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## Income Diversification and Poverty in a Growing Agricultural Economy: The Case of Ghana

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# **Income Diversification and Poverty in a Growing Agricultural Economy: The Case of Ghana**

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## *Abstract*

This paper analyses changes in income portfolios of rural households and its determinants for the case of Ghana in the 1990s. Our analysis shows that, contrary to common beliefs, rural Ghana has seen major economic transformation, as households increasingly diversify their livelihoods by both increased migration and more local non-farm employment. These diversification decisions seem to be driven to a large extent by desperation rather than new opportunities, in particular with regard to migration. Low-income households increase their income share in particular from local non-farm activities through more participation while returns to diversifying activities stagnate or even decrease. Therefore households with a low non-labour asset-base are increasingly *diversified and poor*. In contrast, asset-rich households are more successful at either diversifying or specialising in those activities the household is relatively good at. They also tend to benefit more from agricultural growth.

*Keywords:* Income diversification, non-agricultural activities, remittances, migration, inequality, poverty, sub-Saharan Africa, Ghana

*JEL:* Q12, O17, I31

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## Introduction

It is well established that rural households in Sub-Saharan Africa derive their incomes from a variety of sources, in particular from local non-farm activities and remittances from former household members. Although many observers seem to agree on an increased role for such activities outside agriculture, there is not much empirical work on *change* in patterns of rural income diversification, i.e. structural change, and its driving forces.

For an analysis of change it may prove useful to depart from the observation that rural households diversify out of agriculture because of different motivations. On the one hand, poor rural households may hence embrace multiple livelihoods primarily to ensure survival, as they are forced to diversify mainly because they lack sufficient agricultural assets to sustain subsistence (Reardon and Taylor, 1996; Haggblade et al., 2005). On the other hand, richer rural households with higher asset endowments will choose to diversify their livelihoods to maximise returns to their assets. Such activities typically exhibit entry barriers that the poor are not able to overcome. This dichotomy of diversification illustrates the strong link to welfare outcomes. Finally, households insure themselves against harvest shortfalls through engagement in activities outside crop farming (Reardon et al. 1992).

Such a dichotomy of diversification strategies implies that the stylized fact of increasingly diversified livelihoods in rural Sub-Saharan Africa can either be explained by increased desperation, as suggested by Bryceson (2002a), by better economic opportunities outside agriculture in a growing economy, or even both. From this perspective, this paper examines the patterns of income diversification for the case of rural Ghana during the 1990s, a period of sustained growth in the country. More specifically, we analyse the underlying motivations for diversification as well as related changes in inequality and poverty using the country-wide Living Standards Measurement Surveys of 1991 and 1998. To our knowledge, all existing studies on the topic from the Sub-Saharan context rely on one cross-section or on short-term panels. We use the two cross-sections for a detailed descriptive analysis of changes in diversification behaviour, which is then complemented by the estimation of a multivariate choice model on the pooled cross-sections. Finally, we perform disaggregated incidence analyses to assess the relationship between those changes in

diversification behaviour and welfare outcomes.

The paper finds that rural household in Ghana indeed increasingly diversify their livelihoods by both increased migration and more local non-farm employment. Yet, only asset-rich households seem to be successful diversifiers. Poorer households increase the income share in particular from local non-farm activities through more participation while returns to diversifying activities stagnate or even decrease. In this sense, diversification appears to be driven to a large extent by desperation and asset-poor households increasingly diversify and remain poor.

The paper is structured as follows. We first review the literature on rural income diversification and its welfare implications. Then we present our empirical results. A final section concludes.

## Income Diversification, Poverty, and Inequality

The contribution of non-agricultural activities to household income in the developing world in general and sub-Saharan Africa in particular is substantial. Haggblade et al. (2005) observe that local non-farm income contributes between 30 to 45 percent of rural household incomes in the developing world. Reardon et al. (1998) put this share at 42 percent for sub-Saharan Africa, while Reardon (1999) gives estimates of 32 percent and 40 percent for Asia and Latin America, respectively. Ellis (2000) reports somewhat higher figures from case studies in sub-Saharan Africa in a range of 30 to 50 percent. Local non-farm activities are often pursued through self-employment, but there is also a non-agricultural wage labour market, although this market is typically small in the rural sub-Saharan African context. Significant amounts of money and in-kind transfers are remitted by international and internal migrants. International remittance flows to developing countries made up 167 USD in 2005 (World Bank, 2006). The figure for Ghana indicates an inflow of 99 million USD in 2005 (World Bank (1), 2007). Internal remittances also constitute a big share of household income. Cox and Jimenez (1990) review studies on private inter-family transfers in developing countries. They find that 20-90 percent of households in developing countries receive private transfers, comprising 2-20 percent of household income. In the same time frame only 15 percent of households in the United States received such transfers, comprising only 1 percent of household income on average.

In order to analyse the patterns of income diversification and the link to welfare

outcomes, it is useful to distinguish survival-led and opportunity-led diversification. When diversification is pursued to ensure survival, for example because of declining opportunities in agriculture possibly related to population pressure and land fragmentation, or natural disasters, such as droughts it is also referred to as distress-push diversification (e.g. Islam, 1997; Reardon et al., 2000; Barrett, Reardon and Webb, 2001). Such diversification will be in low-return non-agricultural activities and may be an indication that the non-agricultural sector – both local and elsewhere – is absorbing labour that cannot be employed in agriculture. In contrast, rural households may face new opportunities outside agriculture because of increasing local demand for non-agricultural goods and services. Migrants may find employment in urban regions or better opportunities in agriculture in other rural regions. If non-agricultural income diversification can be traced back to such factors, it is also regarded as demand-pull or high-return diversification.<sup>1</sup>

Furthermore, non-agricultural diversification constitutes an important means to deal with risk and smooth income and consumption in rural areas. This is not surprising since agricultural livelihoods are often subject to great uncertainty. In such an environment, diversification aims at lower covariate risk between different household activities to smooth consumption (Bryceson, 1999; Dercon, 1998 and 2002; Francis and Hoddinott, 1993).<sup>2</sup> While rural household risk can be reduced by venturing into non-agricultural activities, risk considerations may also play a role when deciding between different types of non-agricultural activities. If high-return non-farm activities are more risky than low-return activities, households able to overcome possible entry barriers may engage in both types of non-agricultural activities according to their risk preferences. Yet, migration may be the most adequate strategy to lower covariate risk, as shocks experienced by migrants and the household of origin are less likely to be correlated. That migration serves as a mutual insurance mechanism also explains why net transfer flows to households might be even negative. Several studies on migration and remittances (Boayke-Yiadom and McKay,

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<sup>1</sup> Demand pull diversification does not necessarily have to be high-return, as, for example, a migrant can be ‘pulled’ to urban areas without finding high-return employment.

<sup>2</sup> It is useful to distinguish between ex-ante risk management and ex-post risk coping strategies. Engagement in high-return non-agricultural activities represents an ex-ante risk management strategy, as it is unlikely that entry barriers can be easily overcome after a negative shock. In contrast, low-return non-agricultural diversification will figure prominently as an ex-post coping strategy, i.e. households will relocate labour towards these activities after they have been hit by a negative agricultural shock, typically a weather shock. Yet, in particular poorer household may also be willing to accept lower returns than in agriculture ex-ante in exchange for lower covariate risk.

2007; Schueler, 2007) indeed find that migrants are costly.

Migration and non-farm participation are driven by a similar calculus of the household. On both strategies there is a large empirical literature that often treats them separately. Empirical contributions on participation in non-farm employment and migration tend to stress the influence of household characteristics on diversification decisions. Asset availability as well as educational and skill endowments have been highlighted as key participation determinants of non-farm diversification and high-return activities, in particular (Dercon and Krishnan, 1996; Reardon, 1997; Abdulai and CroleRees, 2001; Ferreira and Lanjouw, 2001; Lanjouw, 2001; Barrett, Reardon and Webb, 2001; Escobal, 2001; Matsumoto et al., 2006). Whereas entry barriers to engage in low-return non-farm activities should be low, they can be considerable for those yielding higher returns. In the presence of underdeveloped credit markets, high-return non-farm activities typically require sufficient cash income, in particular from livestock, cash cropping, and/or remittances, both for initial investment and as working capital (Reardon et al., 2000; Barrett, Bezuneh and Aboud, 2000). Similarly, initial asset endowments play an important role, in particular land (e.g. Seppala, 1996; Elbers and Lanjouw, 2001; Marennya et al., 2003). For instance, Elbers and Lanjouw (2001) show that land scarcity is related to participation in a low-return non-agricultural activity while more landholdings seem to provide collateral for investment in high-return non-agricultural businesses. Another household level factor correlated with participation in non-agricultural activities is the size and structure of the household (Corral and Reardon, 2001; Reardon, 1997). Reardon (1997) shows that a larger size enables households to supply more labour to non-agricultural activities, since sufficient family members remain at home to meet labour demands for agricultural subsistence. As regards community level determinants, most empirical studies confirm an important role for physical and institutional infrastructure, such as paved roads, efficient communication facilities and provision of rural electrification.

With regard to migration it is helpful to distinguish different kinds of migration. Overall, the kind of migration observed the most is migration of a part of household members and not the household as a whole. Furthermore, migration may be seasonal, circular, rural-urban or international. International migration exhibits the highest entry constraints. Migration networks within home countries and in host countries reduce these entry constraints to migration significantly. Decisions on the migration of

household members are also found to be affected importantly by educational and asset characteristics of households (Greenwood, 1997; Lucas, 1997; Deshingkar and Grimm, 2004). A key constraint to migration is the availability of labour within the household. Deshingkar and Start (2003) find that labour-scarce households do not migrate. The poorest households usually cannot migrate due to labour scarcity and resource requirements (Deshingkar and Grimm, 2004).

All these conditions that constrain or enable households to diversify are subject to change. Rapid population growth and shortages of fertile land are often identified as the major cause for the rise of non-farm activities and migration in Sub-Saharan Africa (Bryceson and Jamal 1997, Barrett et al. 2000, Bryceson 2002b). In contrast, other factors at the household-level, in particular the expansion of education may enable quite a few households to overcome skill barriers and earn higher returns from local non-farm activities or migration. Yet, it may also be that an increased supply of (relatively) skilled labour depresses the returns to those activities. In addition, technological advances, better infrastructure, the intensification of links with markets outside the local economy, local engines of growth, such as commercial agriculture or proximity to an urban area, or simply per capita growth and increased demand for non-food goods and services can lead to a growing non-farm sector (Reardon 1999, Haggblade et al. 2002). Furthermore, the structural reform programs that many African countries have undergone in the late 1980s and early 1990s have certainly shaped the patterns of growth and household portfolios in these countries since then. Possibly, reforms had their most pronounced impact on income portfolios through altering the returns in agricultural activities, for example in cash crop sectors, which often had been subject to heavy regulation. Furthermore, macroeconomic stability that has been recorded by most reform countries since the mid-1990s may have strengthened farmers' trust into markets thereby contributing to increased market participation and specialization. On the other hand, it is not clear whether agriculture, or at least certain sub-sectors, have been able to compete in liberalized markets where prices are determined internationally. Overall, these changes in the conditions or drivers of diversification have been subject to relatively little empirical scrutiny. Often, the view on diversification being mainly desperation-led is at best backed by a snapshot of household diversification behaviour, i.e. most studies take a static view when interpreting the findings on the structure of non-farm sector participation or



migration.

Changes in income portfolios will also have important welfare and distributional implications. All in all, there seems to be a positive correlation between wealth and diversification in rural Africa (Barrett et al. 2001). If diversifying incomes go mainly to the better-off, as for instance local non-farm income often does, growth of this sector is inequality increasing (Elbers and Lanjouw 2001). However, others find that non-farm income is concentrated among the poor, so that an increase in these incomes is eventually pro-poor (van den Berg and Kumbi 2006, Adams 2002). These seemingly contradictory findings can possibly be reconciled by taking into account the distinct motivations underlying diversification. For example, if the non-farm sector can be characterized largely by low-return and desperation-led activities, we would expect a pro-poor effect of non-farm income growth. Accordingly, Lay et al. (2007) find the expansion of opportunity-led local non-farm employment to have little impact on poverty, while growth of income from the desperation-led activities significantly reduces poverty. In such a case, the overall impact of diversification on the income distribution remains mixed.

Again, the above empirical work typically builds on cross-sectional data, which implies that poverty and distributional implications are evaluated at the margin. At the margin means that income from a particular source is ‘simulated’ to increase by a marginal amount (e.g. Reardon et al., 1992; Lay et al., 2007). Although useful for illustrative purposes, such simulations can also be misleading, since they do not allow for behavioural response that can have important distributional implications. If for example income from opportunity-led high-return non-farm employment rises, it may well be that this increase enables some households to jump over entry hurdles. The welfare effect of this discrete change in behaviour of some households will of course be different from the effect of a uniform increase in high-return income for those already engaged in this sector.

The behavioural responses to remittances and the corresponding welfare effect are even more complex. Firstly, remittances are transfers of family-members who cannot perfectly observe other household members’ behaviour any more. Due to this informational asymmetry remittances might cause a negative incentive effect on work effort (Rozelle, 1999; Azam and Gubert, 2002; Andersen et al., 2005; Schueler, 2007). Secondly, migrants might be hard to substitute if labour markets work

imperfectly in rural areas, therefore restricting household farm income and production (Rozelle et al. 1999). While the latter effects of remittances would be welfare-decreasing, remittances could also be used for investment in agriculture (Azam and Gubert, 2002)<sup>3</sup> and could effectively insure the household. The net effect of foregone labour and remittances has been found to be negative for rural households (Rozelle et al. 1999). Woodruff (2001) finds that households with an association to migrant networks have a higher probability to be the owner of a micro-enterprise. This could be due to returning migrants who invest their savings or remittances.

Local non-farm income is often reinvested in improved agricultural technology. Empirical evidence shows that non-farm income is indeed the main source of investment for raising farm productivity (Reardon et al., 1994; Reardon, 1997, 1998; Abdulai and Huffman, 2000; Ellis and Ade Freeman, 2004).

The recent literature on rural livelihoods has stressed that these mechanisms can give rise to vicious and virtuous cycles (Ellis and Ade Freeman, 2004). In vicious cycles low asset endowments and low asset productivity force poor rural households into desperation-led diversification, which in turn reduces agricultural productivity. Such poverty traps are eventually caused by entry barriers that prevent households from gradually shifting from lower return to higher return activities (Barrett 2004; Abdulai and Huffman 2005). This outcome is particularly likely in case of very low asset endowments combined with severe financial market failures, but can also result from poor climatic conditions, poor infrastructure, missing markets for agricultural products, and under-developed linkages between agriculture and the rest of the economy.

We are of the opinion that the concepts of the literature on rural livelihoods are probably more useful in examining structural change at the macro level than conventional notions of sectors (modern vs. traditional, formal vs. informal). Whether the growing Ghanaian economy has seen more desperation- or opportunity-led diversification will hence be a core question of the subsequent empirical analyses.

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<sup>3</sup> Azam and Gubert (2005) examine both the disincentive and accumulation effect of remittances. They find remittances to reduce agricultural productivity through moral hazard even though more productive assets are used by the household. However, they do not consider the additional effect of foregone labour in their analysis.

## The Ghanaian Case: Patterns and Changes

Today Ghana is considered an African success story (Bogetic et al., 2007; Coulombe and Wodon, 2007; IMF, 2007; IMF, 2000). Since 1983 average growth of 4.6 percent was considerably higher than in other sub-Saharan economies. In contrast, at the beginning of the 1980s Ghana was battered by fiscal imbalances, deteriorating terms of trade and political unrest. A period of market orientation followed the coup of Rawlings that was interrupted by the implementation of a new constitution that paved the way for the first democratic election in 1992. This however led to a power struggle and political unrest, fiscal imbalances, as well as high inflation rates were a consequence. A few years later Ghana was back on the track of market orientation and macroeconomic as well as political stability.

Ghana's economy is dominated by agriculture that accounts for 40 percent of GDP (Bogetic et al., 2007; IMF, 2000). Growth in agriculture is seen as the key determinant of the substantial reduction in poverty achieved in the 1990s (World Bank (2), 2007). While yields improved only slightly, agricultural growth mainly stems from area expansion. Slow agricultural growth has been attributed to a lack of improvement in the productivity of main food crops, missing support for innovation in small-scale agriculture as well as poor transport and distribution channels (Aryeetey, 2005). Moreover, the parastatal monopoly in cocoa marketing has not been eliminated (World Bank, 1995; IMF, 2000) although reforms ensured that cocoa farmers receive a higher share of world market prices (Kanbur, 1994).

National accounts data suggest that, in the 1990s, services were the fastest growing sector of the economy, driven by growth of 'wholesale, retail, restaurants and hotels' as well as 'transport, storage and communications'. Industrial growth was driven by subsectors energy and construction. Taking into account population growth, this development led to an increase in employment opportunities only in urban areas, especially Accra (Bogetic et al., 2007). Yet overall, the Ghanaian economy seems to exhibit negligible signs of a structural transformation in the 1990s, in particular in terms of the sectoral composition of the economy (IMF, 2000; Bogetic et al., 2007; McKay and Aryeetey 2007; World Bank, 2007).

In this regard, the important social and economic reforms and public investments that have been undertaken by the Ghanaian authorities appear to have had little effect. One of the most important reform programs was the one aimed at

reforming the education system of Ghana. This reform process started in 1987 and resulted in the so-called ‘Free Compulsory Universal Basic Education’ (FCUBE) strategy of the government in 1996 (Akyeampong, 2004). The FCUBE had the target to put into practice free primary education for every child in Ghana until 2005. A World Bank evaluation found evidence that reforms were successful in increasing enrollment, improving test scores and reducing illiteracy rates, even though absolute levels of student achievement are still low (World Bank, 2004). Public investment was not limited to the education sector: Economic infrastructure recovered through massive public investments following the economic upswing in 1991 that led to government revenue excluding foreign aid of 15 percent of GDP. Investments comprised improvement of roads, electricity and water supply and better telephone communication (Kanbur, 1994).

Most reports suggest that the Ghanaian economy has not seen major transformations, at least in rural areas. Yet, as the following analyses show, a look at the patterns of change in rural income portfolios and the underlying determinants yields a different picture. The subsequent analysis focuses on rural areas that still account for 66.8 percent of Ghana’s population in 1991 (66.3 percent in 1998) and host the majority of the country’s poor.

### *Increasing diversification: Descriptive analysis*

Overall, income diversification increases significantly in the 1990s. As illustrated in Table 1, the percentage of diversifying farm households with at least one source of non-farm income increased from 76 to 85 percent between 1991 and 1998. Diversification is defined as participation in the local non-farm sector through wage- or self-employment and participation in migration. A household participates in migration if some household members migrated to villages different from the household’s village of residence. Migration is slightly more important than local non-farm employment as diversification strategy and this does not change much. Most households in fact engage in both diversification strategies at once, followed by farming households sending away migrants only and participating in the non-farm sector only. The overall increase between 1991 and 1998 is entirely due to more households pursuing both strategies rather than a single one.

\*\*\*Table 1 about here\*\*\*

Table 2 shows the income shares that rural households derive from the respective activities. The average share of non-farm income amounts to 38.4 percent in 1991 and remains unchanged until 1998. The (household income) weighted non-farm share stands at almost 50 percent in 1991 and in fact falls afterwards. This indicates that poorer households derive a higher share of income from the non-farm sector in 1998. The increase in non-farm participation combined with a constant (or even falling weighted) income share may be taken as a first indication of a stagnant non-farm economy that grows in employment terms because of the lack of alternatives.

Remittances account for a relatively small portion of household income. Weighted, they make up only 2 percent of total income earned by rural households in 1991. By 1998, this percentage share has increased to almost 3 percent. Yet, the average share has climbed to almost 7 percent in 1998, indicating that poorer households rely more heavily on remittances.

\*\*\*Table 2 about here\*\*\*

The regions of Ghana exhibit considerable socio-economic differences and this also holds to some extent for diversification strategies. Between the Ghanaian regions the share of diversifying households fluctuates between 70 and 85 percent in 1991 with the exception of the Northern Region<sup>4</sup>. The diversifying share appears to converge to about 85 to 90 percent in 1998 in all provinces except Brong Ahafo and the Northern Region. The diversification patterns in those two regions are hence particularly noteworthy. Examining the two diversification strategies separately, developments seem to be fairly similar across the regions, again with the same exceptions.

The Northern Region is the province where households diversified least in both

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<sup>4</sup> Left-out regions are the Upper-East and Upper-West Region due to an insufficient number of observations.

years. Yet, still more than half of the rural households are diversified in 1991 and the increase of more than 20 percentage points is the strongest of all regions. Most of this increase is driven by migration. Surveys analysing migration patterns in Ghana, find that the Brong Ahafo and part of the Ashanti region in the middle of Ghana, one of the leading producers of grain, cereals and tubers, attract mainly farm migrants from the North (Codjoe, 2006). Brong Ahafo's agricultural potential and the fact that it receives migrants rather than sending them away might also explain why the share of diversifying households in this region stays constant and why the share of households with migrants even declines. This may also hold for the Ashanti region to some extent.

Diversification increases with the age of the household head, but declines after the age of 55. This decline in diversification is driven by a sharp decline in non-farm sector participation in old-age. Migration increases with age, as does the average income share, which can be partly explained by migrants that serve as supporters in old-age. Over time both migration and non-farm participation increase with no particular pattern.

The gap between male and female-headed households' involvement in activities outside agriculture appears to be relatively small. Yet, when interpreting these figures it needs to be taken into account that many households are female-headed just because husbands are seasonal or long-term migrants. This is reflected in the much higher reliance on remittances of those households. The relatively small difference in terms of migration may suggest that other female-headed households (e.g. widowed or divorced) are less prone (or able) to send household members away. Non-farm involvement in 1991 is similar for male and female-headed households, as is engagement in both strategies. Yet, between 1991 and 1998 non-farm participation increases considerably more among male-headed households.

When households are disaggregated by educational achievement of the household head an interesting pattern emerges over time. The educational composition of rural households (measured by the head's education) changes considerably in the 1990s possibly reflecting the outcomes of the educational reforms outlined above. Diversification increases for all educational groups except for the best educated. Participation in local non-farm activities grows particularly strongly for household whose head has primary or secondary education. Nevertheless households

whose head has higher than secondary education (about 5 percent of rural households in 1998) are still more often found to diversify. In the 1990s, these households appear to specialise in agriculture; participation in and income from the local non-farm sector declines considerably. Another notable finding is that all other households' income share from local non-farm income increases only slightly despite much higher rates in participation.

As expected diversification rates are higher for land-poor households with less than one acre of arable land – who account for almost half of the rural population. Yet, between 1991 and 1998 households with 1-2 acres reach a similar (even slightly higher) degree of diversification. Strategies of land-poor and land-rich farmers differ. Non-farm participation rates tend to decrease with land size in both years and all groups increasingly engage in the non-farm economy. In contrast, while more land makes households more likely to have migrants in 1991, this relationship seems to break down in 1998 and migration becomes a strategy particularly strongly pursued by households with 1-2 acres. It should be noted that the increase in migration participation of this group goes along with a relatively modest rise in the remittance income share.

Most of the above household characteristics are important determinants of a households' income earning capacity. However, the observations about diversification patterns would make it difficult to a priori judge how the relationship between income and diversification would look like. Overall, we find a positive correlation between income and diversification for both years (Table 3) and for all income groups does diversification increase considerably in the 1990s. This holds for both local non-farm employment and migration. Only with regard to pursuing both strategies at once the 'diversification gap' between poor and rich households widens. In 1998, more than half of the households in the richest income quintile have migrants and pursue a non-farm activity.

More pronounced are the differences in changes in income shares between 1991 and 1998. As Table 4 illustrates, the share of income derived from farming activities declines for all income quintiles, except for the richest. This decline is most pronounced for the poorest quintile that substitutes farm especially through local non-farm income. Poorer households rely more heavily on remittance income – despite lower participation rates. This holds even more strongly in 1998 than in 1991.

\*\*\* Table 3 and 4 about here\*\*\*

In general, income shares of non-agricultural sources increase relatively little despite considerably higher participation rates. In the following, we therefore analyze in more detail the ‘intensity’ of diversification by looking at the number of household members involved in diversification activities across education, land, and income groups (Table 5). Furthermore, we roughly assess the returns to the respective activities by computing annual growth rates for income earned from different activities per migrant or per household member engaged in the non-farm sector, respectively (Table 6). The left column in Table 6 shows total household income divided by the contributors, i.e. all household farm and non-farm workers plus migrants.

\*\*\*Tables 5 and 6 about here\*\*\*

Table 5 shows that households significantly remove labour from the agricultural sector. The average number of migrants in a household doubles to 1.6 while the number of non-farm workers increases only slightly. Better-educated farm households have both more migrants and slightly more non-farm workers and for migration these differences become more pronounced in 1998. Note that we have observed above that the share of highly educated households with migrants and non-farm workers even falls between 1991 and 1998. Furthermore, the income share from agriculture and remittances rises considerably for this group, whereas the non-farm income share declines. Possibly, the intensity of diversification can be taken as a proxy for specialization and the results may hence indicate that these households are better at using their comparative advantages in migration.

With regard to land size, it is not too surprising that the average number of non-farm workers is lower for households with larger land holding – in line with the earlier findings on participation. These households also have less household members working on the farm, most likely because of the use of hired labour. Over time, no particular patterns of change arise.



The pattern for different income groups however changes quite considerably. The intensity of involvement into local non-farm activities is higher for richer households in both years, but the increase is strongest for the poorest income quintile. The average number of migrants in a household is also higher in richer households, but these differences are minor in 1991 and become much more pronounced by 1998. In contrast, the number of farm workers decreases much more for poorer than for richer households, who in general have less household members working on the farm. The average number of farm workers in a household in the lowest (highest) quintile declines from 3.1 (1.8) in 1991 to 2.0 (1.7).

Even more dramatic changes can be observed for returns to different activities.<sup>5</sup> Overall, the returns per migrant or per local non-farm worker decrease, yet, with important differences between socio-economic groups. With regard to educational groups, very interesting patterns emerge. Overall, annual per worker (plus migrant) income growth is even negative for the non-educated – driven by high negative growth rates of returns to both diversification strategies and despite considerable growth of farm income per worker. Workers in households whose head has primary or secondary education fare better in particular regarding migration, but growth rates of income from local non-farm activities are close to zero. As for the non-educated, the reduction in the average number of household members working in the farm sector is accompanied by an increase in returns. The increase in returns from diversification is highest for those with higher than secondary education, whose returns rise by very high rates.

For different land size groups, similar patterns can be observed. Land-rich (with more than 4 acres) households' per worker income grows by the highest rate with remittances income being the income component that grows most strongly. This group is also the only one with a slightly positive growth rate of returns from the non-farm sector. Particularly noteworthy is the strong correlation between land size and growth rate of remittances per migrant. Farm income per worker increases for all land-size groups alike.

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<sup>5</sup> The comparison of agricultural income growth rates between groups may be more reliable than the comparison of growth rates between different sources. It should be noted that the fairly high growth rates for agricultural income are somewhat at odds with previous findings on the performance of Ghanaian agriculture (e.g. McKay and Aryeetey, 2007). Furthermore, we would expect households to equate returns to different activities in their income portfolio, which again would not fit with some of the findings presented in the following.

These relationships between household assets and income growth are reflected in growth rates by income per capita quintiles. This implies that only for remittances per migrant a very clear pattern of growth rates can be detected. Remittances per migrant decrease sharply for the lowest income per capita quintile – at an annual rate of 4 percent. For higher income groups this growth rate is positive. Maybe somewhat unexpectedly, the picture is mixed for local non-farm activities. Only the third quintile experiences significant positive growth. For both the poorest and richest quintile income per worker from this source declines by almost 1 percent annually. Yet, the high income group has by far the highest annual growth rate of farm income per worker, leading to the highest overall growth rate of all income groups. In contrast, households in the lowest quintile are the only group that sees a decline in its farm income.

In sum, the descriptive statistics illustrate fairly large shifts in activity and income portfolios of rural households. Almost universally, rural households retreat from agricultural activities in the 1990s to engage more in local non-farm activities and/or to send migrants. These portfolio shifts seem to be driven by both motives for diversification – distress and opportunities. Asset-poor households, in terms of educational and/or land endowments, increasingly engage in the local non-farm sector and migration despite stagnating or, in some cases, dramatically falling returns from those activities. These households' diversification into activities with low or no entry barriers is hence very likely to be driven by desperation. The number of households with some assets, in particular in terms of formal (primary and secondary) education, increases significantly, as do their efforts to diversify. Although not as dramatic as for example for the non-educated, returns to diversification either stagnate or increase very modestly for this group. In contrast, asset-rich households seem to be able to diversify (or specialize) according to their comparative advantages. For example, some highly educated households even choose to engage in agriculture only. Returns from agriculture however, measured as income per household member working on the farm, do not grow more slowly for asset-poor households. Taken together, diversification by poorer households and therefore diversification of the Ghanaian economy as a whole may indeed be driven by desperation rather than growing opportunities outside agriculture.

### *Assessing change in a multivariate framework*

The above descriptive analysis hints at the dichotomy of the observed diversifying behaviour. This section aims at identifying these different motivations in a multivariate framework. Furthermore, we intend to uncover possible changes in diversification behaviour between the two surveys.

The decisions of the household to participate in either or both of the described diversification strategies cannot be analyzed uncoupled from each other. Diversification decisions are influenced by similar internal and external conditions a household faces and are certainly interdependent. Internal conditions include the composition of the household and its educational and asset endowment, in particular land. Important external conditions comprise access to infrastructure and markets. We estimate a seemingly unrelated probit model that accounts for the interdependence of decisions by allowing the disturbance terms to be correlated across equations. It is therefore superior to a separate probit estimation. We run the multivariate probit on the pooled cross-sections, including in a first stage time interactions for all explanatory variables. We then exclude time interactions that this regression renders insignificant and perform a Chow-Test on joint significance of these excluded variables. The results of this specification are reported in Table 7.

\*\*\* Table 7 about here\*\*\*

Our regression results confirm some of the standard results from the literature on the determinants of diversification. We find that migrant networks are the most important determinant of migration. The supply of labour in the household is also an important explanatory variable: Engagement in migration is likelier the more adults (migrants and household members)<sup>6</sup> belong to the household. Furthermore, population pressure is a significant determinant of migration. The higher population density the more household members seem to be pushed into migration. In the non-farm economy, involvement decreases with age of the household head and the household members as a whole. In addition, the more females of working age live on the farm, the more likely is participation in non-agricultural activities. Females often engage in

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<sup>6</sup> The number of prime-age adults measures the number of ex-ante household members, i.e. before migration.

petty trade, one of the most frequent forms of non-farm self-employment. Farm wealth is positively related to non-farm diversification. To a certain extent, farm wealth is of course endogenous to diversification, especially in the non-farm sector, as cash revenues can be used for agricultural investment. However, it is also possible that higher farm wealth characterizes households with better access to the non-farm sector and migration through reduced entry barriers. Furthermore the rural savannah<sup>7</sup> and forest dummies are only significant for 1998 concerning non-farm diversification. This might reflect the effect a drought in these regions in 1998 causing less participation in the non-farm sector. Non-farm activities in economically underdeveloped regions are most likely closely linked to the farm.

While most of the above results have been found in other studies as well, some findings merit particular consideration. In contrast to standard specifications, the choice model includes total land and land per adult equivalent separately. Total farm land may be an important asset that allows the household to overcome entry barriers, for example by providing collateral. Farm land per equivalent adult instead measures whether the household is able to supply household members adequately with food and land.<sup>8</sup> In fact we find that the likelihood of diversifying in the non-farm sector increases with total land farmed.<sup>9</sup> In contrast, the less land is available per adult equivalent the more the household is pushed into non-farm diversification. For migration, we find similar effects that are not significant at the 10 percent level.

As commonly found, completed vocational and tertiary education seems to be a valuable asset for entering the non-farm economy. This sign of opportunity-led non-farm diversification is also found by Joliffe (2004). In contrast, migration is not a strategy of households whose head has higher education. This implies that migration does not seem to offer higher payoffs to more educated individuals – assuming that household heads' level of formal education is good enough a proxy for the migrants' level. Accordingly, it would be desperation rather than opportunity that lead individuals to migrate.

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<sup>7</sup> The rural savannah region sends significantly fewer migrants. This might be due to the fact that in these regions important trade centers for the neighboring countries are present.

<sup>8</sup> This variable however would be clearly endogenous to migration if we included the number of equivalent adults after migration. We therefore again calculate the number of ex-ante adult equivalents by including migrants.

<sup>9</sup> The total effect of land farmed has to be calculated as follows:  $\beta_3 + \beta_4 \frac{1}{adultequiv}$ .

With regard to variables related to infrastructure and remoteness we find some unexpected effects. Furthermore, the strength and the sign of some of these effects tend to vary over time. We include road access as a general measure for access to infrastructure as well as market access and distance to the next public telephone and post office as a remoteness proxy. Road access, at least initially, decreases the probability to migrate, while remoteness is not a significant determinant of migration. This could reflect the lack of diversification alternatives when markets are missing. When interacted with the 1998 time dummy, the effect of road access changes sign and migration hence becomes a strategy that is increasingly pursued by households along rural roads. As expected, the effect of road access on participation in the non-farm sector is positive, albeit not significant. We find however that households are less likely to be engaged in non-farm activities in more remote areas, although this effect vanishes for 1998, as the remoteness-time interaction is of equal magnitude an opposite sign.

It hence seems that migration has become a more important diversification option for household along rural roads, while non-farm activities have spread to more remote areas. It is difficult to interpret these findings, but they may reflect increased competition in the non-farm sector alongside rural roads, which would render non-farm activities in these localities less attractive and induce more migration there. The results may also reflect growing demand for non-farm products and services in more remote areas. In contrast, remote households who already sent away younger household member may only have the option to additionally diversify into the non-farm sector. A final factor could be the role of former migration decisions and remittances for current diversification choices.

In fact, one of the most interesting results of this multivariate analysis is the change in the effect of migration networks.<sup>10</sup> Initially, we find migrant networks to decrease the probability of non-farm diversification. This most likely captures the effect of missing labour. In 1998, migrant networks however foster participation in non-farm activities. This might be explained by remittances that are invested into small and micro enterprises and/or by returning migrants. These findings hence point

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<sup>10</sup> The more common migration is in the district the more likely the household is to send away migrants. Migration networks significantly reduce entry barriers to migration as migration becomes less costly and the probability of success of the migrant might increase. The variable migrants networks gives the share of households with migrants per district for each household, excluding this specific observation/household if it participates in migration.

to important complementarities between migration and non-farm sector participation.

Overall, the regression analysis suggests that the influence of most of the drivers of diversification behaviour does not change dramatically – except for the effects of location characteristics and migrant networks. In other words, a household whose head has completed secondary education is equally likely to diversify in 1991 and 1998. Yet, there are many more of such households in 1998. Therefore, a look at changes in the explanatory variables may be informative. Table 8 provides descriptive statistics for the right-hand side variables of the above regression. In addition, to quantify the impact of those changes on diversification behaviour, we “endow” the average 1991 farmer with specific characteristics of the average 1998 farmer and calculate counterfactual probabilities. Table 9 hence shows the effects of selected important explanatory variables on participation in different diversification strategies.

\*\*\* Tables 8 and 9 about here\*\*\*

The descriptive statistics in Table 8 illustrate the significant demographic change between 1991 and 1998. The number of prime age adults increases significantly. In Table 8 we can also see the results of the acreage expansion that resulted in more farm land in 1998. However, the increase was rather small in mean. Some of the progenies of the FCUBE initiative are reflected in increased primary school completion rates. As mentioned above the infrastructural investment programs were modestly successful, but road density increased slightly.

Allocating the mean farm household of 1991 the average migrant networks of 1998 has the most sizeable effect on participation. Participation rates in non-farm diversification and involvement in migration significantly increase. When we look at the combined effect of household demographic composition on changes in participation we find smaller but also sizable effect on migration. The likelihood of participating in migration strategies rises with the number of prime-age adults.<sup>11</sup> Allocating the average farmer of 1991 with the infrastructure of 1998 significantly increases the probability of participation in migration.

The results illustrate that governmental reforms only have minor effects on

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<sup>11</sup> The likelihood of participating in the non-farm economy only declines because the household is older on average in 1998.

household behaviour, whereas the demographic transition and former migration decisions appear to have the most pronounced impact.

In sum, the regression results hint towards the existence of dichotomous diversification strategies. Households do seek opportunities outside agriculture that offer higher payoffs to their endowments, but they are also driven into diversification by desperation. For non-farm participation, this dichotomy comes out clearer while migration appears to be mainly driven by desperation. On the one hand, the positive effect of education on non-farm participation shows that human capital seems to pay in these activities. On the other hand, our results suggest that land shortages also motivate or rather force households to engage in these activities.

### *Distributional and poverty implications*

In this section we investigate the poverty and inequality implications of the above described change in income-portfolios. In 1991, about 65 percent of rural households in Ghana were poor using a 900,000 Cedis poverty line (Table 10).<sup>12</sup> Poverty dropped by 16 percentage points to 49 percent in 1998. However, this sharp decline in poverty was accompanied by an increase, albeit small, in the Gini index from 0.329 to 0.334.

\*\*\* Table 10 about here\*\*\*

For the experiment we successively substitute non-farm income, remittance income, and farm income of 1991 with the 1998 values. Non-farm income growth has a significant reducing effect on inequality (2.4 percentage points) and more pronounced on poverty (6 percentage points). Allocating the mean farmer of 1991 remittances of 1998 has no effect on inequality, while poverty declines by 2 percentage points. The growth of farm income alone is associated with a substantial reduction in poverty (9 percentage points) and a considerable increase in inequality (3.5 percentage points). Growth incidence curves (Figure 1) give a more detailed picture of whether the poor benefited overall from economic development in the three

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<sup>12</sup> Headcount and Gini indices are computed from expenditure per capita percentiles, which of course may lead to inaccuracies when compared to figures based on primary data. See also the notes on Table 9.

sectors. Broadly, expenditure growth has been fairly equally distributed. Yet, the growth incidence curve for farm income growth illustrates that agricultural income growth is around nil or even negative in the lowest expenditure quintile while it reaches around 5 percent for the richest rural households. Poorer households compensate for the lack of agricultural income growth by venturing into both non-farm employment and migration. Non-farm income grows by almost 10 percent annually for the poorest. Remittance income increases very strongly for all income groups with a peak in the growth rate around the 20<sup>th</sup> percentile of the distribution. Non-farm employment hence appears to be more accessible to the poorest of the poor than migration.

\*\*\*Figure 1 about here\*\*\*

The above counterfactual experiments illustrate the sizeable shifts in rural income composition across the income distribution. As non-farm income growth apparently benefits the poor more than the rich, one might now be inclined to claim that non-farm income growth is pro-poor: If it had not been for non-farm growth, the poor might not have seen the recorded welfare improvements. This can also be said of remittances income although its overall contribution to rural households' income is still relatively low.

## Conclusions

This paper examines growth and structural change by aggregating rural households' income portfolios and relating them to poverty and distributional outcomes in Ghana in the 1990s. Our analysis shows that Ghana's rural areas, contrary to common beliefs, have seen major economic transformation that may not be evident from national accounts statistics or from averages based on household survey data. We find that rural households increasingly diversify their livelihoods by both increased migration and more local non-farm employment. These diversification decisions seem to be driven to a large extent by desperation rather than new opportunities, in particular with regard to migration.

Our key finding is that households with a low non-labour asset-base are



increasingly *diversified and poor*. Asset-poor households, which account for an important share of the rural population, are hence likely to be ‘pushed’ into activities off the farm to meet subsistence needs. While the returns to diversification activities for these households appear to become under pressure, those earned by asset-rich, in particular highly-educated, households increase, often quite substantially. These households are hence the only group that successfully diversifies or specialises by picking those activities the household is relatively good at.

These developments are reflected in our incidence analysis. The share of income from non-agricultural sources increases considerably and, in fact, drives income growth of the poorest, whose income from agriculture stagnates. While diversification seems to be beneficial to the poor from this static perspective, our analysis may also give reasons to be concerned. High non-farm growth rates are achieved through allocating more labour to the local non-farm sector as well as migration and not by improved ‘diversification productivity’. This does probably not imply that diversification cannot provide a pathway out of poverty. Overall, there still is a positive correlation between income per capita and diversification – despite the dichotomy of diversification. Yet, there are signs that diversification is increasingly desperation-led, which is why this positive correlation tends to become weaker. Even household from better connected areas resort to migration in 1998 and non-farm activities can be found in more remote areas.

Migration seems to be an important driver of local non-farm diversification, most likely through remittances and returning migrants. In addition, the expansion of education has certainly enabled or motivated more individuals to engage in local non-farm activities. These factors may indeed allow some household to escape poverty through diversification. Yet, it is not guaranteed that remittances are used to set up a successful non-farm enterprise. Furthermore, the expansion of the better educated workforce may explain why returns to non-agricultural activities also tend to stagnate for the increasing number of better educated households – although to a lesser extent than for the poor.

Admittedly our work remains relatively silent on the mechanisms why the returns to different activities behave so differently across socio-economic groups. In our view, the paper illustrates an analytical gap in development economics – between household models, on the one hand, and labour market models, on the other. In fact,

the functioning of markets, in particular labour market in rural areas has not received much theoretical or empirical attention. The conceptual framework of opportunity vs. desperation-led diversification used in this paper closes this gap, but it certainly could do so with more analytical rigour. Therefore, more theoretical and empirical work in this direction seems to be warranted. Often, household models depart from the assumption that labour markets in rural areas are non-existent. This seems to be a strange assumption to make in light of the massive presence of non-farm self-employment at least in rural Ghana.

For policy makers, the most striking finding of our analysis may be the pro-rich bias in agricultural growth. Our analysis suggests that farm growth has been the most important source of income growth for richer income groups, thereby increasing inequality. Yet, because of its importance for all rural households it still has a considerable impact on poverty reduction. These finding certainly merit further scrutiny and policies will have to be identified that allow the poor to benefit from agricultural growth. The paper makes a strong point for focus on agriculture, as it does not seem that non-agricultural growth alone will solve the problem of rural poverty.

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**Table 1: Participation rates by households characteristics, 1991 and 1998**

	% of hh in each category		Diversifying		With migrants		Non-farm employment/enterprise		Engaging in both types of diversification	
	1991	1998	1991	1998	1991	1998	1991	1998	1991	1998
<i>Regions</i>										
All			76.3	84.9	55.0	64.0	50.0	60.3	28.8	39.4
Western	11.4	15.0	70.5	88.2	53.5	69.2	43.6	61.1	26.6	42.1
Central	13.5	12.8	79.6	91.0	55.6	68.1	57.0	70.9	33.1	48.0
Volta	1.8	0.9	73.7	88.0	34.2	79.7	52.6	64.7	13.2	56.4
Greater A	19.0	13.6	81.0	86.8	59.6	60.5	55.6	69.9	34.2	43.6
Eastern	11.9	16.5	82.4	88.7	58.0	69.2	55.2	63.9	30.8	44.5
Ashanti	18.9	14.6	79.7	86.7	63.2	70.6	49.6	57.7	33.1	41.6
Brong Ahafo	14.2	13.4	76.6	76.8	58.9	55.0	42.8	46.9	25.1	25.1
Northern	9.3	13.2	54.1	74.5	24.0	52.1	41.3	50.6	11.2	28.3
<i>Age of hh head</i>										
-25	6.5	3.8	45.6	76.3	50.0	55.3	45.6	44.9	23.5	23.8
25-35	23.4	20.5	54.7	86.2	50.2	62.3	54.7	64.1	29.2	40.2
35-55	41.8	48.2	54.4	86.7	57.0	63.7	54.4	66.9	32.3	44.0
55-	28.4	27.5	40.8	82.1	57.0	67.0	40.8	47.8	24.4	32.8
<i>Sex of hh head</i>										
male	72.7	71.5	75.3	84.8	53.2	63.7	50.3	61.8	28.2	40.7
female	27.3	28.5	78.8	85.1	59.7	64.7	49.3	56.5	30.2	36.2
<i>Highest level of education completed of hh head</i>										
none	65.2	48.3	73.4	80.9	52.6	62.0	45.9	51.9	25.1	33.0
primary	4.2	12.4	74.2	88.3	62.9	63.3	46.1	60.1	34.8	35.2
secondary	28.9	35.1	81.6	87.9	58.0	66.2	57.2	68.2	33.6	46.5
higher	1.7	4.2	100.0	95.2	74.3	70.4	97.1	90.5	71.4	65.8
<i>Land size</i>										
0-1	50.3	46.2	80.5	86.4	54.0	61.5	58.4	67.6	31.9	42.8
1-2	23.1	23.0	71.7	88.0	54.0	67.7	44.4	60.3	26.7	40.1
2-4	15.7	17.2	72.1	81.1	56.4	64.4	41.5	52.1	25.8	35.4
4-	11.0	13.6	72.7	79.4	59.7	65.7	35.9	45.5	22.9	31.8

Source: Authors' calculations.



**Table 2: Income shares of from different activities, by household characteristics**

	Share of income from					
	Non-farm		Remittances		Farm	
	1991	1998	1991	1998	1991	1998
All	38.4	38.5	4.5	6.9	57.1	54.6
All (weighted)	49.3	46.4	2.0	2.8	48.7	50.8
<i>Age of hh head</i>						
-25	35.2	32.3	4.7	6.5	60.1	61.1
25-35	42.3	45.9	3.1	4.6	54.5	49.6
35-55	41.8	46.8	3.5	4.0	54.6	49.2
55-	31.0	30.5	6.8	11.1	62.2	58.4
<i>Sex of hh head</i>						
male	38.2	42.2	2.0	3.3	59.8	54.4
female	39.0	40.1	11.2	13.2	49.8	46.7
<i>Highest level of education completed of hh head</i>						
None	34.7	35.6	5.4	7.8	59.9	56.5
primary	35.2	40.1	5.8	6.2	59.0	53.7
secondary	44.7	46.9	2.3	4.1	53.0	49.0
higher	83.7	70.3	0.3	3.9	16.0	25.8
<i>Land size</i>						
0-1	47.2	50.7	5.2	6.4	47.6	42.9
1-2	32.5	40.1	4.5	5.9	63.0	54.0
2-4	29.3	31.1	3.2	5.4	67.4	63.5
4-	23.7	26.5	2.7	6.5	73.6	67.0

Source: Authors' calculations.

**Table 3: Participation by income quintiles, 1991 and 1998**

	% of hh in each category		Diversifying		With migrants		Non-farm employment/enterprise		Engaging in both types of diversification	
	1991	1998	1991	1998	1991	1998	1991	1998	1991	1998
<i>Income Quintile</i>										
1	20.0	20.0	60.6	69.6	47.6	54.1	23.0	33.1	10.0	17.6
2	20.0	20.0	73.8	81.1	53.3	58.7	43.7	52.1	23.2	29.7
3	20.0	20.0	79.3	87.4	53.6	66.2	57.5	65.1	31.8	43.9
4	20.0	20.0	82.9	92.2	60.0	67.5	59.7	72.1	36.8	47.4
5	20.0	20.0	83.6	90.1	60.0	70.8	64.3	71.5	40.7	52.3

Source: Authors' calculations.

**Table 4: Income shares of from different activities, by income and wealth quintiles**

	Share of income from					
	Non-farm		Remittances		Farm	
	1991	1998	1991	1998	1991	1998
<i>Income Quintile</i>						
1	17.9	26.4	8.4	11.7	73.7	61.9
2	35.7	38.8	5.5	7.5	58.8	53.6
3	44.3	48.2	3.6	5.2	52.1	46.6
4	44.3	48.0	3.2	4.6	52.5	47.4
5	48.0	41.9	2.0	3.3	50.0	54.8

Source: Authors' calculations.

**Table 5: Average number of household members engaged in diversification, 1991 and 1998**

	Average number of household members working in					
	Non-farm		Migration		Farm	
	1991	1998	1991	1998	1991	1998
All	0.7	0.8	0.8	1.6	2.6	1.9
<i>Highest level of education completed of hh head</i>						
None	0.6	0.7	0.8	1.5	2.6	2.0
primary	0.7	0.8	0.9	1.6	2.4	1.9
secondary	0.8	1.0	0.9	1.8	2.4	1.9
higher	1.4	1.6	1.1	2.1	2.5	1.8
<i>Land size</i>						
0-1	0.8	1.0	0.8	1.5	2.7	2.0
1-2	0.5	0.8	0.8	1.6	2.6	2.0
2-4	0.5	0.7	0.9	1.6	2.4	1.9
4-	0.4	0.6	1.0	1.9	2.1	1.6
<i>Income quintile</i>						
1	0.2	0.4	0.7	1.3	3.1	2.0
2	0.6	0.7	0.8	1.3	3.0	2.1
3	0.8	0.9	0.8	1.7	2.7	1.9
4	0.8	1.1	0.9	1.7	2.4	1.9
5	0.8	1.0	0.9	2.0	1.8	1.7

Source: Authors' calculations.

**Table 6: Growth of income per worker from different activities**

	Growth of income per worker/migrant			
	All income 1991-98	Non-farm per worker 1991-98	Remittances per migrant 1991-98	Farm per farm worker 1991-98
All	1.0	-0.5	-0.2	4.7
<i>Highest level of education completed of hh head</i>				
None	-0.4	-2.3	-2.0	4.3
primary	1.9	-0.2	1.5	6.7
secondary	1.3	0.1	4.0	3.8
higher	5.7	3.4	29.8	15.8
<i>Land size</i>				
0-1	0.5	-0.4	-5.1	4.6
1-2	-0.3	-2.1	1.7	4.1
2-4	0.7	-0.3	4.4	2.4
4-	2.1	0.3	11.8	4.3
<i>Income quintile</i>				
1	-1.3	-0.9	-4.0	-1.6
2	0.8	0.1	-0.6	2.8
3	0.9	0.7	-2.1	1.9
4	0.6	-0.4	1.3	2.9
5	1.5	-0.9	1.3	5.7

Source: Authors' calculations.

Note: The table reports annual growth rates in percent.

**Table 7: Pooled Seemingly Unrelated Bivariate Probit**

	Migration	Non-farm
Log farm wealth	0.004 (0.004)	0.007 (0.004)*
Prime-age adults	0.207 (0.030)***	0.007 (0.027)
Log farm land	0.151 (0.102)	0.367 (0.102)***
Log land per equivalent adult	-0.161 (0.102)	-0.465 (0.100)***
Age of head	0.004 (0.002)**	-0.005 (0.002)**
Head completed primary education	0.090 (0.078)	0.072 (0.069)
Head completed higher education	0.056 (0.049)	0.302 (0.050)***
Children 0-4	-0.119 (0.025)***	0.019 (0.027)
Children 5-14	-0.070 (0.023)***	-0.012 (0.021)
Adults 60 plus	0.069 (0.050)	-0.095 (0.052)*
Percentage of female prime-age ad.	0.123 (0.075)	0.191 (0.070)***
Road Dummy	-0.168 (0.093)*	0.109 (0.080)
Kilometres to next post off. / telephone	-0.001 (0.001)	-0.009 (0.003)***
Percentage of households with migrants per district	1 021 (0.129)***	-0.456 (0.183)**
Population density	0.308 (0.170)*	0.391 (0.294)
Dummy forest region	0.045 (0.064)	-0.136 (0.109)
Dummy savannah region	-0.199 (0.084)**	-0.119 (0.146)
Road * d98	0.232 (0.125)*	
Dummy 1998 (d98)	-0.135 (0.111)	-0.275 (0.185)
Kilometres to next post off. / telephone *d98		0.008 (0.003)**
Percentage of households with migrants per district*d98		1 012 (0.322)***
Dummy forest region*d98		-0.262 (0.157)*
Dummy savannah region*d98		-0.347 (0.209)*
Constant	-1 062 (0.146)***	-0.184 (0.177)
Observations	4973	4973

Source: Authors' calculations.

Notes: The table reports marginal effects (in case of dummy variables from 0 to 1) and the corresponding standard errors. \*, \*\*, \*\*\* denote significance at the 0.1, 0.05 and 0.01 levels respectively.

**Table 8: Descriptive statistics of determinants 1991-1998**

	1991	1998		1991	1998
Prime-age adults	2.61	3.22	Percentage of female prime-age ad.	0.54	0.54
	<i>0.04</i>	<i>0.06</i>		<i>0.01</i>	<i>0.01</i>
Farm land	7.00	7.27	Road Dummy	0.81	0.86
	<i>0.48</i>	<i>0.37</i>		<i>0.03</i>	<i>0.03</i>
Land per equivalent adult	1.89	1.91	Kilometres to next post off. / telephone	15.64	17.91
	<i>0.11</i>	<i>0.13</i>		<i>1.13</i>	<i>2.08</i>
Age of head	45.11	46.29	Percentage of households with	0.45	0.48
	<i>0.39</i>	<i>0.39</i>		<i>0.02</i>	<i>0.02</i>
Head completed primary education	0.04	0.11	Population density	0.16	0.14
	<i>0.01</i>	<i>0.01</i>		<i>0.01</i>	<i>0.01</i>
Head completed higher education	0.31	0.36	Dummy forest region	0.53	0.50
	<i>0.01</i>	<i>0.02</i>		<i>0.03</i>	<i>0.04</i>
Children 0-4	0.80	0.74	Dummy savannah region	0.23	0.30
	<i>0.02</i>	<i>0.03</i>		<i>0.03</i>	<i>0.04</i>
Children 5-14	1.49	1.58			
	<i>0.04</i>	<i>0.05</i>			
Adults 60 plus	0.31	0.33			
	<i>0.01</i>	<i>0.02</i>			

Source: Authors' calculations.

Notes: Mean values, standard deviations in bold.

**Table 9: Illustrative simulations of contributions of different determinants to changes in diversification outcomes, 1991 to 1998**

	Probability of diversifying into	
	non-farm	migration
Average 1991 farmer	54.7	55.9
Average 1998 farmer	61.8	67.8
<i>Percentage point change in probability (compared to average 1991 farmer)</i>		
with 1998 land endowments	1.8	0.7
with demographic characteristics of 1998	-0.3	5.3
with 1998 migrant network	17.9	1.9
with 1998 infrastructure (road and telecom)	0	8.9

Source: Authors' calculations.

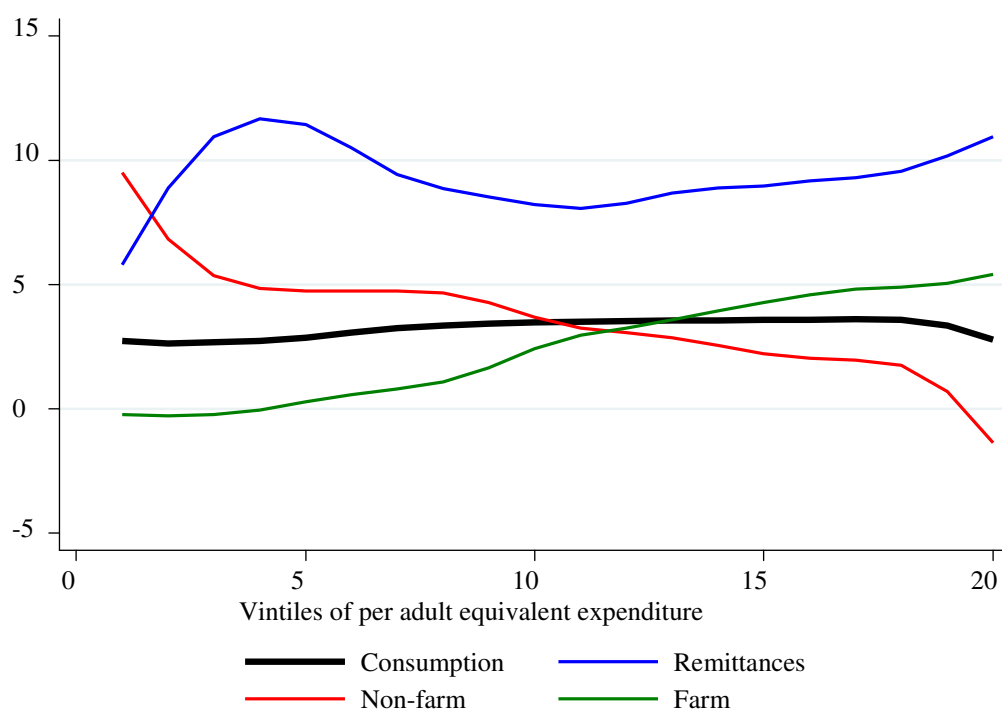
**Table 10: Poverty and distributional implications of income growth by source, illustrative simulations**

	Gini	Headcount
<i>Initial levels</i>	32.9	65.0
<i>Percentage point changes</i>		
overall 1991-98	0.5	-16.0
only nonfarm growth	-2.4	-6.0
only remittances growth	0.4	-2.0
only farm growth	3.5	-9.0

Source: Authors' calculations.

Note: Incomes by source are calculated by multiplying the income share with household consumption to reduce the influence of outliers that seem to be present. The 'simulations' are based on expenditure percentiles. For example, in the 'only non-farm growth' row, each 1991 percentile group is given the 1998 non-farm income of the respective percentile.

**Figure 1: Growth rates of adult equivalent income by source (annual growth rates)**



Source: Authors' calculations.

Note: The graphs plot per adult equivalent income growth by source. Income sources are calculated as in Table 9. The graphs are based on smoothed curves on vintile averages. More details are available from the authors.