance	0.072	0.868	0.582	0,036	0.070	0.968
Other	0.011	0.993	0,872	0.008	0,016	1.661
Total	1.000	0.522		0.522	1 000	
Total non-farm Income	0.364	0,779	0.761	0.205	0.394	1.137

I on GLSS 5 data.

Table 5.4 Inequality decomposition by income source for households in savannah zone

Income source	Share in total income Sk	CHnl cocfTiclent a	Gini correlation with total income Rk	Absolute contribution to overall Inequality	Relative contribution to overall inequality	Relative concentration coefficient gk“R*-G</G
Farm	0.753	0.687	0.895	0.463	0767	1.018
Farm wage	0.00-1	0.999	0.793	0.003	0.005	1.310
Non-farm self-employ	0.120	0.827	0.635	0.064	0 107	0868
Non-famt wage employ	0.057	0.969	0.814	0,037	0.061	1.304
Rental	0.023	0.620	0.463	0.008	0.014	0475
Remittance	0.041	0.919	0.604	0.027	0045	0.919
Other	0.002	0.998	0.789	0.001	0002	1.303
Total	1.000	0604		0604	1.000	
Total non-firm income	0-177	0.827	0747	0.100	0 166	1.023

Source: Author's computation based on GLSS 5 data.

Geographically, Tables 5.2, 5.3 and 5.4 indicate that aggregate non-farm income contributes to increasing income inequality.[55] In terms of its components, non-farm wage employment still emerges as an income source that increases income inequality as was the case nationally. Differences emerge when it comes to non-farm self-employment income. In the coastal and savannah belts, non-farm self-employment income maintains the status quo as an income source that decreases income inequality (Tables 5.2 and 5.4). In the forest belt (Table 5.3) however non-farm self-employment income increases income inequality. This indicates that entry barriers may be present in non-farm self-employment in addition to non-farm wage employment in the forest region. In the coastal and savannah belts, on-farm and farm wage income have dis-equalizing effects on total income (Tables 5.2 and 5.4), while in the forest belt it is only farm wage income that increases inequality. On-farm income however has income inequality-reducing in the forest belt.

[55] The result is somehow weaker for the suvunnuh bolt whose relative concentration coefficient is approximately equal to 1.

Tables 5.5 and 5.6 present the results of the Gini decomposition by gender of household head and indicate that the pattern of the distribution of total income is fairly identical between male-headed and female headed households, with incomc Ginis of 0.564 and 0.551 respectively. Non-farm income (in aggregate) contributes to increasing inequality among both types of households and this again may be explained by better access of the wealthy to more remunerative activities. The tendency for non-farm income to contribute to inequality is greater among female-headed households for whom self-employment is more important. Table 5.6 thus show-s that non-farm self-employment income increases inequality among female-headed households while decreasing income inequality among households headed by-men (Table 5.5). The fact that non-farm self-employment increases inequality among female-headed households while decreasing it among male-headed households per se is not indicative that it is the gender of the household head that determines whether a particular income source will increase or decrease income inequality. Household composition may also be important. For both types of households non-farm wage employment is a source of income inequality. The results for male-headed and female-headed households regarding the effects of on-farm and farm wage income on inequality are consistent with the results obtained for all households combined.

Tabic 5 5 Inequality decomposition by income source for male-headed households

Income source	Share in total Income Sk	Oni coefficient Q	..... BET correlation with total Income Rk	Absolute contribution to overall Inequality	Relative contribution to overall Inequality	Relative concentration coefficient gk“Rj,><i/G
Farm	0.622	0.682	0.822	0.346	0 614	0.994
Farm wage	0.021	0,983	0.698	0012	0.022	1.217
Non-fami self-employ	0,167	0.834	0.641	0.092	0.163	0.948
Non-farm wage employ	0 124	0,932	0,773	0 079	0 140	1 277
Rental	0.0 is	0.642	0.370	0.006	0.010	0421
Remittance	0.040	0902	0.633	0.023	0 041	1 012
Other	0.008	0.996	0.879	0.006	0.010	1.551
Total	1.000	0.S64		0.564	1,000	
Total non-form income	0,291	0.806	0.766	0.168	0.298	1 096

Source: Author's computation based on GLSS 5 data,

Table 5.6 Inequality decomposition by income source for female-headed households

Income source	Share in total income Sk	Grni coefficient a	Grni correlation with total income Rk	Absolute contribution to overall inequality	Relative contribution to overall inequality	Relative concentration coefficient g_k=Ri-G,'G
Farm	0.423	0.726	0.748	0.224	0.407	0985
Farm wage	0.019	0.988	0.613	0.011	0.021	1.099
Non-farm self-employ	0.281	0.804	0.738	0.158	0.287	1077
Non-farm wage employ	0.089	0.974	0.829	0.064	0 116	1.465
Rental	0.023	0.740	0.280	0.008	0015	0376
Remittance	0.162	0.814	0.637	0.083	0.151	0.941
Other	0.003	0.989	0.530	0.001	0.003	0.952
Total	1.000	0,551		0.551	1.000	
Total non-farm income	0.370	0.792	0.803	0.220	0.400	! .154

Source: Author's computation based on GLSS 5 data.

5.2.2 Results of the Regression based Decomposition

Tabic 5.7 presents the results from the regression-based inequality decomposition to identify and quantify the relative contribution of household level factors in determining inequality. In the decompositions, the proportional contribution of a factor to inequality is zero when income from that factor is distributed uniformly

among households. It is for this reason that the constant term contributes zero to inequality for each of the sources of income. Also a factor's contribution depends only on the variation of that factor's income around the mean, and not on the mean itself (Adams, 2001). Thus those factors which are distributed fairly equally among households will not contribute substantially to inequality. When a factor's contribution is positive it contributes to increasing inequality and a factor decreases inequality when its contribution is negative (Adams, 2001).

Table 5.7 Factor contribution to inequality in income component (percent)

	On-farm income	Farm wage income	Total Hon-farm income	Non-ftuw self-employ income	Non-fiuw wage income
Household head is male	6.821	3.596	0.054	3.234	3.703
No. ofhousehold members	1.747	5.327	7.038	9.531	3064
No.ofmales I5yrs & above	0.312	8.276	1.318	2.074	0.483
No. offemales 15 yrs & above	1.218	0.342	-0.044	-0.124	0.617
Avg. yrs ofseh ofhh members	3.420	21.808	39.243	13.802	65.010
Years of schooling ofhh head	1.463	0.674	9.952	6.329	11.758
Household received remittances	4.202	0.210	0.456	0.176	0696
Land owned (hectares)	0.796	0.432	0.006	0.017	0.022
Farms ize (hectares)	0.242	0.052	0.833	1.208	0.252
Livestock owned (TLU)	0.014	0.287	-0.045	-0.062	-0.024
Value of farm equipment	0.017	0.087	-0.001	0.004	0076
Constant	0.000	0.000	0.000	0.000	0 000
Regression residual	79.748	58.909	41.190	63.811	14.342
Tout	100.000	100.000	100.000	100.000	100 000
Gni coefficient	0.693	0.984	0.804	0.829	0941

Source: Author's estimation based on GLSS 5 data.

The relative contribution of household agricultural assets (such as land and livestock) to inequality (or the Gini coefficient) of the various income components is less than 1 percent in most cases. This means that ownership of agricultural assets is not a major factor contributing to income inequality in rural Ghana. Indeed, this seems plausible

given the fact that on-farm income and non-farm self-employment income[56] were earlier on found to be inequality-decreasing.

One plausible factor that the study hypothesizes as being important to the inequality-increasing effect of non-farm income is education. Table 5.7 indicates that education is the single most important factor contributing to inequality in non-farm income. Differences in the average years of schooling across households contributes almost 40 percent to the inequality in non-farm income whiles the years of schooling of the head of household contributes another 10 percent. The effect of education on inequality is even more pronounced for non-farm wage income. The average years of schooling of household members and the years of schooling of the household head together account for about 77 percent of the inequality in non-farm wage income. As indicated earlier, narrowing education inequality among rural households could be one of the ways to reducing rural income inequality and reducing rural poverty.

5.3 Non-farm Income and Welfare

Studies have shown that households that derive income from non-farm sources enjoy higher welfare (Reardon et al., 1992; Dercon and Krishnan, 1996; Reardon et al., 1998; Barrett et al., 2000; Block and Webb, 2001; Canagarajah et al., 2001). In other words, non-farm income diversification is associated with higher income and food consumption as well as more stable income and consumption over time. De Janvrv and Sadoulet (2001) note that non-farm income diversification is an effective way to

[56] Household agricultural assets are often considered a proxy lor the capital required for entry into non-farm self-employment.

combat poverty and inequality, while Ellis (1999) notes that the capability to diversify is seen as beneficial for households at or below the poverty line.

The majority of Ghanaians live in rural communities. Rural households arc not only the poorest segment of the population, but also have to contend with the variability of income from agriculture. Given the seasonality of agriculture, the erratic nature of rainfall patterns, the low level of irrigation usage, and near absence of credit and insurance markets, income from non-farm activities could be a good source of income and consumption smoothing for rural households. It follows therefore that rural households that are able to participate in non-farm activities or combine their agricultural activities with other income generating activities outside agriculture are better able to withstand any shocks to agricultural incomes, and therefore are able to enjoy higher and more predictable incomes than households that depend solely on agriculture. It is therefore expected that households engaged in non-farm activities in addition to their own farming will have higher levels of welfare than households that do not.

To empirically investigate this hypothesis, the thesis estimates the effect of different measures of non-farm income diversification on household income. Two measures of income are used: welfare[57] and per capita total household expenditure. Three measures of non-farm income diversification are used. Firstly, a dummy is used as an indicator of diversification, with a household being assigned the value of 1 if it earns income from non-farm activities and zero otherwise. The second measure considers the number of non-farm income generating activities the household is engaged in.

[57] Household expenditure per adult equivalent.

This variable assumes three values, 0, 1, and 2. It is hypothesized that all things being equal, household welfare increases with the number of non-farm activities. For this second measure of diversification, the base category is when the number of non-farm activities is zero. The third measure of non-farm diversification is based on the eight different income diversification strategies available to households, as was discussed in chapter 4. The base income strategy is when the household derives income from on-farm sources only *(SI)*. The other independent (control) variables in the model are standard variables that affect welfare.

The results of the effect of non-farm income diversification on household welfare are presented in Tables 5.8 and 5.9.[58] In Table 5.8, the results of model 1 indicate that participation in non-farm activity has a positive effect on household welfare (per capita consumption per adult equivalent). Participation in non-farm activity increases welfare by approximately 10%[59] above that of a household that does not participate in non-farm activity, and it is significant at the 1% level. The second model also posts a positive association between welfare and non-farm income diversification, but indicates that the higher the number of non-farm activities, the higher the level of welfare. While households with just one non-farm activity have a welfare level that is 9 percentage points higher than households without, households with two non-farm activities have a welfare level that is 21 percentage points above households that do not participate in non-farm activity. In model 3, except for households combining on-farm with non-farm wage employment, the welfare levels of households combining on-farm activities with other off-farm activities or are engaged in purely non-farm

" The Variance Inflation factor (VIF) test was used to test for probable eollinearily among the Independent variables. The results show that multlcolllncavlty Is not u problem. See Appendix AS.

w The model Is estimated In u log-linear form. I.e. In(}') = /?<,+ /?,.V . For such formulations, a change In X by one unit is associated with a $100/7,\%$ change In Y.

activities are belter off than households deriving income purely from on-farm activities. These findings are consistent with those obtained by Rahut (2006) for the Lower Himalayas of Eastern India and Babatundc and Qaim (2009) for Nigeria.

Table 5.8 Determinants of household welfare (log of welfare[60])

	MotM(l)		*Modal (2)*		*Model (3)*	
	Cocff.	Robust Sid Err	Coeff	Robust Std Err	Coeff	Robust Std Err
Household characteristics:						
Age of household head	-0.0003	0.0006	-0.0003	00006	-00001	00006
Household head is male	-0.002	0.0231	*0.0211	0.0231	-0.0175	00234
No. of household members	-O.D33—	0.0059	*0.1051—	00039	-0.104—	0.0059
No. of males 15 yrs & above	•0.0072	0.0 Q9	-0.0093	00129	-00085	00(28
No. of females 15 yrs & above	0.0377—	0.0D1	0.0361—	00B1	00364—	00 DO
Avg. yrs of sch of hh members	0.0361-	0.0043	0.0365—	0.0043	0J035 I—•	0.0044
Years of schooling of hh head	0.0049*	0.0027	0.0039	0.0027	00045*	00027
Household received remittances	-0.04 W—	0.0168	■0.04 D—	0.0167	-0.0401“	00167
Geographical location:						
Fo rest	-0.0553—	0.02 »	*0.0538—	0.02 D	-00456“	00211
Savannah	-0.4421—	0.0253	-0.4393—	0.0253	-0.4311—	00254
Agricultural assets:						
Land owned (hectares)	0.000—	0.0005	0.000—	00005	0.000—	00005
Farm size (hectares)	0.0005—	0.0002	0.0005—	0.0002	0.0005—	00002
Livestock owned (TLU)	0.0008	0.0006	0.0008	00006	00008	00006
Value of farm equipment	0.0001	0.0000	0.0001	00000	00001	00001
Infrastructure <& other factors:						
Access to credit	0.063—	0.0 B2	0.052—	0.0182	0 094—	00 BJ
Access to electricity	02064—	0.0193	0.2014—	0003	0.049—	0004
Distance to market (km)	-0.0019*	0.0010	-0.00B—	0.00 D	-0.00 B*	0.00 D
Distance to main road (km)	0.0085—	0.0021	0.0084—	00021	0.0084—	00021
Diversification variables:						
Non-farm activity (yes=l)	0.0999—	0.0170				
One non-farm activity			0,0908—	0.0173		
Two non-farm activities			02102—	00359		
On-farm & farm wage only					01774“	00717
On-farm & non-farm self-employ only					0 0807—	0002
On-farm & non-farm wage employ only					O.OI72	00322
On-farm with non-farm self- & wage-employ					02044—	00397
Non-farm self- & wage employ only					02421—	00^20
Non-farm wage employ only					0226—	00515
Non-farm self-employ only					0.B17—	00430
Constant	W.36—	0.0428	MJ4—	00428	M32—	00430
Number of observations	5065		5065		5065	
R-squared	0.4239		0.4269		04289	
F-statistic	164.52		156.58		128.03	
Prob > F	0,0000		00000		00000	
Root MSI:	0 37981		057938		057806	

•**, ** and * indicates significance at 1%, J% and 10% respectively

Source: Author's estimation based on GLSS 5 data

[40] Measured as expenditure per adult equivalent.

An alternative measure for household welfare, per capita total household expenditure, was used as the dependent variable. The results are presented in Table 5.9. These results are quantitatively and qualitatively similar to those obtained using household expenditure per adult equivalent as the dependent variable (Table 5.8),

Table 5.9 Determinants of household welfare (log of per capita total expenditure)

	Model (4)		*UoiUUfi)*		*Modtl (6)*	
	Coeff.	Robust Std Err	Coeff	Robust Std Err	Coeff	Robust Sid Err
Hotmhold characicnsltcs;						
Age of household head	-0 0006	0.0006	-0.0006	00006	-00004	00006
Household head is male	0.042*	0.0242	0.0404*	0.0242	00385	00245
No of household members	-O.G52—	0.0062	-0.1251—	00062	-0C4r*	00061
No of males 15 yrs &above	0.0606—	0.0 DO	00589—	00 DO	00597—	OODO
No of females 15 yrs &above	00269*	0.0 D8	0 0256*	0.0D8	0 0257*	00D7
Avg yrs of sch of hh members	0.0554—	0 0049	00558—	0 0049	00540—	0 0049
Years of schooling of hh head	•0.00 D	00030	-0 008	0 0030	-00011	0.0030
Household received remittances	•0.03 M *	0.0 BO	-OD3I2*	00180	-00306*	0 060
Geographical location						
Forest	•0 0842*—	00235	-0083—	00235	-0076—	00236
Savannah	-05298—	0 0270	-05274—	0.0271	•05199—	00271
Land owned (hectares)	0.0022—	0.0006	0.0022—	0.0006	0.0022—	00006
Agricultural assets:						
Farmsizc (hectares)	0.0006—	0.0002	0.0005—	00002	0.0005—	0JD002
Livestock owned (TLU)	0.0010	0.0006	0.00 D	00006	OJOOD	0 0006
Value of farm equipment	0.0001	0.0001	0.0001	00001	00001	00001
Infrastructure A other factors:						
Access to credit	02192—	0.0190	02184—	00189	02217—	00B9
Access to elect ncity	0.1994—	0.02 M	0.1951—	0.0215	01894—	0028
Distance to market (km)	-00016	0.0011	•0.0016	00011	-00017	00011
Distance to mam road (km)	0.0 D4—	0.0023	00103—	00023	0 0KM—	0 0023
Diversification variables:						
Non-farm activity (ycs=!)	0.1124—	0.0182				
One non-farm activity			0X47—	00 86		
Tvio non-farm activities			02056—	00381		
On-farm & farm wage only					0226F—	O0T7J
On-farm &non-farm self-employ only					00997—	00*9
On-farm & non-farm wage employ only					0 0454	00346
On-farm with non-farm self- & wage-employ					02028—	004B
Non-farm self- &wage employ only					02378—	00S07
Non-farm wage employ only					02629—	00651
Non-farm self-employ only					0 D68-	0 0578
Constant	15 28—	0 0473	1529-	0 0473	1527—	0CM75
Number of observations	5065		5065		5065	
R-squared	04575		04581		0 4598	
F'statistic	184 86		175 77		H190	
Prob > F	0 0000		0 0000		00000	
Root MSB	0 62152		062D5		06206	

, —— w' ■ J 'o uiivj iu7o rcapci

Source: Author's estimation based on GLSS 5 data

In conclusion, the results of Tables 5.8 and 5.9 indicate that households that combine their own farming with at least one non-farm activity have a higher welfare compared to households that depend solely on farm income. While this study is not advocating for non-farm activities as a substitute for on-farm activities, given the tendency for agricultural incomes to fluctuate because of seasonality and unpredictability in weather patterns, it is evident from the results that diversified households would be better able to smooth income and consumption than non-diversified households. Thus policy could focus on developing alternative livelihoods in rural areas to complement income from agriculture.

CHAPTER SIX

SUMMARY, CONCLUSION AND POLICY RECOMMENDATIONS

6,1 Introduction

Evidence abounds that non-farm activities are important sources of employment and income for rural households in developing countries. In other words, diversification is the norm rather than the exception. Several factors cause households and individuals to diversify their income sources. These factors are generally classified as "push" or "pull" factors. Push factors arise from the desire to reduce the risk of earning income from only one source, diminishing factor returns in any given use (such as family labour supply) in the presence of land constraints driven by population pressure and landholdings fragmentation. Households may also be pushed into diversifying due to liquidity constraints or high transactions costs that induce households to self-provision in several goods and services. Pull factors on the other hand arise from the realization of strategic complementarities between farm and non-farm activities, and specialization according to comparative advantage accorded by superior technologies, skills or endowments.

Majority of Ghanaians live in rural communities. The predominant economic activity for these households is agriculture or farming. Rural households have to contend with the variability of income from farming because of the seasonality of agriculture, the erratic nature of rainfall patterns, the low level of irrigation usage, and near absence of credit and insurance markets. Income from non-farm activities may therefore be a good source of income and consumption smoothing for these households. However,

not much work has been done on rural non-farm income diversification patterns and their determinants in Ghana. While income from non-farm sources may contribute to minimizing the variability of household incomes, they also have implications for income distribution and welfare.

Poverty reduction is one of the central goals of government economic policy. The motivation for this study, therefore, is to investigate the extent to which rural households in Ghana depend on non-farm sources for their livelihood, what factors determine their participation and the implications of non-farm income diversification for income inequality and welfare. Addressing these issues will reveal the potential role of non-farm activities in accelerated growth and poverty reduction in rural Ghana, and hence lead to policy options that can help maximize the complementarities between agriculture and rural non-farm activities for poverty reduction and growth in rural Ghana.

Earlier work on non-farm income diversification in rural Ghana has focused on the gender dimensions and poverty reducing impacts of non-farm income. One major shortcoming of these studies is that they analyzed the determinants of aggregate rural household non-farm income without making a distinction between self-employment and wage employment income. The present study makes a distinction between the various income components in the non-farm category. Given that there are several non-farm activities, the study investigates the determinants of pursuing a multiplicity of non-farm activities. In other words this study does not model non-farm diversification simply as a binary proccss but models the diversification strategy of households as a Poisson generating process. This approach, for example, brings to the

fore whether a given household level factor or community characteristic is important or not for the household to engage in a multiplicity of non-farm activities. The study also investigates the determinants of income diversification by modeling various income strategies adopted by households, an exercise that has not been undertaken in any study of rural income diversification in rural Ghana. The study also investigates the implications of non-farm income diversification for income distribution and welfare.

6.2 Summary of findings

6.2.1 Determinants of Non-farm Income Diversification

Three approaches were used in ascertaining the determinants of non-farm income diversification. First, diversification was modeled in terms of the number of non-farm activities a household engages in. Second, diversification was modeled in terms of the share of non-farm income in total household income. Thirdly, diversification was modeled by the income portfolio a household chooses. In this latter case, eight mutually exclusive income portfolios were developed.

Descriptive statistics indicate that rural non-farm activities are very important to rural households. About fifty percent of households participated in at least one rural non-farni activity and it contributed to over 40 percent of the household's total income in 2005/2006. In 2005/06, on-farm income accounted for 57 percent of total household income while farm wage income account for about 2 percent. The respective contributions of non-farm self-employment income and non-farm wage income were 20 percent and 8 percent respectively. Remittances and other income accounted for

about 14 percent. Descriptive statistics also show that education, land assets and household wealth status are important correlates of rural non-farm income diversification. The results indicate that better educated and wealthier households are better able to participate in and derive greater income from non-farm activities. Particularly, non-farm wage employment is important for better educated households. By contrast, participation in non-farm activity decreases with household wealth status.

Descriptive statistics for the income strategies (portfolios) of households indicate that education is an important factor in the pursuit of non-farm wage-employment strategy or income strategies that combine non-farm wage-employment with others. The more educated the household, the more likely it will pursue a non-farm wage only strategy or an income strategy that combines non-farm wage with on-farm. On the other hand, the less educated the household, the more likely it will pursue an on-farm only strategy or combine on-farm with non-farm self employment. For the purely non-farm wage-employment income strategy, the effect of education begins to show up only after the mean years of education exceeds 6 years. This implies that for poverty to be alleviated through wage employment, the minimum level of education for rural households should exceed the primary level.

Econometric results corroborated most of the conclusions from the descriptive statistics. On the whole, the results from the three approaches (variables) used to examine the determinants of non-farm income diversification reinforce each other in the majority of cases. Household characteristics such as gender of household head, size, number of adult females, and average years of schooling are important for participation, income strategy as well as income derived from non-farm activities. For

household agricultural assets, while the participation regression suggests that non-farm activity decreases with ownership of these assets and the income regressions also indicate that agricultural asset-ownership and non-farm income are negatively correlated, the results are not statistically significant. The results arc mixed however when it comes to geographical location. While the participation regression indicates no statistically significant difference among the three geographical locations, the income regressions indicate that households in the coastal belt earn significantly higher income from non-farm sources than households in the forest and savannah belts. This may be indicative that non-farm activities are more remunerative in the coastal belt. For infrastructure variables, access to credit, access to electricity, and distance to the nearest market were significant in the participation, income strategy and income regressions. Thus for instance, access to credit facilitates participation in non-farm activity as well as boosts non-farm income. These three infrastructural factors are also important in the income strategies adopted by households, but particularly important for income strategies that combine on-farm with non-farm activities. This may be indicative that households do not consider non-farm activities as a substitute for farming but rather a complement to it. Household wealth significantly affects participation as well as income from non-farm activities, and this is particularly true for the first and second income quintiles relative to the upper (fifth) income quintile. This shows that poorer households have limited capacity to participate in and earn income from non-farm activities. Even when they do, they may be confined to low-return activities.

An important policy variable, remittances, is not a significant factor affecting participation but is significantly negatively correlated with total non-farm income and

non-farm self-employment. It is however not significant with regard to non-farm wage income. This may be read as an indication that remittances are either invested in farming activities or being largely used for consumption rather than being invested in non-farm income activities.

The Poisson model was used to investigate the determinants of participation in non-farm activity. The results show that the probability of participation in and the numbers of non-farm activities depend on the age and gender of the household head, household size, the number of males above 14 years, wealth status of household (being among the poorest 20%), and household agricultural assets (land size, farm size, livestock and value of farm equipment). Households headed by older persons and men, the poorest 20%, and households endowed with agricultural assets or cultivating larger farms are less likely to diversify into non-farm activities. On the other hand, households with larger number of persons and males 15 years and above as well as households located in the savannah belt of the country are more likely to diversify into non-farm activities. On the multiplicity of activities, significant determinants are age and gender of household head, household size, the poorest 20% of households, the household's farm size, access to credit, the number of female household members 15 years and above, education level of the household (head and the average for household), access to electricity and distance to the nearest market.

The tobit model was used to analyse the determinants of non-farm incomc. In the total non-farm income model, all the household characteristics variables were statistically significant at the 1% level exccpt for the number of adult males above 14 years. For self-employment income share, except for the number of adult males and average

years of schooling of household members, all the household characteristics are significant at the 1% level. In the non-farm wage income shares regression, the insignificant variables are household size, number of adult females and household that received remittances. The insignificance of household size as a determinant of non-farm wage income share may be explained by the fact that wage employment depends on the quality of human capital (education) rather than sheer numbers (quantity). It is not surprising therefore that the two education variables - average years of schooling of household members and years of schooling of the household head - are statistically significant in both total non-farm income and non-farm wage income share regressions. While the average years of schooling of household members does not significantly influence self-employment income, education as a determinant of self-employment income is significant for household heads, an indication perhaps that self-owned businesses require some entrepreneurial ability or skills that higher education can offer. What is clear however is that households' level of education is a key factor determining income diversification. In order words, the higher the household's education level, the lower is the incentive for it to obtain income from farm sources, and the greater the incentive to deploy its human capital to non-farm activities. This assertion is confirmed by the significantly negative effect education had on household on-farm income shares.

The multinomial logit model was used to model household income strategies. The results indicated that household and locational characteristics all play a role in explaining income strategies adopted by households. The key determinants of pursuing non-farm income strategies are gender of head of household (with lower participation for households headed by females), household size and composition (key

for self-employment), education level of the household (key for wage employment), household wealth (i.e. richer households), access to credit, and access to electricity.

6.2.2 Non-farm Income and Inequality

The cfTect of non-farm incomc on income inequality is mixed. While some studies find that it decreases income inequality, others find that it is inequality-increasing. The study found that in aggregate, non-farm income worsened income inequality. In terms of its components, while non-farm self-employment income reduced income inequality, non-farm wage income on the other hand, worsened income inequality in rural Ghana.

While the tendency for non-farm income to increase income inequality is sometimes attributed to entry barriers that prevent poor households from participating actively, especially entry into high return activities, the finding that non-farm self-employment reduces income inequality may be an indication that there are no significant barriers to entry into non-farm self-employment in rural Ghana, perhaps due to the nature of the activities. The results however seem to suggest the existence of entry barriers into non-farm wage employment, and here education is an important factor.

A regression based approach to inequality decomposition was employed and it was found that the education level of households is an important factor contributing to inequality in non-farm income. The effect of education on inequality was more pronouncecd for non-farm wage income.

6.2.3 Non-farm Income and Welfare

Household farm income may be subject to a lot of variability given the seasonality of agriculture, the erratic nature of rainfall patterns, the low level of irrigation usage, and near absence of credit and insurance markets. Income from non-farm activities may therefore be a good source of income and consumption smoothing for rural households. It follows that rural households that are able to participate in non-farm activities or combine their agricultural activities with other income generating activities outside agriculture may be better able to withstand any shocks to agricultural incomes and thereby enjoy higher and more predictable income than households that depend solely on agriculture. It is therefore expected that households engaged in non-farm activities in addition to their own farming will have higher levels of welfare than households that do not.

The results of this study indicate that participation in non-farm activity has a positive effect on household welfare (per capita consumption per adult equivalent). For instance, participation in non-farm activity increases welfare by approximately 10% above that of a household that does not participate in non-farm activity. The welfare level of households with two non-farm activities was 21% above that of households that do not participate in non-farm activity. Households combining on-farm activities with other off-farm activities or are engaged in purely non-farm activities are better off than households deriving income purely from on-farm activities.

6.3 Conclusion and Policy Recommendations

The study has clearly demonstrated that non-farm activities constitute an important source of employment and income to rural households in Ghana. Overall the study obtains robust results for participation (number of non-farm activities), income shares and income strategies regressions. Education, household size and composition, wealth status (poorest 20% relative to richest 20%), access to credit, electricity and markets are main the determinants of non-farm income diversification in rural Ghana. Non-farm income increases income inequality, but results differ by type of non-farm income component. Welfare generally is higher for diversified households. While this study is not advocating for non-farm activities as a substitute for on-farm activities, given the tendency for agricultural incomes to fluctuate because of seasonality and unpredictability in weather patterns, it is evident from the results of the study that diversified households would be better able to smooth income and consumption than non-diversified households. In the light of the foregoing, the following recommendations are being offered:

First, the findings call for a rethinking of strategies that have traditionally focused on improving agriculture as the solution to rural poverty. Strategies to promote rural economic activities need to take into account the heterogeneity in the asset positions across rural households and the multiplicity of activities in which they are engaged to generate income. Given the important role of non-farm activities in the determination of household income in rural Ghana, it is imperative to promote the generation of non-farm income-earning opportunities and to enhance access of rural households to these sources of income.

Second, a key determinant of non-farm income diversification, especially wage employment is education. Rural poverty and income inequality may thus be reduced by enhancing better access to education. Narrowing education inequality among rural households would go a long way to create opportunities for effective participation in non-farm activities and to alleviate rural poverty.

Third, rural non-farm income tends to be relatively concentrated among the upper income quintiles of households. This concentration may imply high entry barriers (for example, capital requirements and education) confronting poor households. These poor households are thus forced to depend entirely on agriculture or diversify into low-retum non-farm activities. Equipping them through training and acquisition of diverse forms of capital to engage in high remunerative non-farm activities will enable them to enjoy greater benefits from non-farm diversification.

Fourth, access to credit and electricity are important for non-farm self-employment (small and micro enterprises) activities. Policy should therefore aim at enhancing access to small credits to bridge the gap in physical assets endowments between asset-rich aud asset-poor households. The policy of rural electrification must also be effectively implemented to promote village/ cottage industries.

Finally, the results show that physical infrastructure like roads and markets are important to non-farm employment and incomes. Policy should therefore focus on improving access to well developed infrastructure to promote equitable development of the non-farm sector in rural Ghana.

6.4 Contribution to Knowledge

This research has done quite a comprehensive analysis of non-farm income diversification in rural Ghana. It therefore contributes to the empirical literature by way of

- Providing new evidence on determinants of non-farm income diversification, particularly, within the Ghanaian context, using more recent data
- Making a distinction between various income components in assessing determinants of income diversification and its inequality effects
- Investigating the determinants of pursuing a multiplicity of non-farm activities
- Modeling household income activity portfolios and examining the determinants of the various income strategies, particularly, within the Ghanaian context
- Providing evidence on the effect of non-farm income diversification on household welfare, within the Ghanaian context

6.5 Limitations and Areas for Future Research

While investigating the determinants of the number of non-farm activities pursued by rural households is revealing, an analysis of the types (rather than number) of non-farm activities could have shed even more light on the factors driving such activities. Future studies could therefore examine more explicitly the determinants of the various types of non-farm activities rural households are engaged in. This will enable rural development policy to explicitly target such activities as sustainable livelihood options for rural households.

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APPENDICES

Appendix A3

Table A3.! Percent rural households participating in income generating activities: 1998/99 & 2005/06

	1998/99		2005/06	
	Male head	Female head	Male head	Female head
On farm	94.6	86.3	94,3	84.2
Farm wage	3.9	1.3	3.2	2.5
Non-farm self-employ	45.3	45.7	45.5	48.2
Non-farm wage	18.7	8.1	15.2	8.4
Remit lances	JO.O	73.0	42.8	67.2
Other	67.7	53.9	72.7	55.6

Source: Author's computation based on GLSS 4 and 5 data.

Table A3.2 Percent rural households participating in income generating activities: 1998/99 & 2005/06

	1998/99			2005/06		
	Coastal	Forest	Savannah	Coastal	Forest	Savannah
On farm	84.7	91.9	99.2	83.4	92.0	96.8
Farm wage	5.9	3.7	0.7	5.6	4.3	0.4
Non-farm self-employ	60.7	48.3	30.2	46.1	44.6	47.6
Non-farm wage	20.0	20.5	6.4	18.1	17.8	7.1
Remittances	60.2	58.7	46.9	46.6	53.4	41.2
Other	56.8	60.7	74.9	65.0	61.5	80.7

Source: Author's computation based on GLSS 4 and 5 data.

Table A3.3 Percent rural households participating in income generating activities: 1998/99 & 2005/06

	1998/99					2005/06				
	<?*	Q2	Q3	04	Q5	01	02	93	Q4	05
On farm	98.2	97.2	94.0	89.1	76.3	97.5	95.2	92.4	86.5	78.4
Farm wage	2.0	2.4	3.4	5.4	4.1	1.4	2.7	4.9	3.5	4.2
Non-farm self-employ	31.7	48.4	48.1	50.6	55.3	38.7	43.7	51.4	54.0	48.4
Non-farm wage	4J	13.3	17.0	26.5	27.7	7.2	13 *2*	12.7	20.4	26.6
Remittances	53.6	54.3	58.4	54.2	57.3	45.2	45.9	49.3	47.5	56.1
Other	69.4	68.0	61.6	61.4	56.0	74.6	72.4	68.9	64.4	54.4

Source: Author's computation based on GLSS 4 and 5 data.

Appendix A3 coat'd

Table A3.4 Correlation Matrix of independent Variables

	agehd	sexhd	hhstzea&mle	adtflc	eduyrs	cduhh	remit	qi	q3	q4	95	czl	ez2	ez3	land	fszc	livcslk	equip	crcdii	elect	mkdist	rddia
agshead	1 00																					
sexhead	-0 13	1.00																				
hhsze	007	0 25	1 00																			
aduitmalc	0 14	0 46	0 57	1 00																		
adukIcsnalc	0 20	-0 04	0 70	0 28	I 00																	
ctkiyn	-0 17	0 03	-0 26	-001	-0 19	1.00																
■rtirn ishh	-0 27	0 14	-0 14	-0 04	-0 18	0.78	1 00															
ran il	0 04	-0 20	-O 18	-0 19	-0 10	0.06	0.03	1 00														
qi	0 07	0 14	0 36	024	024	-0.32	-0 29	-0.07	1.00													
	-001	0.02	0 10	0 06	0.05	-005	-001	-0.02	-0.31	1.00												
<P	0.00	-0.03	-0 05	-0.06	-0.04	0.03	005	000	-0 30	-0.26	1.00											
	-0.03	-0.05	-0.17	-0.12	-0.09	0 14	0.13	0.02	-0.27	-0.24	•0.23	1.00										
<£	-0 04	-0.10	-0 34	-0.17	-0.22	0.28	0.19	009	-0.25	-0.22	-0.21	-0.19	1.00									
ezl	003	-on	-0 16	-0.12	-0.11	0.11	009	0.01	-0.18	-0.01	0.05	0.08	0.10	1.00								
ez2	-003	-0 10	-0 14	-0.1!	-0.14	0.30	0.30	0 10	-0.29	0.04	0.09	0.10	0.12	-0.39	1 00							
czJ	001	0,19	0 26	0.20	0.22	-0.38	-0 37	-0.11	043	-0.03	-0.12	-0.16	-0.19	-0 38	-0 71	1.00						
land	002	0 05	0.13	0.05	0.11	-0 04	-0.04	000	003	0.01	-0.01	-0.03	-0.01	-0 03	-0.04	0 06	1.00					
farm size	0 03	0 03	0 08	0 03	0 07	-0 01	0.01	0 01	0 00	-0.01	0.00	0.02	-0 01	-0.02	0.01	0.01	0.09	1 00				
hvraock	001	0 05	0 09	007	0 08	-005	-0 04	-0 04	004	0 03	-0.03	-0.03	-0 03	-0 04	-0 08	0.11	0.03	0 01	1.00			
equip	000	0 04	0 06	005	003	-003	-0,02	-0 03	-001	0 04	-0.01	-0.02	000	-0,02	-0.02	003	0.08	0.01	0 03	1 00		
credji	-0 07	0,02	0 07	001	0.05	0 10	0.13	005	-0 15	0.03	0.02	0.03	009	001	0 09	-0 10	0.01	-0.01	-0.01	002	1 00	
electric	-0 03	-0 08	-0.07	-0 05	-0 04	0 30	0 27	008	-0 21	-0,01	0,03	0.08	0 15	0 07	0 14	-0.19	-003	-0.02	-0 04	0 00	004	1 00
mktdisi	-001	0 04	-0 01	002	-0 02	-003	-0.02	-0 01	-0 02	0 02	0.03	0.01	-0.03	-0 04	0 10	-0.07	-0 02	0.00	0.00	003	0 04	- O i 1 1 0 0
rddis	-0 04	0.06	0 04	0 04	0 00	-0 11	-0 07	-005	002	0 02	0.02	-0.03	-0 04	-0 08	-0,14	0.20	-0,01	-0.01	0.04	0.09	001	-0.11 0 37 1 00

Appendix A3 cont'd

Table A3.S Heckman selection model (recession model with sample selection)

	Non-farm self-employ incomc		Non-farm wap: incomc		Tolul nun-farm Oti-fwm incomc incomc				Pumvwajii incomc	
	Cocf P>*		Co«r. ?>i		Cocf. ?>z	Cocf P>z			Cocf P >1	
Age of household head	-0,001	0.804	.0.005	0.002	-0.001	0 821	0002	0420	0018	0692
Household head is male	-0 034	0875	-0.001	0 992	0026	0843	-0063	0.543	-O 398	0676
No of household members	0.000	0993	-0 009	0367	-0008	0857	0 026	0.225	-0 023	0 700
No of mala IS yrs & nbovc	-0 047	0421	0.006	0.795	-0.029	0.574	0,048	0.310	-0.047	0 713
No. of fcmalos 15 yrs & above	0.023	0.801	■0.002	0.946	0.021	0.770	•0.115	0019	0 027	0847
A\% y re of sch of hh members	0.014	0.598	0.025	0.037	0.021	0.463	•0.003	0.885	0013	0.743
YOBS of schooling of hh head	-0011	0.580	0.006	0.451	-0.003	0858	-0003	0 805	0 026	0646
Household received remiliancc9	0 12V	0161	•0.093	0.001	-0 127	0 086	0012	0 861	-0045	0.774
First rap quint ile	-0105	0.685	0.043	0.516	-0 088	0 707	-0.132	0 350	0372	0 609
Second op quimile	-0080	0 654	0.064	0.173	-0 053	0.752	-0 005	0 970	0 135	0678
Third op quint ile	-0 035	0.823	0.023	0639	-0 046	0721	0 015	0.907	0.222	0 730
Fourth rap quint ilc	0 247	0140	-0.008	0837	0 198	0111	-0,149	0 253	0321	067B
Forest belt	-0 067	0599	-0.051	0138	-0 089	0393	0075	0486	0229	0 788
Savannah bell	0 092	0583	0.013	0.794	0 046	0 721	-0018	0875	1 119	0.708
Land owned (hectares)	0 000	0.872	-0.005	0.138	0000	0 902	0001	0.771	0.065	0 681
Land'household wealth status	-0002	0.773	0.002	0.502	-0.002	0.706	0.001	0.902	-0062	0.68I
Farms ire (hectares)	0.000	0.907	0.000	0.780	0.000	0 954	0.000	0.969	-0007	0 366
Livestock owned (TLU)	-0.001	0.822	-0.001	0.797	-0.002	0.730	0.000	0.802	0.009	0.698
Value of farm equipment	0.000	0.667	0.000	0.521	0.000	0.568	0.000	0.792	0.000	0648
Access to credit	-0.079	0.664	-0.013	0.679	-0.091	0.537	-0.001	0.985	-0227	0625
Access to electricity	0.321	0029	0.136	0.004	0.321	0.027	-0.284	0.002	-0.014	0.950
Disunce to market (km)	0.003	0.761	-0.001	0.777	0.003	0.782	0.000	0 990	-0024	0.669
Distance to main road (km)	-0.004	0 779	-0.008	0.138	-0.004	0.753	0.005	0.542	0 086	0.727
Irwnulls ratio	0.217	0.824	0.112	0.519	0.091	0.915	•0.344	0 091	-IJ59	0.673
Constant	0.374	0 698	0.510	0.193	0.513	0.507	0.669	0.002	3214	0578
Number of obscrations	5065		5065		5065		5065		5065	
Censored observations	3023		4428		2624		529		4922	
Uncensorcd observations	2042		637		2441		4536		143	
Wald chi'(23)	25.9		98.5		35.7		24.2		4.1	
Pn^ch?	0307		0.000		0.045		0.393		1.000	

Appendix A4

Table A4.! Multinomial logit estimates of rural income strategies (regression coefficients)

Variable	$2	S3	S4	S5	S6	S7	S8
Age of household head	-00474—	■0.0140—	-00166-	•OOB7—	•00121	•00409—	-00B5—
	(0.0D9)	(0 0024)	(00050	(0 0068)	(00109)	(0 0087)	(00053)
Household head is male	09703*	-03148—	04280**	048P*	12655**	10570—	-0 7073—
	(04*9)	(0 0974)	(0.2147)	(0 2845)	(03821)	(03685)	(026(2)
No of household members	•0 0092	0.M34—	00751	0 B23—	OM»	-0 0989	00993
	(0D02)	(00220)	(0.0572)	(0 04 0)	(0 1232)	(0 092)	(00704)
No. of males 15 yrs & above	-0 0654	-0.0772	0 0667	02654—	023 C	0 MI6	-00460
	(0.2494)	(0.0478)	(0.1036)	(0.0885)	(03519)	(024 *B)*	(07798)
No. of females IS yrs & above	0.2324	02060—	O.D27	03990—	03105*	03025	007*4
	(0.2305)	(0.05 B)	(0 1080)	(0.0935)	(02996)	(02394)	(0.1529)
Avg. yrs of sch ofhh members	*0.0164	0.0174	0.1470—	0.0873**	-O.MD*	0.089-	-00081
	(00680)	(0.0189)	(00355)	(00398)	(0.0838)	(00626)	(00447)
Years of schooling of hh head	0 0479	00322—	0.1098—	0.1583—	0 051—	0.0838*	00249
	(00503)	(0.0122)	(00257)	(00292)	(00598)	(00505)	(00336)
Household received remittances	00622	-0 0646	O.II27	-00085	•03233	-03554	-03607—
	(02538)	(0 0698)	(0 075)	(0 1659)	(0356 D	(02280)	(0B75)
First exp quintile	-18863**	-0.4708—	-0 1058	-13952—	-L2535	-L52D*	-0900-
	(0J642)	(0.D57)	(027 M)	(0 3668)	(10627)	(0.8 B5)	(0 3883)
Second exp quintile	■0.5534	-02391*	00365	-04052	-04908	-0 4956	-02F7I
	(03759)	(0.1259)	(02267)	(02882)	(0.7274)	(0 4346)	(03012)
Third exp quintile	-11588—	-0.0040	•02524	-02908	02667	-03568	0.0286
	(0.4050)	(0.1232)	(02358)	(02733)	(0301)	(037 B)	(02727)
Fourth exp. quintile	-0.704 P*	0.D95	0.1096	0.1209	0_5193	-00322	02868
	(03474)	(0.059)	(02163)	(02642)	(0.4319)	(02678)	(02447)
Forest	-0.7322—	0.0756	-0.0246	-0.1671	-0.0305	02724	-0D03
	(02591)	(0.D36)	(0.1819)	(02286)	(03863)	(02453)	(02D4)
Savannah	-2 0067—	04581—	-0.D59	0.0278	01522	-02070	02457
	(04694)	(0.1130)	(02339)	(02705)	(03856)	(03873;	(02396)
Land owied (hectares)	-0 0737	-0.0011	-0.0009	-0.0005	-427®	0.0 B9	-0347?*
	(0.0949)	(0.0017)	(0.0043)	(00028)	(3.8047)	(0.0359)	(0 1934)
Farm size (hectares)	00030*	00020	-0.0 M8	0.0029-	-86534—	-42959—	-53824—
	(0.0017)	(0.0015)	(00138)	(00015)	(2.7760	(192 Dj	(16262)
Livestock owned (TLU)	-0.0115	-0.0014	-0.0211	-00270*	-0 8968	-00066	-03742
	(00584)	(0.0016)	(0 0467)	(0.0 M8)	(0 6667)	(0 1196)	(04997)
Value of farm equipment	-00069	-0.0001	■0.0060—	-00008	-0 D79	-0299r	-01D2*
	(0 0043)	(0.0001)	(0.0024)	(0.0010)	(0.1202)	(0 1191)	(00660)
Access to credit	0486*	0.4811—	03564-	0.5944—	022 M	-0 260	02529
	(02538)	(0.0747)	(0.M23)	(0 1677)	(04151)	(02470)	(02064)
Access to electricity	•00361	0.2053"	0.1680	0.7042—	0732*	07552—	03320*
	(02963)	(0.0884)	(0.1617)	(0.1828)	(03802)	(02 »0)	(0 B94)
Distance to market (km)	0 0389—	-0.0218—	-0.0094	-0.0303*	-0.0525	-0.0196	-0.0372—
	(0 0D6)	(0.0045)	(0 0086)	(0.0 M 5)	(00472)	(00205)	(00M7)
Distance to main road (km)	-03553—	-00M2*	-0.0257	0.00 n	-280 0—	-0 4826	00430
	(0 843)	(0.0087)	(00339)	(0.0294)	(9 0492)	(03205)	(0.03 r?)
Constant	-L303P	■0.7571—	•3 7085—	-5.062—	-33641—	*12294-	0.8059-
	(07672)	(0.2005)	(0.4 B9)	(0.5040)	(0.8087)	(03953)	(0408)
Number of observations	5065						
Log likelihood	-5209.8						
Pseudo R-squared	0.2092						
Wald Chi-squared	6064.8						
Prob>chi2	00000						

Ofi

Appendix A4 cont'd

Table A4.2 Hausinan tests of I1A assumption

Omitted calcRory	Ch 12	P>chl2	Evidence
0	0.000	1.000	for Ho
1	0.000	1.000	for Ho
2	0.000	1.000	for Ho
3	0.000	1.000	for Ho
4	0.000	1.000	for Ho
S	-2.774	1.000	for Ho
6	0.000	1.000	for Ho
7	0.000	1.000	lor Ho

Ho: 6<Ms(Outcome-J vs Outcome-K) are independent of other alternatives.

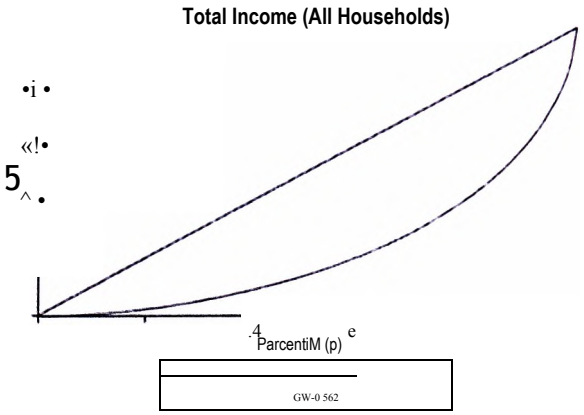
Appendix A5

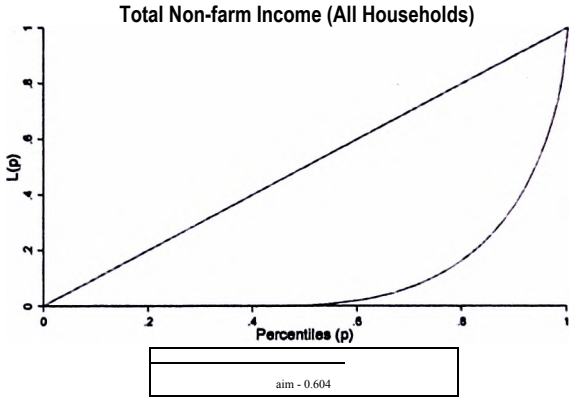
Appendix A5.1 Variance Inflation Factor (V1F) test for multicolincarity

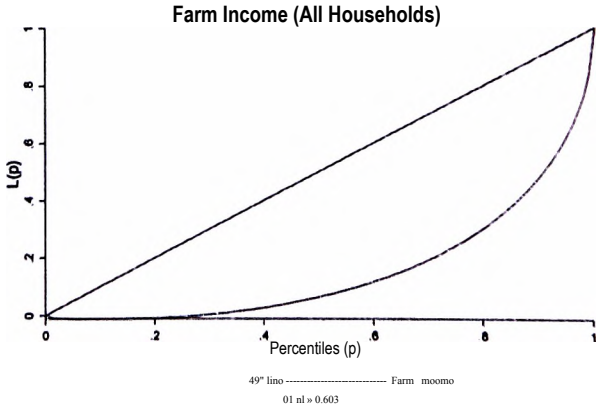
Variable	VIF	1 /VIF
Ap: of household head	1.23	0.8144
Household head is male	1.54	0.6473
No of household members	3.44	02910
No. of males 1J yrs & above	2.09	0.4792
No. of females 15 yrs & above	2.39	0.4192
Avg yrs of schooling ofhh members	3.15	0.3179
Years ofschoolingofhh head	3.07	0.3253
Household received remittances	1.08	0.9257
Forest bell	2.04	0.4907
Savannah belt	2.41	0.4154
Land owned (hectares)	1.04	0.9650
Farm size (hectares)	1.02	0.9832
Livestock owned (TLU)	1.02	0.9811
Value of farm equipment	1.02	0.9813
Access to credit	1.05	0.9485
Access to electricity	1.15	0.8728
Distance to nearest market (km)	1.23	0.8128
Distance to main road (km)	1.25	0.7978
Non-farm activity (yes=l)	1.13	0.8842
Mean VIF	1.70	

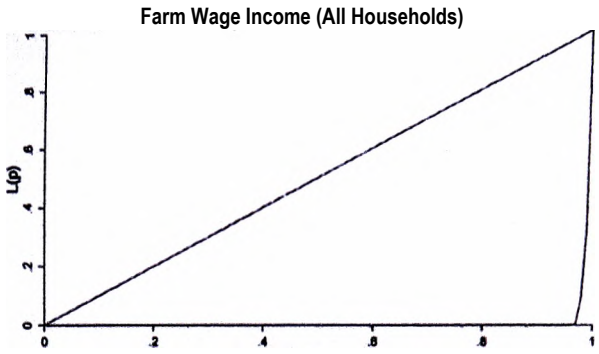
Nole: Multicollinearity is a problem when the VIF excceds 10.

Appendix AS cont'd **Figure A5.1 Income Lorenz Curves**

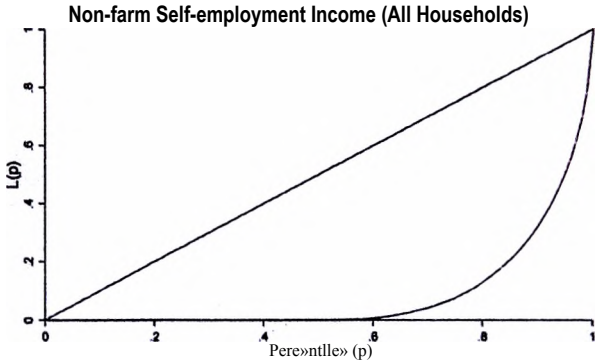




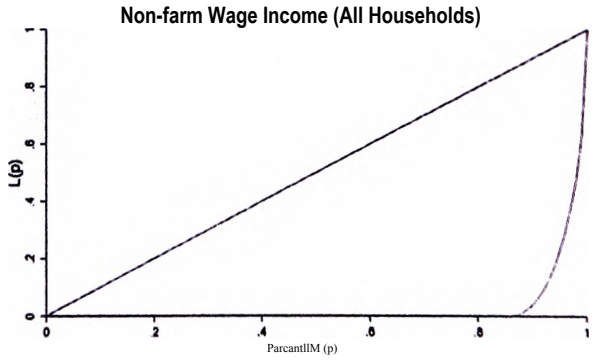




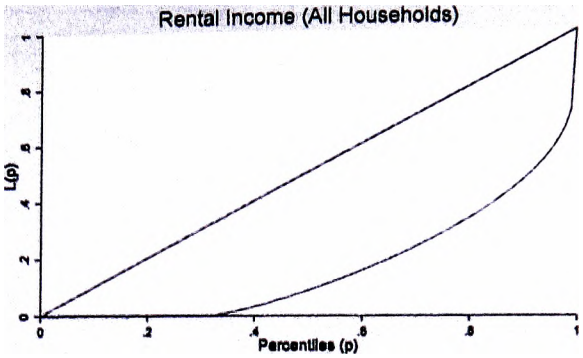
46* bno ----------Fœm w*@# income
GUn) - 0.084



46* lino ---------- Non-firm tolf-omploy income
Glni» 0-829

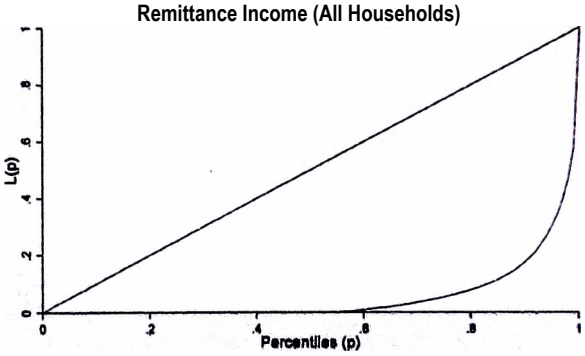


4ft* lino---------- Non-farm wage income
aim-0.041



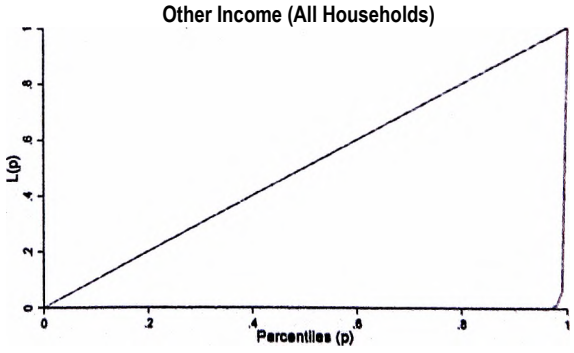
45* Bn* ---------- Rωnl*t income

OW* 0-687



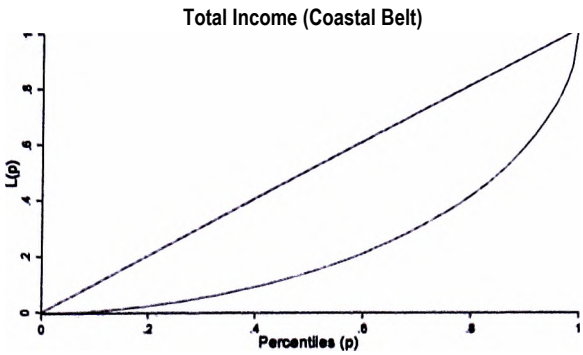
..———— 45' lino RtmHOno* Income

Ginι« 0,092



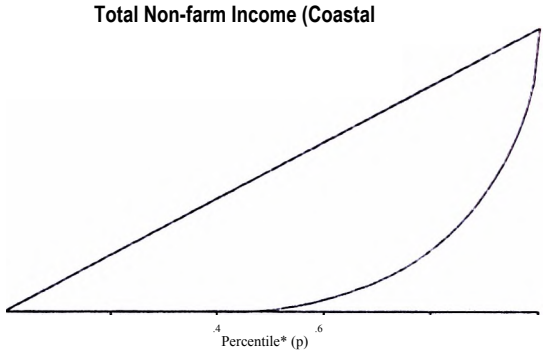
4ft* lino ----------Other Income

Qini - 0.0T5



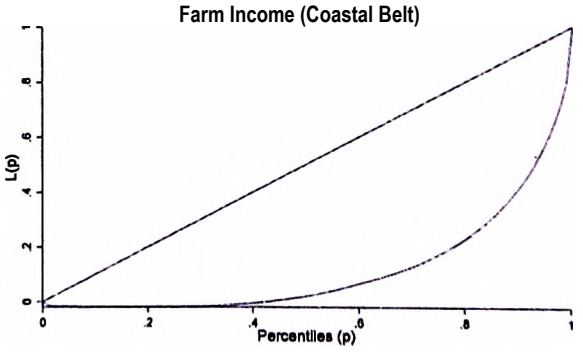
45' Ino ---------- Total incom*

G.ni-0 603



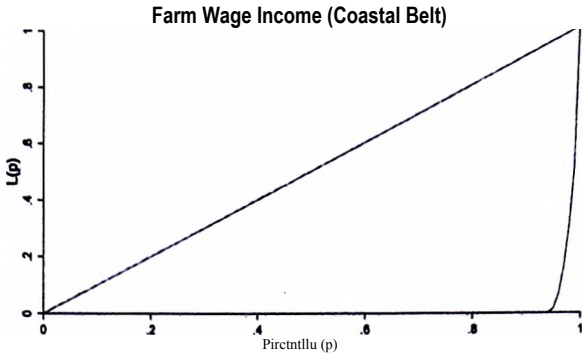
45' Imo ---------- Non-firm mcomo

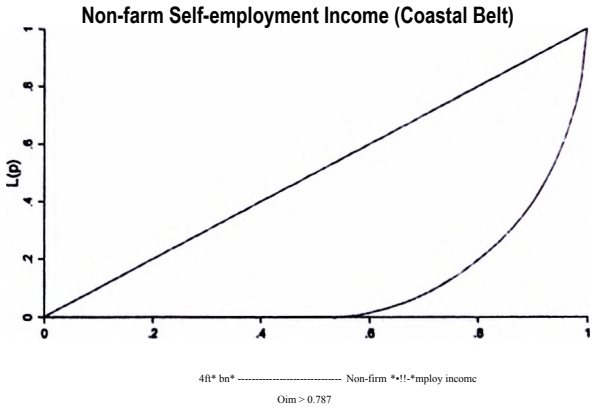
Glnl ■ 0 768

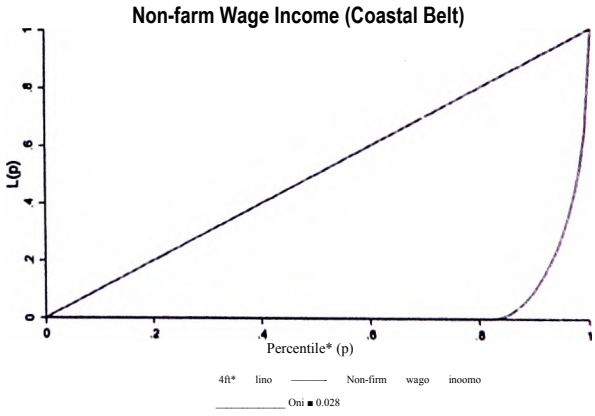


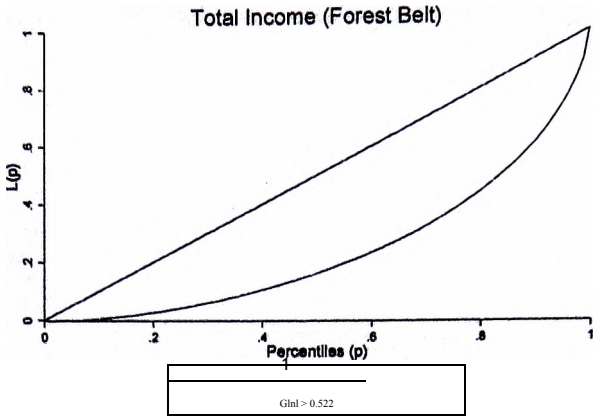
45" Iino ---------- Form to com#

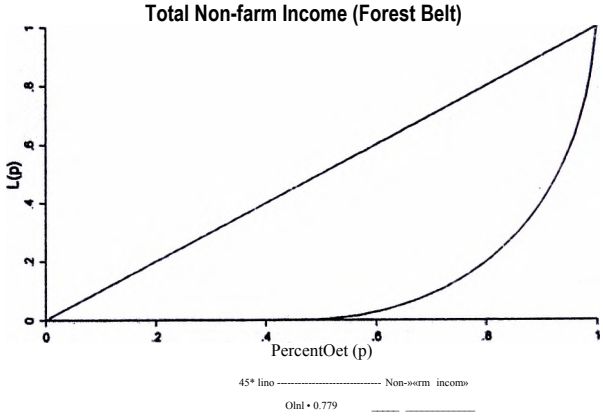
Olnl • 0.770

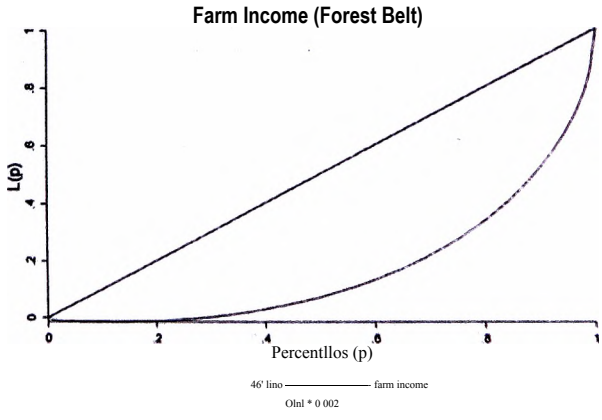


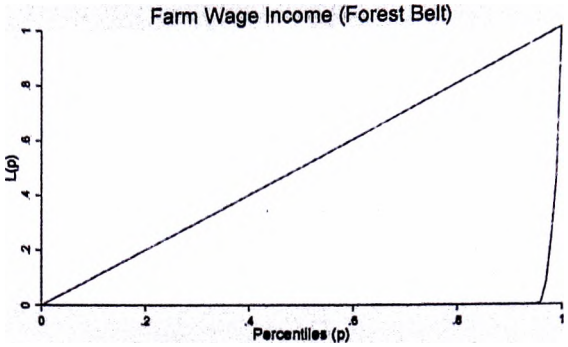




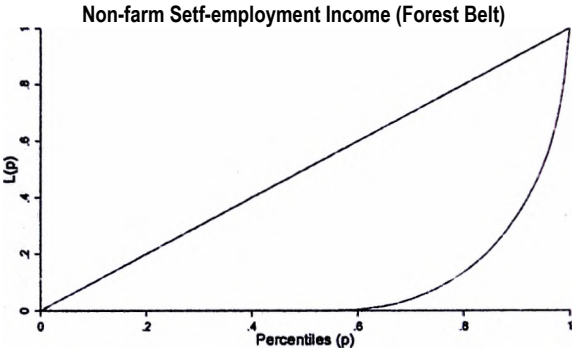




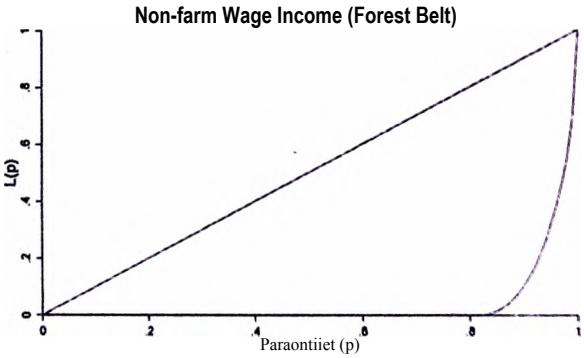




45* Bna ——F w m wag* mcomt
Glnl • 0.876



Non-lirm teK-amploy income



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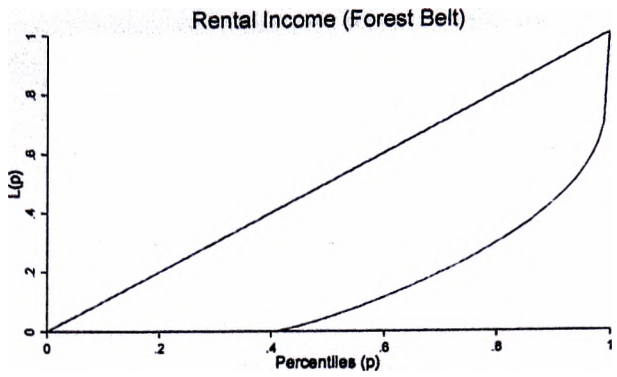
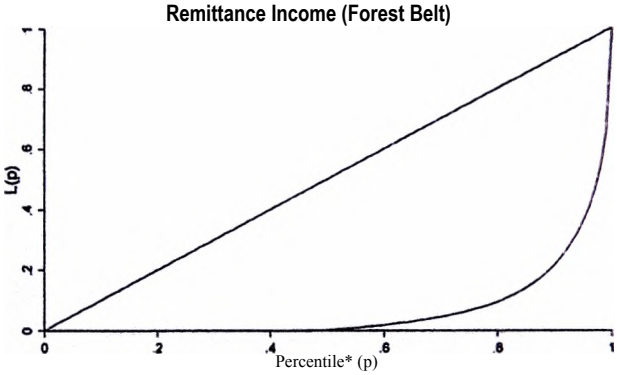
Olnl * 0 621



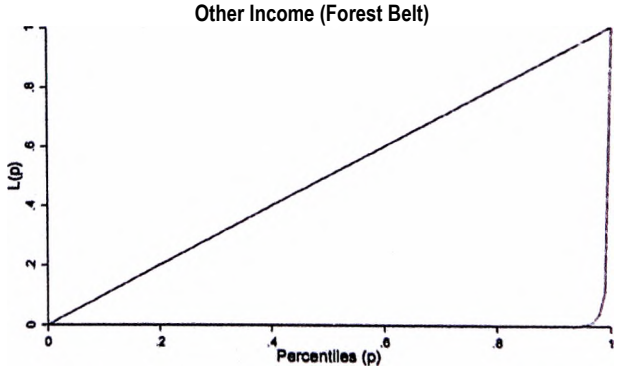
45* lino ---------- Renlaifcwomo

GM a 0.719



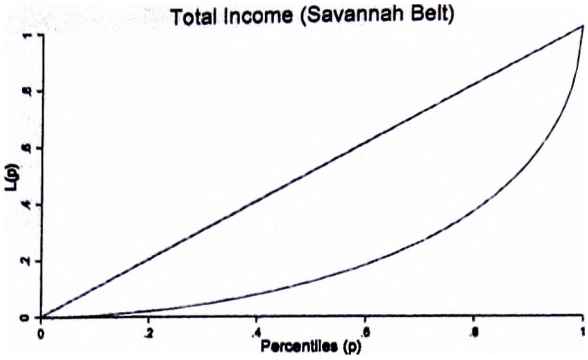
45* lino ---------- Romttoncoinoomo

Giro « 0 868



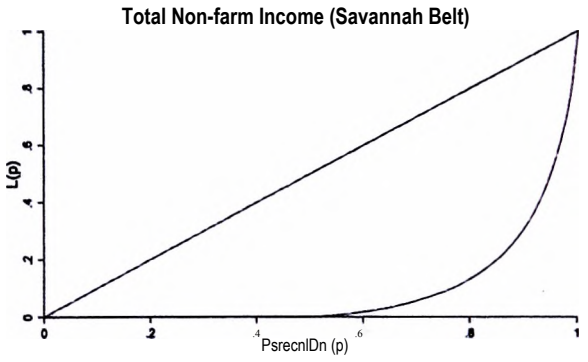
48" lino ---------- Olhof incomo

Glnl» 0 003



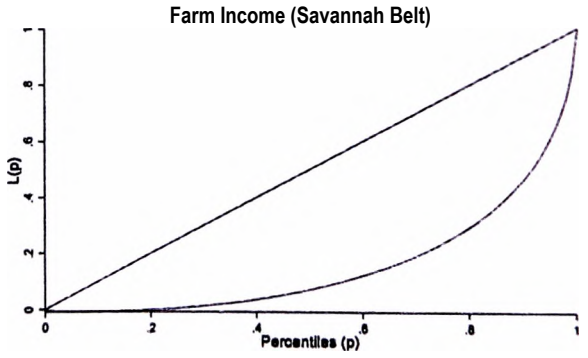
48* In* ---------- Total mcorn*

Olnl - 0 604



48* 8n» ---------- Non-firm incomt

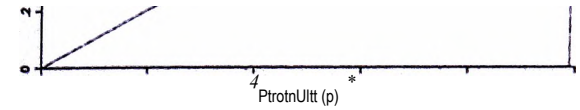
Olnl - 0.627



48* lino ---------- Pwm tnooma

Olnl > 0.687

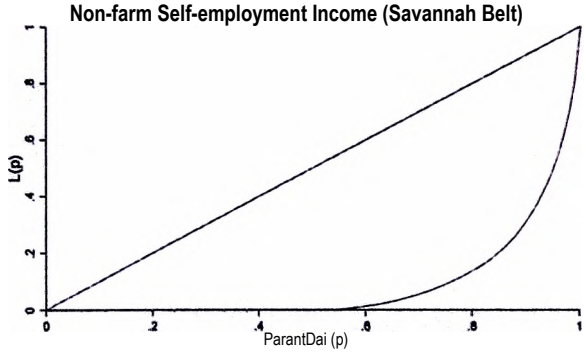
Farm Wage Income (Savannah Belt)



46* in* ---------- P*m><«ıg* Mconw

©M • 0W9

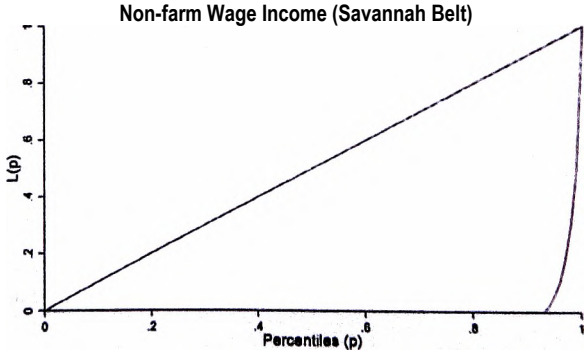
Non-farm Self-employment Income (Savannah Belt)



45* Unn---------- Non-fiim ••If-tmploy inoomt

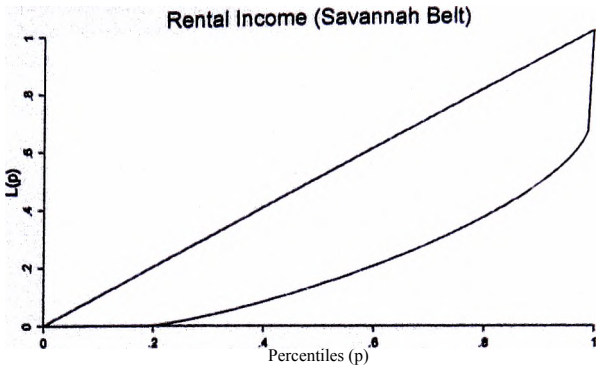
Gini - 0.B27

Non-farm Wage Income (Savannah Belt)



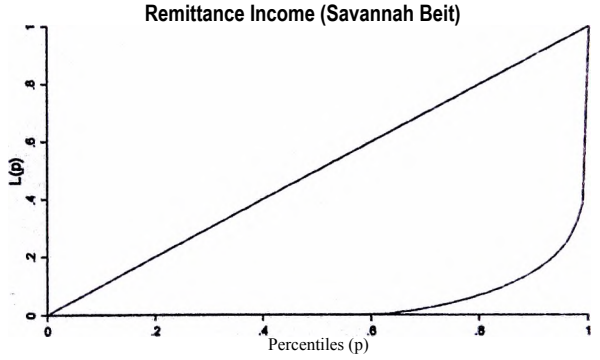
48* lino ——— Non*▷rm tnoom*

Qlnl - 980



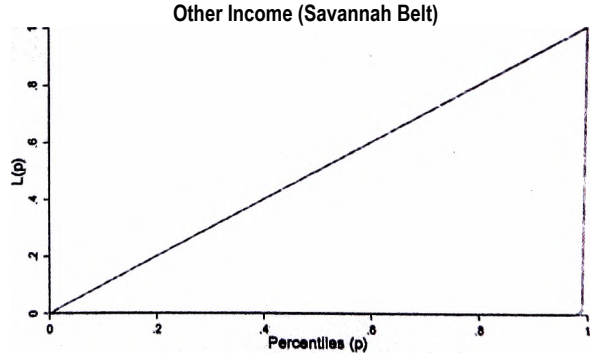
46' lino ——————■— Rontoi Incom*

Glnl ■ 0 020_____ _____



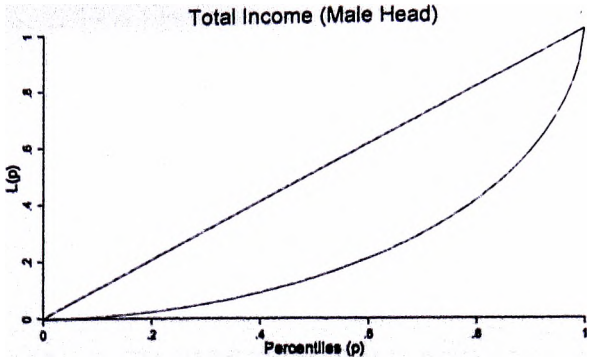
45* lino ---------- Remittance Jncomt

Glnl -0.819



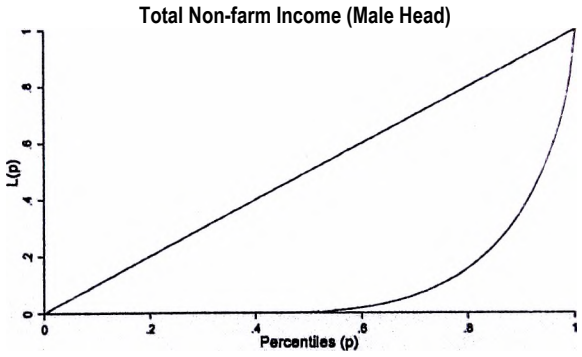
40* lino ---------- Oth or Incom#

Glnl » 0.088



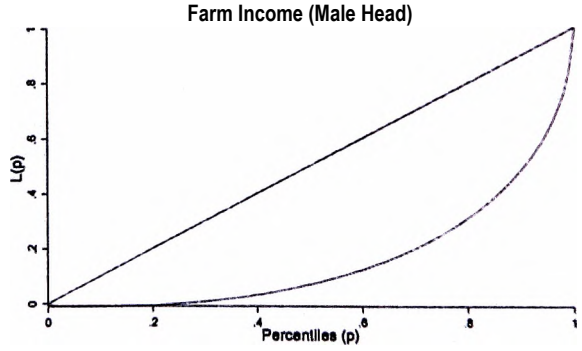
48° line ---------- Total ineoma

OInI« 0.664



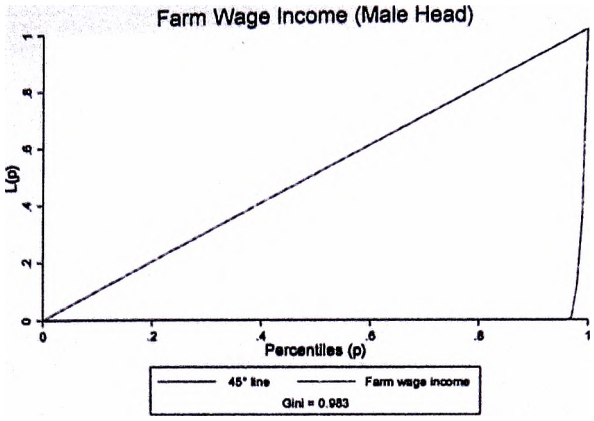
45* linc ---------- Non-faim income

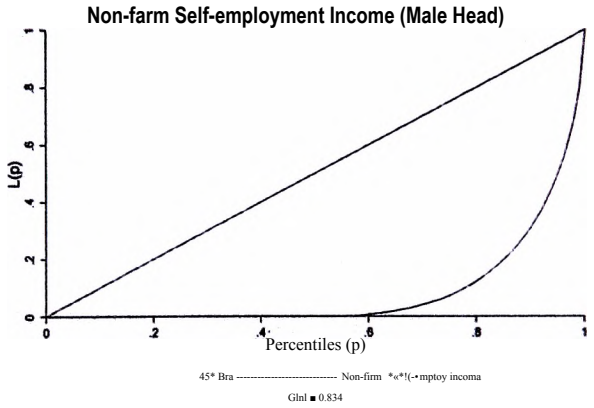
GInI ■ 0.606



40* Una ---------- **Farm ineomo**

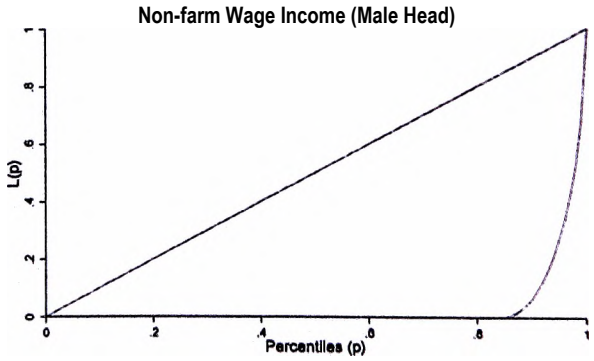
OInI • 0-882





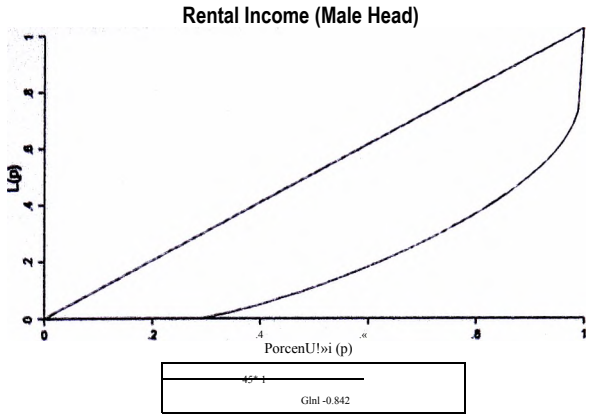
45* Bra ---------- Non-firm *«*!(-•mptoy incoma

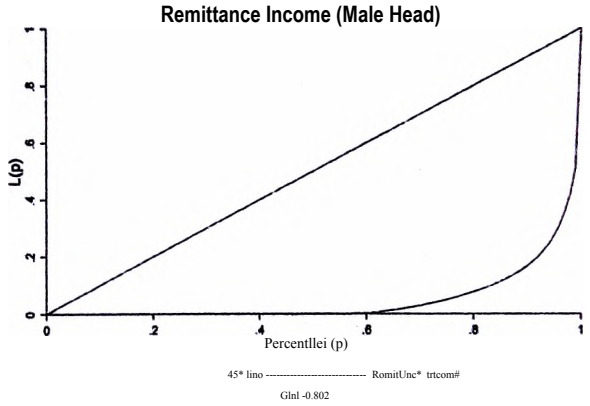
Glnl ■ 0.834

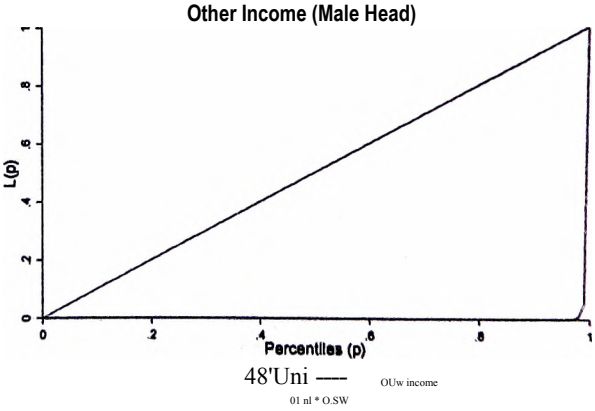


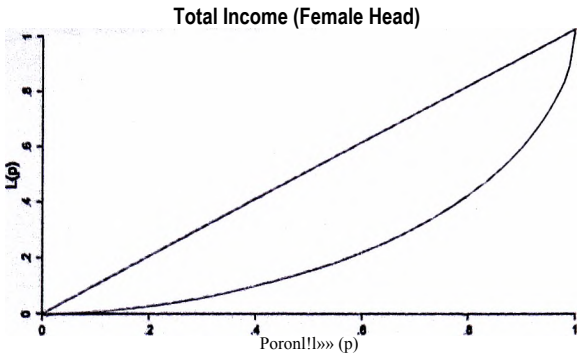
46' line — Non-farm wag# tnoom*

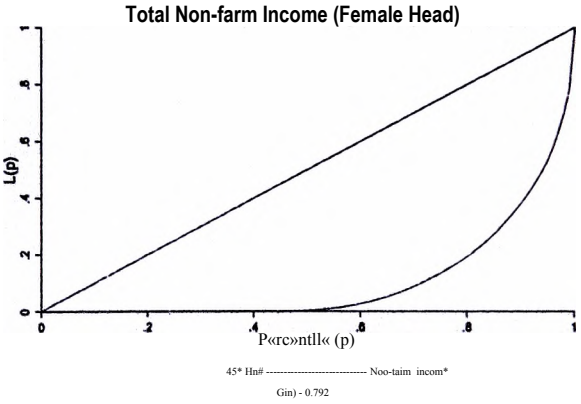
Qlnl» 0.032

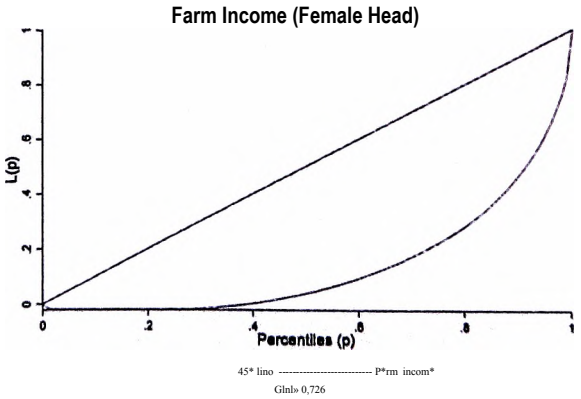


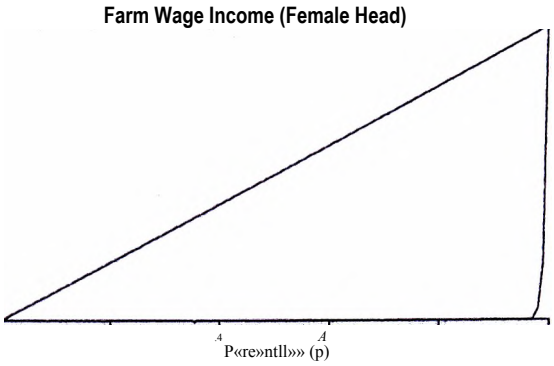










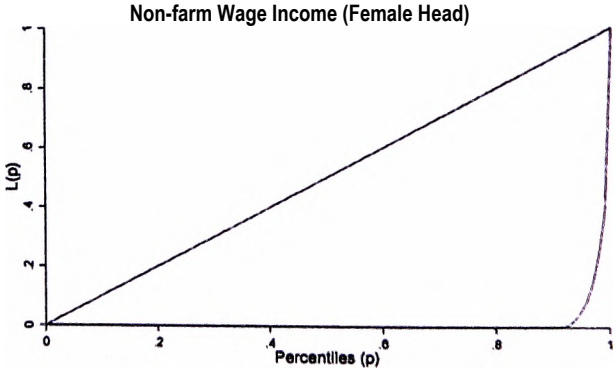


45* lino ---------- Farm *wlgo* inco*rm*

Glnl " O.WJB

46* lino ---------- Non-lorm ■otf-ornptoy income

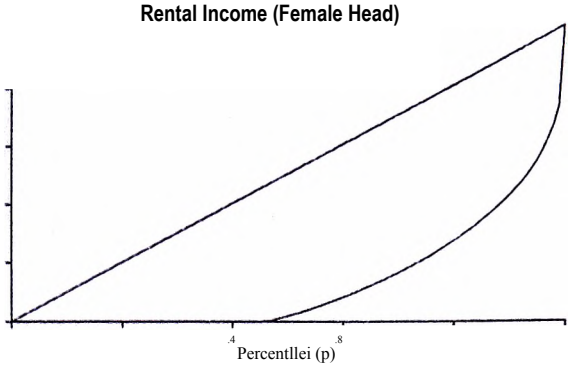
Glnl» 0.804



48* lino —- Non-famt **wbqo** income

Qlnl *» 0.074

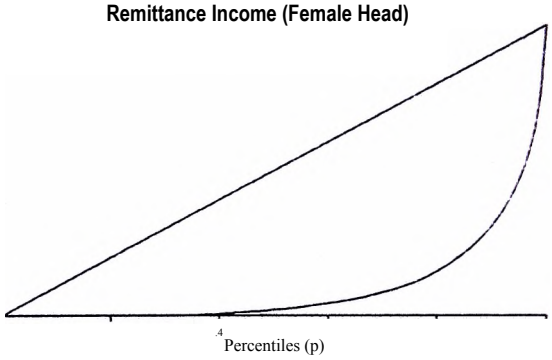
Rental Income (Female Head)



46* lino ---------- RonioJ income

Gini« 0.740

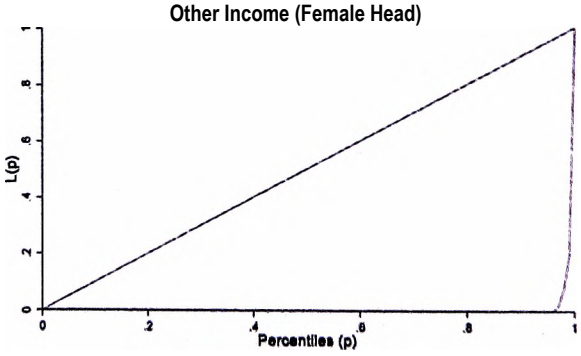
Remittance Income (Female Head)



45* lino . Rom Kline# inoomo

Glnl = 0.814

Other Income (Female Head)



48* lino —«— Oihor Income

Olnl» 0,880