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Few Opportunities, Much Desperation: The Dichotomy of
Non-agricultural Activities and Inequality in Western Kenya

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Abstract. —Using data from Western Kenya, we confirm the existence of a dichotomous non-agricultural sector. The poverty and inequality implications of the differently motivated diversification strategies only partly correspond to expected patterns. While high-return activities are indeed confined to richer households, low-return activities constitute an important income source for households across the entire income distribution. Finally, we examine the wider implications of our findings for rural livelihoods. We find that only engagement in high-return non-agricultural activities is significantly associated with increased agricultural productivity. It seems that such high-return activities play a key role in triggering cumulative effects of relative livelihood success.

Key words — income diversification, non-agricultural activities, inequality, agricultural productivity, sub-Saharan Africa, Kenya

1. INTRODUCTION

A number of studies have shown that rural households in sub-Saharan Africa derive their incomes from a variety of sources with non-agricultural activities accounting for a substantial share of total income.[1] Despite the importance of non-agricultural activities for rural farm households, we still know little about the impact of such activities on the distribution of income and, hence, on poverty.

Broadly, one may classify diversification strategies of rural households as survival-led or opportunity-led. It has been observed that poor households with low asset endowments embrace multiple livelihoods, in particular engagement in non-agricultural activities, to ensure survival. These households are forced to diversify mainly because they lack sufficient agricultural assets to sustain subsistence (Reardon & Taylor, 1996; Haggblade et al., 2005). Returns to these activities may well be below those in agriculture. At the same time, richer rural households with higher asset endowments will choose to diversify their livelihoods to maximize returns on their assets. Such activities will have at least the same returns as agricultural activities and exhibit entry barriers that the poor are not able to overcome.

The existence of these two types of non-agricultural activities implies a U-shaped relationship between the share of income derived from non-agricultural activities and household wealth as well as household income. The poverty and distributional impact of non-agricultural incomes should hence be ambiguous: Survival-led engagement in non-agricultural activities should be inequality-decreasing through increasing the incomes of the poorer parts of the population and hence reduce poverty. Opportunity-led diversification, however, should increase inequality and have a minor effect on poverty, as it may be confined to non-poor households. Some authors have pointed to this ambiguity (e.g. Ferreira & Lanjouw, 2001; Haggblade et al., 2005), but only few, e.g. Elbers and Lanjouw (2001) for rural Ecuador, explicitly address the relationship between different diversification strategies, on the one hand, and poverty and inequality outcomes, on the other. This paper intends to fill this gap by providing evidence from sub-Saharan Africa. We test for the dichotomy of the non-agricultural activities and examine their distributional consequences using household survey data from Kakamega district in Western Kenya that can be considered as representative for the densely populated rural areas of many parts of Eastern sub-Saharan Africa.

We proceed as follows. In the first section we shortly review the theoretical and empirical literature on non-agricultural activities and their poverty and distributional implications. Then, we provide evidence on the incidence and characteristics of the non-agricultural economy in the study region. Subsequently, we present the results of the choice model and, based on this typology of non-agricultural incomes, examine the poverty and inequality implications. We then briefly examine the relationship between the different non-agricultural activities and agricultural productivity. The last section concludes with policy implications and an outlook for future research.

2. THE RURAL NON-AGRICULTURAL ECONOMY:
THEORY AND EMPIRICS

The non-agricultural economy involves employment outside the realm of direct soil cultivation and cattle breeding and includes activities such as services, construction, mining, commerce, manufacturing and processing. Such activities are often pursued through self-employment, but there is also a non-agricultural wage labor market, although this market is typically small in the rural sub-Saharan African context. The contribution of these activities to household income in the developing world in general and sub-Saharan Africa in particular is substantial. Haggblade et al. (2005) observe that non-agricultural 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. Jayne et al.'s (2003) estimates for five sub-Saharan African countries lie between 8.1 percent for Ethiopia and 40 percent for Kenya.

(a) Low- vs. high-return activities and drivers of participation

Rapid population growth and the related pressure on the natural resource base, in particular land, have been identified as major causes for the rise of non-agricultural activities in sub-Saharan Africa.[2] Other driving forces are supply factors, such as technological advances and the expansion of educational attainment, as well as demand shocks, including higher per capita incomes and increased demand for non-food goods and services (Reardon, 1997).

In order to understand how these variables affect the participation in and patterns of non-agricultural employment and the related incomes, it is useful to differentiate between survival-led and opportunity-led diversification into non-agricultural activities.

When non-agricultural diversification is pursued to ensure survival, for example because of land constraints, it is also referred to as distress-push diversification (cf. Islam, 1997; Reardon et al., 2000; Barrett, Reardon & Webb, 2001). Such diversification will be in low-return non-agricultural activities and may be an indication that the non-agricultural sector is absorbing labor that cannot be employed in agriculture. In contrast, rural households may face new opportunities outside agriculture because of technological advances, the intensification of links with markets outside the local economy, or local engines of growth, such as commercial agriculture or proximity to an urban area.[3] If non-agricultural income diversification can be traced back to such factors, it is also regarded as demand-pull diversification.

While the aggregate prevalence of the specific type of non-agricultural diversification in a region (or country) will hence be driven by meso (or macro) determinants, household characteristics will

decide on the individual household's diversification decision. The literature has stressed asset availability and educational endowments as key participation determinants of non-agricultural diversification (Abdulai & CroleRees, 2001; Barrett, Reardon & Webb, 2001; Escobal, 2001; Matsumoto et al., 2006). Whereas entry barriers to low-return diversification should be low, they can be considerable for high-return activities. In the presence of underdeveloped credit markets, the latter 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 & Aboud, 2000). Skill requirements may impose another important entry constraint (Dercon & Krishnan, 1996; Reardon, 1997). Some high-return non-agricultural activities such as skilled wage employment are restricted to those with formal education.[4]

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, 2002; Francis & Hoddinott, 1993). For our discussion, 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 labor 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.

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 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.

The empirical literature on the rural non-agricultural economy has emphasized the drivers of participation in these activities at the individual, household, and community level. Some of the empirical contributions have distinguished between low- and high-return activities in doing so. Studies in sub-Saharan Africa, Asia, and Latin America have confirmed that the level of formal education is positively correlated with participation in non-agricultural activities, in general, and high-return activities, in particular (Ferreira & Lanjouw, 2001; Lanjouw, 2001; van den Berg & Kumbi, 2006). Land and other productive assets have also been demonstrated to be important determinants of different types of diversification strategies (e.g. Seppala, 1996; Elbers & Lanjouw, 2001; Marenya et al., 2003). For instance, Elbers and Lanjouw (2001) show that land scarcity is a driving force of 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 & Reardon, 2001; Reardon, 1997; van den Berg & Kumbi, 2006). On the one hand, a larger household size enables households to supply more labor to non-agricultural activities, since sufficient family members remain at home to meet labor demands for agricultural subsistence. On the other hand, however, large households are also more likely to suffer from land constraints. Thus, they might find themselves forced to engage in non-agricultural activities to ensure survival. 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 (Jalan & Ravallion, 2002; Lanjouw & Feder, 2001).

(b) Non-agricultural incomes, poverty and inequality

There are limited empirical accounts of the relationship between farm households' income composition and inequality, in particular for sub-Saharan Africa.[5] Moreover, most existing studies do not distinguish between different types of non-agricultural activities (e.g. Adams, 2002). From the above discussion, it has become apparent that the equity impact of non-agricultural employment depends on the type of activity. Early work on the informal sector (ILO, 1972) claims that, given their intrinsic characteristics, such as easy entry, non-agricultural activities will decrease income inequalities, particularly through self-employment. While low-return activities undertaken by poorer households should hence be inequality-decreasing, high-return activities may well increase inequality, as they tend to reinforce asset inequalities. Accordingly, Haggblade et al. (2005) observe that because of the differing equity impact of various segments of these activities, their overall effect on income distribution remains mixed. Thus, depending on the nature and motivation of non-agricultural activity undertaken, aggregate non-agricultural earnings improve equity in some instances, while they aggravate inequality in others.

This explains the differing results of empirical studies on the equity impact of non-agricultural activities. In fact, most empirical studies tend to find that non-agricultural incomes go primarily to the better-off so that higher non-agricultural incomes (as opposed to more non-agricultural income earners) are associated with higher income inequality. For example, case studies on Burkina Faso by Reardon et al. (1992) and on Ecuador by Elbers and Lanjouw (2001) find that the income share from non-agricultural sources increases with per capita income. For Mexico, de Janvry and Sadoulet (2001) show non-agricultural wages to be inequality-increasing, while non-agricultural self-employment tends to decrease inequality. Some empirical studies show an inequality-decreasing effect of non-agricultural activities, e.g. by Norman et. al. (1982) on rural households in Northern Nigeria, Adams (2002) on Egypt, or van den Berg and Kumbi (2006).

It is likely that these seemingly contradictory findings could be reconciled by an analysis of the underlying type of non-agricultural activities. Once this is understood, the conditions that drive the

prevalence of one type of non-agricultural activity or another should be addressed, as they eventually represent the fundamental causes of the inequality implications. According to Reardon et al. (1998) such conditions include the proximity to urban markets, physical and market infrastructure, resource endowments and the distribution of productive resources within rural areas. In the following, we will (i) assess which kind of activities prevail in the poverty-ridden context that we have studied and (ii) examine whether the poverty and distributional consequences correspond to the patterns one could expect under the specific conditions in the study region.

3. THE PATTERNS OF NON-AGRICULTURAL ACTIVITIES IN KAKAMEGA

The data for our analysis come from a household survey which was conducted in Kakamega district, a densely populated and poor rural area of Western Kenya, in the last quarter of the year 2005. In this year, Kakamega district had a population of about 700,000 with a mean population density of approximately 500 persons per square kilometer. The largest urban agglomeration in the region, the district capital Kakamega Town, has a population of about 85,000, which only partly resides in a strictly urban setting. The region is considered to have good agricultural potential, yet population growth and further subdivision of land has led to land fragmentation and extremely small farm sizes in parts of the district. These developments have also caused high rates of out-migration.[6]

The survey was designed with a focus on economic activities of rural households in both agriculture and non-agricultural sectors. This focus allows for a very detailed analysis of these activities that accounts for regional specificities. Yet, it also constrains the subsequent empirical analysis to those characteristics and leaves out many social and cultural aspects that certainly play a role in determining activity choices and hence welfare outcomes. Only some of those aspects can be captured in a proximate way in the following empirical setup, for example the socio-culturally determined control over household resources.

The survey used a two-stage sampling technique and covered 375 households with a total of 1950 household members, which were spread over 20 clusters. One cluster, however, was excluded from our sample as it was mainly inhabited by teachers who had been sent to the study region.[7] Six of the remaining clusters were located in urban or peri-urban areas. Nevertheless, households in these clusters derive a substantial amount of their income from agriculture-related activities and therefore form part of our sample. It is important to note that this paper focuses on locally conducted non-agricultural activities. This is why non-agricultural activities, as used subsequently, exclude migration, another important diversification strategy of rural households in the region.

In the following, we give an overview of the structure of household income and non-agricultural employment patterns in the study region, taking into account the different character of low-

return and high-return non-agricultural activities. In contrast to other authors, e.g. Ferreira and Lanjouw (2001) who define high-return non-agricultural activities as those whose monthly returns are above the poverty line our definition of such activities takes a different approach. On the one hand, activities based on self-employment are considered to be high-return activities if the household enterprise employs at least one hired worker or two household members. Given the rural character of the Kakamega district, such-defined enterprises can well be assumed to generate higher incomes than remaining in traditional agricultural activities. On the other hand, the definition of wage-based high-return activities draws on specific sectors which typically exhibit entry constraints. In our view, these entry barriers should not only encompass special skills or asset requirements, but also such simple hurdles like a clean and healthy appearance, which some poor households may well not be able to overcome. Accordingly, the following sectors offer high-return wage employment in the study region: repair of motor vehicles, medical services, hair dressing and beauty, churches/NGOs/international organizations, and hotels and restaurants. This definition is bolstered by the fact that high-return wage employment can only be found as primary occupation and not as a secondary one for all individuals in the sample. It is important to note that we exclude employment in the public sector from our analysis. Entry barriers in this segment are likely to be very different from those in other high-return activities, as public employment is often arranged by nepotistic and corrupt structures.

All remaining forms of non-agricultural employment, i.e. household enterprises which are run by one household member only and wage employment in non-agricultural sectors other than those mentioned above, constitute the group of low-return non-agricultural activities. With this definition of low-return and high-return non-agricultural employment, we believe to adequately reflect the idea of survival-led and opportunity-led income diversification.

Table 1a shows the participation rates of households in different types of activities. It reveals that households in Kakamega district earn income from a variety of activities.[8] As can be expected for a rural region, the vast majority of the households (86 percent) work at least partly in agriculture. Still, 46 percent engage in low-return and 20 percent in high-return non-agricultural activities. In addition, migration is a common phenomenon in the area. A fourth of all households reports income in the form of remittances.

Table 1b presents a matrix of agricultural and non-agricultural income-generating activities of households. The rows show in which activities households are engaged *in addition* to the activities indicated in the columns. Accordingly, households on the diagonal line do not diversify their income sources.

tables 1a and 1b about here

Out of all farming households, only 26 percent are fully specialized in agriculture, while about 55 percent diversify into non-agricultural activities, primarily into low-return activities. With a participation rate of 26 percent, migration is also an important diversification strategy of agricultural

households. Non-agricultural income constitutes the sole income source for roughly 17 percent of all households. This relatively high proportion is principally due to the fact that our sample still includes the urban and peri-urban clusters to give a more complete overview of the income-generating activities in the study region. Moreover, the table illustrates that more than a third of the households engaged in high-return activities in the non-agricultural sector also pursue some low-return activity. Among the households with non-agricultural activities, about 18 percent also report receiving remittances.

Since the focus of this paper is on rural income diversification, we now confine our sample to households which have access to at least half an acre of land and engage in agricultural activities. This step makes the sample more likely to include only those households which diversify out of agriculture and not the ones which have some limited supplementary agricultural activities. Virtually all excluded households are from urban or peri-urban areas.

Based on this sample, we compile a detailed profile of non-agricultural activities in Kakamega district, which clearly reveals that the rural non-agricultural sector is dominated by low-return activities and provides relatively little space for high-return activities. In addition, most of the non-agricultural activities take the form of household enterprises. In total, we find 136 such enterprises in the sample, 99 of which belong to the low-return segment. This compares to 37 wage-employed individuals, out of which 19 are in the low-return segment. Thus, in the case of wage employment the frequency of low-return and high-return activities seems to be roughly equal.

As regards high-return wage employment, all recorded activities belong to the service sector. Most individuals work with churches, NGOs or international organizations, followed by hotels and restaurants. Interestingly, the same number of men and women are engaged in these activities, suggesting that both sexes have equal access to them. In contrast, low-return wage employment seems to favor men as it often requires physical strength though most activities again belong to the service sector. Only four out of the 19 individuals in this segment of non-agricultural employment are women. The most frequent low-return wage activities include security, food production, and retailing. Women, however, are solely active in retailing, house-help, and informal services.

Micro and small businesses are involved in a fairly wide range of activities, primarily retailing, informal services such as shoe-shining and washing, boda-boda transportation[9], and construction. Only in the sphere of retailing can we find a concentration of both low-return and high-return household enterprises. This suggests that low-return and high-return businesses operate in relatively segmented markets. Informal services and boda-boda transportation are exclusively provided by low-return enterprises, whereas formal services and food production are clearly dominated by high-return businesses. Some manufacturing activities can be observed in non-agricultural self-employment. These comprise food production, carpentry, and the manufacturing of textile products.

We now turn to the analysis of the determinants of rural non-agricultural employment in the study region. First, we inspect the shares of income from agricultural and non-agricultural activities by

basic characteristics of the household head and the household itself. Subsequently, we estimate a multivariate choice model of participation in different types of non-agricultural activities.

Table 2 presents income shares from different sources tabulated by some key determinants of participation in non-agricultural activities.[10] Overall, income from non-agricultural activities constitutes a major source of income in rural areas of Kakamega district, accounting for 23 percent of total household income on average. Yet, this share is below the averages that have been found in similar studies for sub-Saharan Africa.

table 2 about here

We find that throughout all age groups of the household head agriculture remains the dominant income source, as it always accounts for at least half of all household income. As the age of the household head rises, however, the share of agricultural income increases significantly while the share of income from non-agricultural employment drops sharply. This observation is true for both low-return and high-return non-agricultural activities though the share of low-return income is consistently higher than the share of high-return income. We may relate this pattern to the fact that under traditional land subdivision and inheritance norms older household heads have better claim to land resources (Jayne et al., 2003). This gives them a head start when it comes to agricultural activities, whereas younger household heads will have to embrace non-agricultural strategies to secure their livelihoods.

Looking at the sex of the household head, the table shows that households with a female head earn considerably lower income shares from both types of non-agricultural activities. Given the lower number of adult members in female-headed households and the numerous tasks of their heads in agriculture, housekeeping and child-rearing, these households' ability to engage in non-agricultural employment is likely to be limited.

The share of non-agricultural income does not rise with the level of formal education and accounts for roughly 25 percent of total household income. With 16 percent, however, this share is considerably lower in the case of household heads without any formal education at all. Yet, the actual relationship between non-agricultural income and educational attainment is clouded by the dichotomy of the non-agricultural sector.[11]

The tabulation of the share of total non-agricultural income with total land holdings generates a U-shaped relationship. Whereas households with low endowments of land earn about 27 percent of their income from non-agricultural activities, this share falls to 19 percent for medium-endowed households, and then rises again to 23 percent for households that are highly endowed with land. A separate inspection of the shares of income derived from low-return and high-return activities again reveals the two-pronged diversification behavior. The share of income from low-return activities drops sharply with increasing landholdings. The opposite effect is observable for the income share of high-return activities. For many households in sub-Saharan Africa, land is a key asset and serves multiple

uses including cultivation, sustaining livestock, storing wealth, and providing collateral for financial credit. The findings hence support the notion that declining farm sizes and related declines in soil fertility force land-poor households to diversify into non-agricultural employment to ensure survival. At the same time, higher land endowments may enable households to diversify into high-return activities as land may serve as collateral for credit or simply provide higher cash flows from agriculture for the necessary start-up capital.

Even in our restricted sample, the share of non-agricultural income considerably varies with the location of the household. Whereas rural households earn about 21 percent of their income in the non-agricultural sector, the corresponding figure climbs to 35 percent for households in peri-urban areas. In particular income from high-return activities plays a more important role for households in those places. This lends credence to the notion that rural non-agricultural activities are closely linked to the infrastructural benefits in the urban areas, which also provide access to markets and linkages to the formal sector.

With the results of the univariate analysis above in mind, we now turn to a multivariate choice model to shed more light on the possible determinants of engagement in the rural non-agricultural sector. This allows us to consider individual choice determinants beyond the household head's characteristics and to test whether the univariate results also hold once we control for other factors. We estimate a multinomial logit model where we allow individuals (not households) to choose between the two types of non-agricultural activities and staying on the farm. The results are presented in Table 3. The table reports odds ratios of low-return and high-return non-agricultural activities vis-à-vis agricultural ones in the first two columns and the odds of choosing high- vs. low-return activities in the last column. In line with the theory outlined above and existing empirical work, the set of explanatory variables comprises individual characteristics, such as age, gender, position in the household and formal education, and household composition variables. It also includes household assets, such as land and livestock, and a dummy indicating whether or not a household receives remittances. In addition, the distance to the nearest access road and an urban dummy are used as proxies for access to infrastructure and markets. We expect the diversification behavior of sugarcane farmers to be different from other farm households as the period between the cash flows from sugarcane harvests can be longer than three years.[12] Given this cycle and lacking access to financial markets, we expect sugarcane farmers to invest their considerable cash income in non-agricultural activities, particularly in the high-return segment, in order to smooth their income. Sugarcane farmers, however, may also be forced into the low-return segment once the last harvest's cash has been consumed.

Since the two types of non-agricultural activities might be more similar than staying on the farm, we test for independence of irrelevant alternatives using the Hausman test. The null hypothesis, i.e. the odds of choosing between alternatives a and b are affected by the existence of alternative c, can

be rejected at the one percent level. Hence, the test does not reject our hypothesis of the different characteristics of low-return and high-return non-agricultural activities.

table 3 about here

Most effects of the included explanatory variables have the expected sign, but some variables do not turn out to be significant. Yet, the analysis also yields some unexpected results that we will try to explain below. The effect of age corresponds to expectations, as younger individuals are more likely to be engaged in both low- and high-return non-agricultural activities rather than in agriculture. The reported odds ratios of 0.97 and 0.95 imply that the odds of being engaged in non-agricultural activities decrease by three percent for low-return and five percent for high-return activities for a unit change in the predictor, i.e. for one additional year of age. According to the estimation, age does not seem to affect the choice between low- and high-return activities.

The position of a member in the household is quite important in choosing a non-agricultural activity. Household heads are considerably more likely to take up a high-return activity as compared to both a low-return or agricultural activity. Yet, agricultural activities still seem to be more attractive to them than engaging in the low-return segment of the non-agricultural sector. The latter effect, however, is not significant. This finding may suggest that the control over resources, as typically exerted by the household head, could be crucial for building up the necessary start-up capital to invest into high-return activities. Hence, the decision to diversify into such activities may not solely be taken at the household level, but also reflect individual considerations and possibilities. In view of that, it is not surprising that household composition variables with the exception of the number of young adults do not appear to be important for the decision to diversify.

With regard to gender, we find that females are more than twice as likely to engage in the high-return non-agricultural sector as in agriculture. Yet, this observation is only close to being significant. In contrast, being female does not seem to be associated with involvement in low-return activities. Interestingly, we find different effects for individuals who live in female-headed households. Individuals from these households are much less likely to participate in high-return non-agricultural employment as compared to agriculture. If they participate in non-agricultural activities, they do so in the low-return segment.

In contrast to expectations, education seems to have a significant positive impact on entering low-return non-agricultural employment only. Although the odds ratios indicate a stronger effect of education on the probability of taking up a high-return activity rather than being in agriculture, these results are not significant. Taken together, the effects of education, derived from multivariate analysis, are quite different to those from the univariate analysis above. Apparently, education is correlated with other observed characteristics, for which we already control in our estimation framework. Thus, the additional impact of education seems to be limited when it comes to provide the skills necessary to grasp the few business opportunities available in the study area. Barrett et al. (2006) make very similar

observations about the difficulties of school leavers to find remunerative employment in Vihiga district that neighbors Kakamega. They relate this observation to the considerable decline in Kenyan public sector employment and infrastructure in the region.

Our analysis considers two types of assets, land and livestock holdings. To better capture the potentially non-linear effects of landholdings, we split the households into three groups: households with landholdings between 0.5 and 1.5 acres, between 1.5 and 3.5 acres, and larger than 3.5 acres. We use households in the second group as reference category. We find that the likelihood of engaging in low-return non-agricultural vs. agricultural activities is almost twice as high for individuals in households with few landholdings. As hypothesized, we find the opposite effect for diversification into high-return activities. Individuals in households with large landholdings are more than twice as likely to engage in the high-return segment of the non-agricultural sector. This supports the view that land endowments play a key role in explaining both survival-led and opportunity-led diversification strategies. Land size, however, turns out to be insignificant, when considering the odds of engaging in high vs. low-return activities. It is also interesting to note that not having a title deed is also a significant predictor for choosing low-return instead of agricultural employment. More secure land rights hence seem to provide an incentive for people to engage more heavily in agriculture. The effects for livestock holdings are very similar to the ones observed for land holdings. Higher values of livestock seem to increase the odds of diversifying into high-return activities. The reverse is true in the case of low-return activities. All in all, the asset variables clearly support our hypothesis on the dichotomous character of the non-agricultural sector.

Since migration is a wide-spread phenomenon in Kakamega district, remittances may be commonly used to invest into non-agricultural enterprises. Our results, however, suggest that receiving remittances is not associated with either form of non-agricultural activities.

For sugarcane farmers, we find the expected effects. Growing a profitable crop, they are less likely to involve in the non-agricultural sector. Yet, the period that has passed since the last sugarcane harvest seems to have a significant positive impact on participation in either type of non-agricultural activity.

The effects of infrastructure are less clear-cut. Whereas being located in an urban area appears to considerably increase the likelihood of high-return non-agricultural employment, the distance to the nearest access road does not seem to play a role in the decision to involve in non-agricultural activities. Yet, better access to markets also implies that it is easier to sell agricultural produce, thereby making agriculture a more profitable activity.

The investigation into the patterns of non-agricultural activities in Kakamega district has shown that income diversification is a widely observed phenomenon and that non-agricultural income contributes significantly to income earned by farm households. We observe that households primarily pursue low-return non-agricultural activities. The results of the multinomial logit model lend support to the

hypothesized dichotomy of non-agricultural activities and point to the existence of entry barriers to high-return activities.[13] We now turn to the analysis of the distributional implications of these different diversification strategies and test for the existence of virtuous spirals linked to high-return activities.

4. POVERTY, INEQUALITY, AND VIRTUOUS CIRCLES

Table 4 shows the participation rates in non-agricultural activities and the respective income shares by per adult equivalent expenditure quintiles. Note that the income share is calculated only for those households that engage in the non-agricultural sector. Surprisingly, participation in low-return activities is not concentrated among poor households. In fact, participation is even lowest among households in the poorest quintile, peaks in the second and third quintile, and is still around 40 percent in the two highest quintiles. Yet, despite relatively low participation, the income share derived from low-return activities is by far the highest for households in the poorest quintile. With increasing living standards, this share declines considerably. As regards high-return activities, barriers seem to effectively exclude the poorest households from such diversification strategies. Only starting from the second quintile do households pursue high-return activities. Participation in the high-return sector as well as the derived share of income then increase strongly with higher consumption levels.

     table 4 about here

     To better understand the inequality implications of the different types of non-agricultural activities, we decompose the Gini coefficient of income inequality by income source, using the approach described in Lerman and Yitzhaki (1985) and in Stark, Taylor and Yitzhaki (1986). The decomposition allows us to determine the impact that a marginal change in a particular income source would have on overall inequality. The results are reported in Tables 5a and 5b. The last column of the two tables refers to the point change in the Gini that would be brought about by a one percent increase in the respective income source. Three additional elements are included in the result tables: The share of each income source in total income, the Gini of the income source, and the correlation of income from the respective source with a household's per adult equivalent total income rank. Table 5a considers both diversifying and non-diversifying households whereas Table 5b only looks at diversifying households.

     tables 5a and 5b about here

     Despite the significantly lower participation rates for high-return activities, both tables show that the total income share of high-return activities is not much lower than that of low-return activities. The previous observation that participation in the high-return sector increases with living standards is reflected in the strong correlation of high-return income with the rank of per adult equivalent total income. The source Ginis (0.88 and 0.93) demonstrate that income from high-return activities is the most inequitably distributed source of income. Accordingly, we find that a percentage change in

income associated with high-return activities brings about a remarkable rise in inequality (Gini elasticities of 0.106 and 0.062).

In contrast, the source Ginis for income from low-return activities (0.70 and 0.83) are markedly lower. This echoes the fact that income from low-return activities constitutes an important income source for households across the entire income distribution, which can also be seen by the relatively low correlation of low-return income with the rank of total income. Consequently, the effect of a marginal increase in low-return income on overall inequality is small (Gini elasticities of 0.009 and 0.022).

Agricultural income, in contrast, stands out as the most equitably distributed source of income. A marginal increase of agricultural income would even result in a sizeable reduction of overall inequality. This mirrors the earlier finding that for the poorest quintile overall participation rates in the non-agricultural sector are particularly low.

We now examine the impact of changes in a particular income source on different poverty measures. For this purpose, we increase a household's income from the respective sources by 50 percent to create sizeable poverty effects. We then calculate the corresponding per adult equivalent amount of this additional income and add it to the actually observed per adult equivalent expenditure level. Table 6 summarizes the results. The first and the second column show the poverty headcount and the average normalized poverty gap before increasing the respective incomes. The third and fourth columns present the resulting changes in the poverty measures after the simulated income increases.

table 6 about here

The table illustrates that the Kakamega district is indeed a very poor region. The overall headcount ratio is about 76 percent with an average normalized poverty gap of 45 percent. On average, households involved in non-agricultural activities fare considerably better. However, the dichotomy of the non-agricultural sector is strongly reflected in poverty outcomes. Whereas 72 percent of people living in households which are engaged in low-return activities are below the poverty line, the headcount for their counterparts in high-return activities is considerably lower, but still amounts to 63 percent. In addition, the average normalized poverty gap is markedly smaller for the latter households. The poverty headcount of low-return diversifiers is thus comparable to the headcount of all households. Yet, the intensity of poverty, measured by the poverty gap, is much lower for households that are active in the low-return non-agricultural sector. This again reflects the fact that the poorest households engage relatively less in this sector.

A 50 percent increase in incomes from all non-agricultural activities would result in a 3.14 percentage point decrease in the overall poverty headcount and a 3.24 percentage point decrease in the poverty gap. The bulk of this poverty reduction would be attributable to higher earnings from low-return activities which alone would reduce the headcount by 2.42 and the poverty gap by about 2.18 percentage points. The corresponding figures for incomes from the high-return sector are 0.33 and 1.08

percentage points, respectively. The relatively large poverty reduction potential of low-return activities becomes even more apparent when examining the poverty effects for households involved in the low-return and high-return non-agricultural sector separately. A 50 percent rise in incomes from low-return activities would reduce the poverty headcount by 5.67 and the average normalized poverty gap by 5.11 percentage points for households which engage in the low-return sector. This compares to 1.80 and 5.97 percentage points if the same exercise is undertaken for households with high-return activities. The larger simulated poverty impact for incomes from low-return activities reflects the participation rates and income shares observed above. These activities constitute an important source of income throughout the entire income distribution.

A more detailed view on the distributional consequences can be obtained by looking at growth incidence curves, which plot the growth impact of a 50 percent rise in non-agricultural income on per adult equivalent income by per adult equivalent income vintiles (figures A1 and A2 in the appendix). Considering all households, figure A1 shows that by and large increasing incomes from low-return activities would be rather pro-poor. Among the poorer half of the sample, per adult equivalent income increases by roughly eight percent. Only from the tenth vintile upwards, does the growth rate consecutively drop to reach less than four percentage points for the highest expenditure vintile. In contrast, the growth incidence curve for high-return activities is almost strictly pro-rich.[14] Whereas the poorest households are virtually excluded from this segment of the non-agricultural sector, the richest vintiles would experience a per adult equivalent income growth rate of about five percentage points. This low growth rate reflects the relatively low participation rates and low income shares even among the very rich. All in all, households in the middle of the income distribution would profit most from an overall increase in non-agricultural incomes.

The picture changes, in particular for low-return activities, when only considering diversifying households. Then, rising incomes from low-return activities would be strictly pro-poor while an increase in incomes from high-return activities would be strictly pro-rich. However, given the relative dominance of the low-return sector in the study region, the growth impact of high-return activities would be much lower than the corresponding growth impact of low-return activities. Thus, in the case of diversifying households a rise in total non-agricultural income would be in favor of the poor, above all the very poor diversifiers who could boost their incomes by more than 25 percent. Most households in the interior parts of the income distribution would see their per adult equivalent income grow by roughly the same rate of just under 20 percent.

The analysis and simulation in this section represents a very simplistic and purely statistical exercise that is useful to illustrate the de facto distribution of non-agricultural income. Yet, it ignores many facets of the complex relationships shaping rural livelihoods. In particular, it does not account for possible interactions between agricultural and non-agricultural activities that have been stressed in the livelihood literature. It has been noted that high non-agricultural earnings are often associated with high

agricultural productivity (Evans & Ngau, 1991; Ellis & Freeman, 2004). This link may be explained by non-agricultural income providing households with the cash necessary for the purchase of agricultural inputs such as fertilizer or improved seeds as well as hired wage labor. The resulting improvement in production technologies would then increase agricultural yields. This, in turn, would raise the resources available to further invest into non-agricultural activities, thus triggering a virtuous spiral of income.

Departing from the dichotomy of the non-agricultural sector, we expect the agricultural productivity implications to depend on the type of non-agricultural activities pursued. Cleary, high-return activities would give rise to this welfare-enhancing cumulative process. Low-return activities, however, due to their survival-led character, would most likely not generate sufficient cash income to initiate such a virtuous spiral. Their impact on agricultural productivity might therefore be limited. Similar to pure agricultural households low-return diversifiers may find themselves in a poverty trap, since high-return activities constitute one of the few opportunities for resource-poor household to accumulate assets and eventually exit poverty.

To test for the existence of such virtuous circles, we examine the relationship between different diversification patterns and agricultural productivity by regressing the value of agricultural output per acre on two dummies indicating a household's engagement in high-return and low-return non-agricultural activities respectively. Control variables include the characteristics of the household head, household composition, land holdings, and location as well as some basic inputs into agricultural production such as household farm labor or the use of fertilizer and pesticides. Table 7 reports the results.

table 7 about here

Most variables have the expected sign and many turn out to be significant. Like other studies (e.g. Bardhan 1973), we also find a negative relationship between agricultural yields and the size of land holdings. As expected, high-return activities are strongly and significantly associated with higher agricultural productivity. This is even true although we already control for the utilization of fertilizer and pesticides, two important agricultural cash inputs that might be purchased with the income earned from high-return activities.[15] In contrast, low-return activities do not appear to have productivity effects. This finding supports the view that there are cumulative and reinforcing relationships between assets, opportunities, and income sources (Ellis & Bahiigwa, 2003). Yet, as we have shown, it is important not to attribute this relative livelihood success to engagement in non-agricultural activities in general. It is only the high-return segment of the non-agricultural sector that potentially gives rise to the positive dynamics described above. Yet, this segment accounts for a small portion of the sector in our study area.

5. CONCLUSIONS

This paper empirically confirms the existence of a dichotomous non-agricultural sector in a fairly typical poor rural East African context. Low-return activities with some but low entry barriers account for the bulk of local non-agricultural activities, while only few households have the skills and assets to engage in activities that offer higher returns. We provide evidence that involvement in such high-return activities may trigger virtuous spirals as exemplified by positive spillovers to agricultural productivity. Higher income from high-return activities consequently tends to aggravate existing inequalities, as these activities are confined to richer households. In contrast, engagement in low-return activities does not seem to affect agricultural productivity, an indication that this sector does not provide a path out of poverty. Finally, our findings suggest that some extremely poor households are even excluded from the latter activities, which makes them particularly vulnerable to shocks that frequently affect agriculture in this climatic zone.

The dominance of low-return activities is possibly the finding that calls most for additional explanation. If engagement in low-return activities is driven by desperation, as implied by the concept of survival-led diversification and backed by our analysis of determinants, we would expect these activities to be pursued primarily if not exclusively by poorer households. This is not the case and, in fact, participation rates for low-return activities of richer households are comparable to those of poorer ones.

One might argue that these results are owed to Kakamega district being a particularly poor region, where just too many households are not able to overcome the entry barriers to high-return activities. However, we find a number of richer households in both low- and high-return activities. This may indicate that available resources cannot be employed more productively than in low-return activities and implies that households do not only face asset constraints or other types of entry barriers. Possibly, demand for non-agricultural products that are produced by high-return activities in small spatially segmented markets may just be too limited. Furthermore, the simultaneous diversification into low- and high-return activities may reflect the high risk being associated with high-return activities, which these households compensate by venturing into low-return activities. Another explanation for our observation of rich households in low-return activities might be that some individuals do only have limited access to household resources. Our empirical analysis supports this view, showing that the relevant decision unit is not necessarily the household.

Of course, one has to be careful in drawing too far-ranging conclusions from findings from a specific region. In addition, the static "snapshot" character of our analysis limits its contribution towards understanding the mechanisms that would explain the emergence of either type of non-agricultural activity. Research on rural livelihoods is already trying to examine such dynamics (e.g.

Barrett, 2004), but both cyclical movements and long-run changes in non-agricultural participation have been somewhat neglected in empirical research.[16]

Along similar lines, our work hints at a shift of research focus away from the analysis of household behavior and household level constraints towards a closer examination of meso- or macro-level determinants of structural transformation in rural areas, in particular in sub-Saharan Africa. It is well known that poor rural households face important asset and skill constraints. Yet, if we want to understand the structural transformation and the emerging of the non-agricultural economy, we need to look beyond the household level and also investigate the meso or macro level drivers and facilitators of change, such as demographic pressure, resource degradation, technical change, urbanization processes, and rural infrastructure.

Because of the limited amount of cultivable land, the demographic developments in East Africa will necessarily force people out of agriculture. Despite the effects of HIV/AIDS, the population of Kakamega district is projected to grow from 660,000 to 780,000 between 2005 and 2015[17] – a district where average farm size already stands at less than a hectare to meet the subsistence needs of more than five people. Under such circumstances, the prospects for growth and poverty reduction will crucially depend on the performance of the non-agricultural sector.

NOTES

[1] See e.g. Reardon (1997), Reardon et al. (1998), Ellis (2000), and Haggblade et al. (2005).

[2] See e.g. Bryceson and Jamal (1997), Barrett, Bezuneh, Clay and Reardon (2000), and Bryceson (2002).

[3] For more detailed explanations see e.g. Reardon (1999) or Haggblade et al. (2002).

[4] Specific emphasis is given here on the role of formal education in skilled non-agricultural wage employment (e.g. Corral and Reardon, 2001; Lanjouw, 2001; Reardon, 1997).

[5] Some exceptions that explicitly address the poverty and inequality implications of non-agricultural activities in sub-Saharan Africa include Jayne et al. (2003), Kijima et al. (2006) on Uganda and van den Berg and Kumbi (2006) on Ethiopia. From a more comprehensive livelihood perspective, the four studies summarized by Ellis and Freeman (2004) examine the link between income portfolios and welfare outcomes. A case study from Kenya can be found in Freeman et al. (2004).

[6] Detailed descriptions of similar rural livelihoods in nearby Kisumu district with a focus on migration can be found in Francis (2000). The study also contains insightful accounts of employment histories in the non-agricultural sector. For more details on Kakamega district see, for example, Government of Kenya (2002). A recent analysis of migration using the same data as this paper is provided by Giesbert (2007).

[7] Though non-agricultural employment comprises teaching activities, the observed patterns in this cluster are not compatible with the idea of rural income diversification.

[8] Our analysis includes both primary and secondary non-agricultural employment.

[9] Boda-boda is a bicycle taxi in East Africa (from English border-border). The bicycle rider can also be called boda-boda.

[10] The household's total gross monthly income is computed as the sum of all income from wage or self-employment in the low and high-return non-agricultural sector, farm income including the imputed value of unsold farm produce as well as other income sources such as remittances or pensions. Income from employment in the public sector is also subsumed under other income.

[11] The share of low-return non-agricultural income falls with the educational level of the household head, whereas the reverse is true for the share of high-return non-agricultural income. The observation that the income share from agricultural activities steadily decreases with educational attainment can be explained by the income earned from employment in the public sector, which is included in income from other sources. As can be clearly seen, the share of the latter rises strongly with educational attainment. Households whose head has a secondary or higher education degree earn as much as 30 percent of their income in the public sector.

[12] On average, it takes twenty-four months before a commercial sugarcane crop is harvested. Even after harvest, it may take more months before payments are actually made to the farmers.

[13] Yet, the results are less clear-cut than one might expect from the univariate analysis that was based on household head characteristics. It should be borne in mind though that our sample is relatively small and that we estimate a simple reduced form model without controlling for potential endogeneity of some variables.

[14] We define a growth pattern as strictly pro-poor (pro-rich) when the growth incidence curve is monotonically decreasing (increasing). In the present case, the curve is 'almost pro-rich' as it falls slightly for the richest vintile.

[15] This finding may also be explained by unobservables that affect both the capacity to engage in high-return activities and agricultural yields and that eventually give rise to virtuous circles.

[16] There are some important exceptions. Reardon and Taylor (1996) and Kijima et al. (2006) focus and short-term dynamics. In general, contributions from non-economists have more often assessed medium to long-run changes in rural livelihoods (Bryceson, 2002; Francis, 2000)

[17] Population projections for Kakamega were provided by Wondimu Kenea, PhD student at the University of Dortmund, Germany.

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Table 1a. *Participation of Households in Income-generating Activities*

	Agriculture	Local non-agricultural activities			Public employment	Migration (remittances)	No activity
		All	Low-return	High-return			
Households with respective activity	314 *86.03*	214 *58.63*	166 *45.48*	73 *20.00*	26 *7.12*	90 *24.66*	4 *1.10*

Note: Column percentages provided in italics.—The total number of households is 365.

Source: Authors' calculations.

Table 1b. *Income Diversification Strategies of Households*

	Agriculture	Local non-agricultural activities			Public employment	Migration (remittances)
		All	Low-return	High-return		
Agriculture	82 *26.11*	174 *81.31*	134 *80.72*	56 *76.71*	22 *84.62*	82 *91.11*
All non-agr. activities	174 *55.41*	36 *16.82*			6 *23.08*	39 *43.33*
Low-return	134 *42.68*	166 *77.57*	21 *12.65*	25 *34.25*	5 *19.23*	28 *31.11*
High-return	56 *17.83*	73 *34.11*	25 *15.06*	6 *8.22*	2 *7.69*	15 *16.67*
Public employment	22 *7.01*	6 *2.80*	5 *3.01*	2 *2.74*	3 *11.54*	9 *10.00*
Migration (remittances)	82 *26.11*	39 *18.22*	28 *16.87*	15 *20.55*	9 *34.62*	3 *3.33*
Total	314	214	166	73	26	90

Note: Column percentages provided in italics. Due to the fact that a number of households are involved in more than two income-generating activities, the percentage shares do not add up to 100 percent.

Source: Authors' calculations.

Table 2. *Shares of Income from Agricultural and Non-agricultural Activities (in percent)*

	Households in respective category	Income from				
		All non-agricultural activities	Low-return	High-return	Agriculture	Other sources
All	100	23	16	7	67	10
Age of household head						
–25	6	40	28	12	53	7
25–35	25	29	20	9	64	7
35–45	22	29	20	9	59	11
45–55	18	18	11	6	67	16
55–	29	12	9	4	78	9
Sex of household head						
Male	72	27	18	9	65	9
Female	28	12	10	3	74	14
Level of formal education of household head						
No formal education	26	16	14	3	74	9
Uncompleted primary school	46	25	18	7	71	4
Completed primary school	18	24	16	8	67	9
Completed secondary school and higher	10	24	12	12	53	23
Land size in acres						
0.5–1.5	38	27	21	6	62	11
1.5–3.5	42	19	13	6	71	10
3.5–	20	23	12	10	69	9
Location						
Rural	88	21	15	6	70	9
Urban	12	35	18	17	48	17

Source: Authors' calculations.

Table 3. *Multinomial Logit Model of Rural Non-agricultural Employment*

	Low-return vs. agriculture	High-return vs. agriculture	High- vs. low-return
Age	0.97**	0.95**	0.97
	(-2.18)	(-2.20)	(-1.01)
Female	0.90	2.66	2.96
	(-0.37)	(1.49)	(1.64)
Head	0.65	5.99**	9.16***
	(-1.25)	(2.37)	(2.86)
Uncompleted primary	1.46	5.83	3.98
	(1.00)	(1.63)	(1.24)
Completed primary	2.16**	4.96	2.29
	(2.06)	(1.44)	(0.73)
Completed secondary and higher	2.23*	2.39	1.07
	(1.67)	(0.69)	(0.05)
Number of children (0–4)	0.90	0.86	0.96
	(-0.88)	(-0.69)	(-0.18)
Number of children (5–14)	1.04	1.00	0.95
	(0.45)	(-0.02)	(-0.26)
Number of adults (15–24)	0.94	1.20	1.27*
	(-0.60)	(1.48)	(1.76)
Number of adults (25–60)	0.83	0.93	1.12
	(-1.17)	(-0.28)	(0.43)
Number of old people (>60)	1.08	0.49	0.45
	(0.23)	(-1.04)	(-1.09)
Female household head	1.25	0.31*	0.25**
	(0.74)	(-1.78)	(-2.03)
Landsize (0.5-1.5 acres) dummy	1.81*	1.14	0.63
	(1.89)	(0.25)	(-0.85)
Landsize (>3.5 acres) dummy	1.51	2.39	1.58
	(1.15)	(1.55)	(0.77)
Title deed	0.55*	1.15	2.11
	(-1.92)	(0.31)	(1.46)
Livestock value (1,000 KSh)	1.00	1.01	1.01**
	(-1.60)	(1.61)	(2.55)
Remittances dummy	1.05	0.90	0.86
	(0.15)	(-0.19)	(-0.26)
Sugar cane dummy	0.45*	0.40	0.88
	(-1.89)	(-1.48)	(-0.19)
Sugar cane period	1.04***	1.05***	1.01
	(2.64)	(2.65)	(0.36)
Distance to nearest access road	1.00**	1.00	1.00
	(-2.19)	(-0.10)	(1.53)
Urban	0.57	2.64*	4.66**
	(-1.21)	(1.66)	(2.20)
Observations	437	437	437
Wald chi2(42)	95.06		
Log pseudo-likelihood	–310.59		
Pseudo R2	0.14		

Note: Robust z statistics in parentheses. * significant at 10 percent, ** significant at 5 percent, *** significant at 1 percent

Source: Authors' calculations.

Table 4. *Participation in and Income Share of Local Non-agricultural Activities, by Expenditure Quintile (in percent)*

Expenditure Quintile	Participation			Average share of non-agricultural income			Median share of non-agricultural income		
	All	Low-return	High-return	All	Low-return	High-return	All	Low-return	High-return
Bottom	38	36	2	45	43	3	47	43	0
2nd	63	50	16	38	31	7	31	31	0
3rd	55	45	18	44	32	12	36	24	0
4th	61	39	25	39	24	15	38	14	0
5th	62	42	29	41	17	24	37	14	0

Source: Authors' calculations.

Table 5a. *Inequality Decomposition by Sources, All Households*

Income source	Income share (%)	Gini coefficient of income source	Correlation with rank of total income	Elasticity of overall Gini coefficient
Low-return	19	0.83	0.68	0.022
High-return	14	0.93	0.80	0.062
Agriculture	50	0.45	0.78	−0.162
Other income	17	0.90	0.82	0.078
Total income		0.51		

Note: Other income includes income from public employment.

Source: Authors' calculations.

Table 5b. *Inequality Decomposition by Sources, Only Diversifying Households*

Income source	Income share (%)	Gini coefficient of income source	Correlation with rank of total income	Elasticity of overall Gini coefficient
Low-return	28	0.70	0.66	0.009
High-return	20	0.88	0.77	0.106
Agriculture	44	0.41	0.70	−0.153
Other income	8	0.91	0.74	0.038
Total income		0.45		

Note: Other income includes income from public employment.

Source: Authors' calculations.

Table 6. *Poverty Effects of a 50 Percent Increase in Non-agricultural Income*

	Before		After	
	P0	P1	P0	P1
Increase of non-agricultural income by 50%				
All households	75.96	45.26	–3.14	–3.24
Only households involved in non-agricultural activities	70.35	37.04	–5.52	–5.70
Increase of low-return non-agricultural income by 50%				
All households	75.96	45.26	–2.42	–2.18
Only households involved in low-return	72.28	37.94	–5.67	–5.11
Increase of high-return non-agrilcultural income by 50%				
All households	75.96	45.26	–0.33	–1.08
Only households involved in high-return	63.31	31.20	–1.80	–5.97

Note: Changes are reported as percentage points. The poverty line is defined on per adult equivalent expenditures. It is based on the rural poverty line used for the 1997 poverty assessments, KSh 1239 for rural and KSh 2648 for urban areas (Welfare and Monitoring Survey of that year), and adjusted to reflect inflation. Comparing maize and beans prices in urban and rural areas of the study region, we assume the urban price level in Kakamega district to be 25 per cent above the rural price level. The resulting poverty lines are then KSh 1843 for rural and KSh 2304 for urban areas, respectively.

Source: Authors' calculations.

Table 7. *OLS Regression of Agricultural Yields*

	Log (value of agricultural production per acre)
High-return non-agr. activity	0.52** (2.49)
Low-return non-agr. activity	0.09 (0.68)
Female household head	0.38*** (2.96)
Level of education of household head: Uncompleted primary	0.30* (1.81)
Level of education of household head: Completed primary	0.37** (2.38)
Level of education of household head: Completed secondary and higher	0.20 (0.80)
Number of children (0–4)	0.01 (0.08)
Number of children (5–14)	-0.03 (-0.52)
Number of old people (>60)	0.02 (0.20)
Household size	0.04 (0.99)
Land size per adult equivalent	-0.18*** (-3.53)
Land size (0.5-1.5 acres) dummy	0.39*** (2.63)
Land size (>3.5 acres) dummy	-0.29 (-1.47)
Number of hh farm workers	0.15 (1.49)
Fertilizer dummy	0.39* (1.76)
Pesticides/herbicides dummy	0.54** (2.51)
Distance to nearest market	-0.04** (-2.06)
Urban	-0.14 (-0.65)
Constant	5.59*** (14.75)
Observations	271
$F_{(19, 251)}$	3.27
R^2	0.19

Note: Robust z statistics in parentheses. * significant at 10 percent, ** significant at 5 percent, *** significant 1 at percent
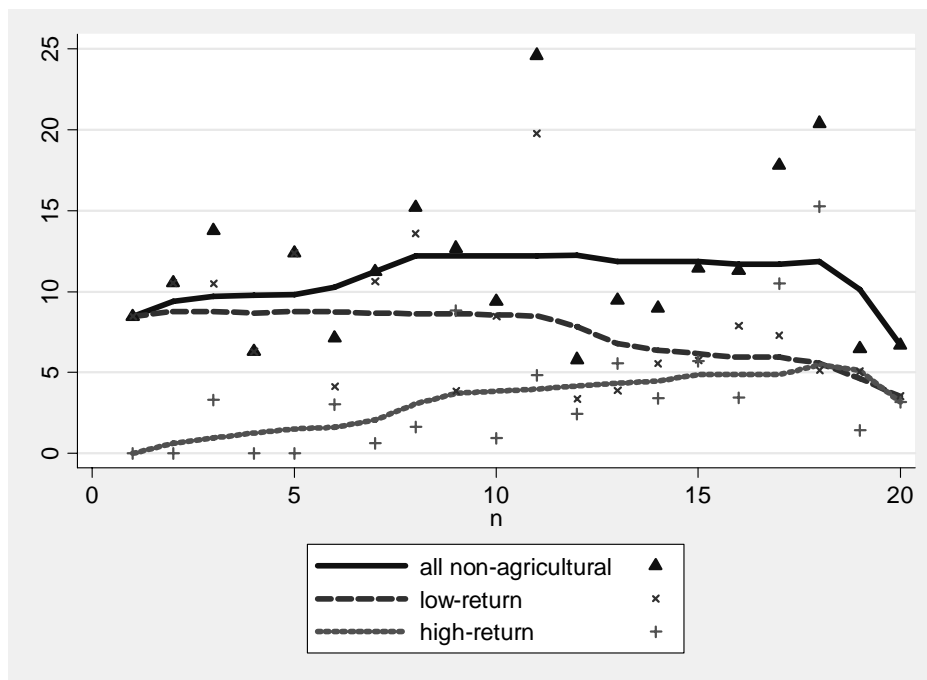
Source: Authors' calculations.

APPENDIX

Figure A1. *Smoothed Growth Incidence Curve, 50 Percent Increase in Non-agricultural Incomes, All Households (vertical axis: per adult equivalent income growth in percentage points, horizontal axis: per adult equivalent expenditure vintiles)*
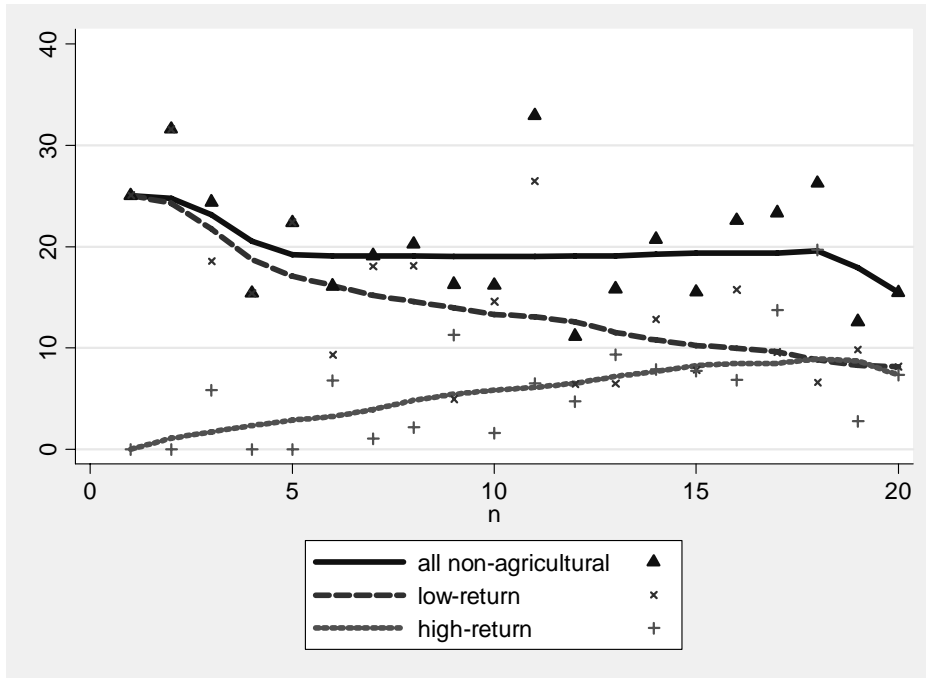
Source: Authors' calculations.

Figure A2. *Smoothed Growth Incidence Curve, 50 Percent Increase in Non-agricultural Incomes, Only Diversifying Households (vertical axis: per adult equivalent income growth in percentage points, horizontal axis: per adult equivalent expenditure vintiles)*

Source: Authors' calculations.