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Income Portfolios in Rural Ethiopia and Tanzania: Choices and Constraints

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ABSTRACT: The paper analyzes the different income portfolios of households using survey data from rural Ethiopia and rural Tanzania. It suggests that the different portfolios held by households cannot be explained by their behaviour towards risk as is usually suggested. It is better explained by differences in ability, location, and in access to credit. A logit analysis of households with different income portfolios, controlling for the effects of location, suggests that entry into high-return activities is determined by investment in particular skills or by access to capital.

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1. Introduction

Peasant households in developing countries typically earn income from many different sources. A rural household may have a plot of land, purchase consumer goods and inputs in local markets, and grow crops both for subsistence and for sale. In addition, it might engage in local crafts and trades, hire out its labour and keep livestock. The household might receive remittances from relatives away in town and help in a crisis from neighbours.

This paper examines the income portfolios of households in rural Ethiopia and Tanzania. As in most developing countries, rural households are usually engaged in various activities both within and outside agriculture. However, some households may not be able to diversify since entry constraints exist for many activities and therefore, the ability to take up particular activities will distinguish the better-off household from the household that is merely getting by.

The fact that incomes are derived from many sources is usually attributed to a deliberate policy of diversification of uncertain incomes in the face of absent or imperfect markets for credit and insurance (Alderman and Paxson, 1992). Risk-averse households will be willing to trade lower incomes for lower variability of incomes. They might achieve lower variability of incomes in a variety of ways; by diversifying crops and plots, finding employment off-farm and through migration to other areas or to the town. Case studies from many countries have suggested that diversified portfolios are linked to lowering risk at the cost of lower incomes[1]. The extent to which a household might choose to diversify depends on its preferences towards risk, on the technology available and its ability to smooth consumption given a particular level of income. The fact that imperfections in factor markets and the limitations of available technology affect diversification makes it difficult to measure attitudes to risk. Furthermore, if a household can rely on transfers, remittances or help from the community to smooth consumption despite falls in income, then a risk-averse household might make decisions 'as-if' it were risk-neutral in its preferences. In short, these issues rather confuse the measurement of risk and make it difficult to separate preference for risk from constraints that can make a household seem risk-averse.

Even if all households have access to the same technology and face the same risks and even have the same preferences towards risk, they might differ by the ability to smooth consumption. Poorer households might well expect to be credit constrained in the future and so be willing to trade lower incomes for less risk (Eswaran and Kotwal, 1990). Furthermore, empirical studies have found evidence in support of the importance of credit constraints and risk in determining production and income choices[2].

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[1] See, for instance, Walker and Ryan (1990), Liedholm and Kilby (1989) and Jackson and Collier (1987).

[2] For example, Morduch (1993) uses data from the ICRISAT-survey in southern India to show that the ability to borrow to smooth consumption is important in determining the effect on production. He finds that constrained households are more diversified in crops and across plots. Dercon (1996) examines the effect of liquidity constraints on crop choice in rural Tanzania and finds that constrained households are growing more of the safe, low-yield crop.

However, risk aversion, combined with credit and insurance market imperfections, is not the only reason for diversified portfolios of activities. There is evidence that some kinds of diversification might actually serve to increase rather than to lower incomes and so makes it difficult to gauge the importance of risk as a factor in diversification (Carter, 1991). Also, a study of income diversification in rural Burkina Faso, Senegal and Niger finds that a higher share of non-cropping income is associated with higher incomes (Reardon et al. 1992). Collier et al. (1986) find a similar relationship for Tanzania: richer households are characterized by more non-cropping income. The apparent contradictory results with respect to the consequences of income diversification may be related to the extent of aggregation of the different sources of non-cropping activities. Non-cropping income includes both livestock income and various sources of off-farm incomes, with different returns and riskiness[3].

In this paper, we emphasise the importance of factors other than the household's behaviour towards risk using data from Ethiopia and Tanzania in 1989/90[4]. Behaviour towards risk does play a role in income diversification but a more important determinant of income diversification must be the comparative advantage of households who possess particular skills or endowments of labour which obtains higher returns in some activities. However, such activities might require substantial investment, so that poorer or credit constrained households will not be able to enter them. In fact, skill or ability constraints may be sufficient to exclude certain households from particular activities. Comparative advantage and entry constraints will not just help to explain differences in portfolios within particular areas or villages, but also across areas or even countries. Access to public infrastructure such as market places and roads, proximity to towns, common property resources such as forests, and other public goods will also contribute to the different portfolio patterns across regions. Finally, policy factors, such as the regulatory framework of different markets and taxation policy will also steer the patterns of income source portfolios in different directions.

In this paper, we concentrate on the importance of credit constraints, ability constraints and differences in location in determining the nature of income portfolios. The point of departure from previous studies is that both constrained and unconstrained households do diversify but that access to some kinds of high return activities might be limited - while low return activities do not have these constraints. We will focus both on the differences in outcomes in consumption, income and asset terms of different type of portfolios, and on the differences in household and village characteristics driving access and entry into the different portfolios.

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[3] For example, Reardon et al.'s (1992) study of income diversification in some West-African countries defines a higher share of non-cropping income in total income as evidence of higher diversification. They discuss the possible reasons for taking up non-farm work, and discuss both risk and investment constraints. Nevertheless, since their measure of diversification aggregates all non-cropping incomes, their analysis seems to conflate the different reasons for holding different income portfolios. Our approach differs from theirs by trying to disentangle entry constraints and choices of portfolios in the analysis.

[4] One set of data derive from a survey conducted by USAID in rural Shinyanga in the West of Tanzania, and the other is based on a survey conducted by International Food Policy Research Institute in a number of villages in Southern and Central Ethiopia. For details on the Tanzanian survey see USAID (1990) and Dercon (1992, 1996) and for the Ethiopian survey see Webb et al. (1992).

In the next section, we describe the general economic environment faced by households in both countries and the specific areas from which the data are obtained. Section 3 contains a discussion of the extent to which differences in such environmental and household characteristics affect income portfolios and their subsequent effects on consumption, income and wealth. Section 4 contains the theoretical and empirical framework used, while section 5 contains the empirical results on outcomes and characteristics of different groups. Section 6 concludes.

2. The Setting: Tanzania and Ethiopia in 1989/90

The Ethiopian economy is dominated by agriculture, which contributes about 45% of GDP and employs 80% of the labour force. In 1989, the rural economy was subject to strict controls, which affected both the range of possible activities and the returns to them. Firstly, the government instituted sweeping land reforms in 1975 which dissolved all existing tenancy and abolished private land ownership (Dessalegn, 1984). All households were given some land to cultivate, but tenancy was highly uncertain since land redistribution took place every year. Investment in land, such as private drainage or irrigation was therefore discouraged. Secondly, agriculture was highly taxed through direct contributions and compulsory crop deliveries to a parastatal agency, the Agricultural Marketing Corporation. Thirdly, trading in agricultural and other commodities, an important source of off-farm incomes in many parts of the world (e.g. Haggblade, et al. 1989) was strictly controlled, with road-blocks and high taxation. A large number of trade routes became unprofitable and insecure while the civil war intensified in the north (Dercon, 1994). Fourthly, the hiring of agricultural wage labour was prohibited and restrictions placed on migration (Dessalegn, 1987). All these factors limited off-farm employment. Furthermore, it encouraged farmers to focus on less-traded and less-taxed crops. Nevertheless, some activities remained relatively unrestricted. The market for livestock, particularly cattle, was not regulated. Cattle play an important role in the farming systems both in the highlands and lowlands[5] and wealth and economic status are traditionally linked to cattle ownership. The lack of alternative investment opportunities and the relatively unrestricted cattle markets increased the incentives for cattle ownership[6].

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[5] The highlands (i.e. areas with an altitude above 1500m) are characterized by different forms of mixed farming, while in the lowlands, pastoralism thrives. Studies differ in the classification of farming systems in the highlands. All six areas considered here are in the highlands. Gryseels (1988) considered three broad systems: high potential cereal-livestock, low potential cereal-livestock and high potential perennial-livestock. In the first two, cattle are crucial for ploughing, as well as for manure (mainly for fuel and fertilizer); in the latter, cattle are not used in land-preparation but livestock products such as milk, fuel and fertilizer dominate. The main crops grown are teff, wheat barley and pulses in the cereal-livestock systems and coffee, tubers and enset in the perennial-livestock system. See Westphal (1976) for an alternative and more detailed classification of farming systems.

[6] Since 1989/90 substantial change has taken place in the Ethiopian economy: first, most of the agricultural taxation and the restrictions on trade have been abolished (for details, see Dercon, 1994), secondly, the war has ended with the fall of the marxist government of the Dergue, restoring a relative peace to the country and allowing the renewed movement of goods and people. While these factors are likely to have encouraged peasant agriculture for sale and non-farm activities, renewed ethnic tension and the regionalisation

While Tanzania's recent history is far less turbulent than Ethiopia's, some aspects of the policy environment are comparable. Firstly, investment in land is not a viable option, since land transactions are restricted both by customary and national law (Cory, 1953; Wily, 1988; Hoben, 1992). Secondly, cattle is traditionally an important asset for accumulation in many parts of the country, and especially so in the survey-area in Western Tanzania (von Rotenhan, 1966; Marketing Development Bureau, 1987). During the period of strict government control of the economy, including the pricing and marketing of agricultural produce, livestock markets remained entirely unregulated as in Ethiopia[7]. Nevertheless, an important difference from the Ethiopian case in 1989/90 is that many of the restrictions on agricultural and other trade had been abolished during the first years of the structural adjustment programme, which started in 1986. Consequently, off-farm activities were not liable to the same restrictions and constraints as in Ethiopia during the same period.

The data for Tanzania used here are from rural Shinyanga District in the Shinyanga region in Western Tanzania. This area is semi-arid and the main crops grown are cotton, sorghum, millet, maize and sweet potatoes. A random sample of 80 households was used, of which 77 households mainly farm, while 2 have a shop and one household head is a civil servant; data on one household was incomplete. All households are involved in cropping. Cattle are traditionally important in the farming system, being used for ploughing as well as for livestock products and manure (von Rotenhan, 1966). Transport infrastructure to other areas is quite poor, which may contribute to restrict the profitability of trade and other business activities with other areas. Off-farm employment has long been quite common: people have in recent decades participated in the cotton harvest in the region and worked beyond the area in Mwanza region as casual labour in the cotton ginneries.

In Ethiopia, six different communities were included in the data set, with a total of 423 households interviewed[8]. Table 1 summarizes some of their characteristics, with an emphasis on their agricultural potential and possibilities for non-farm activities. Two of the sites, Debre Berhan and Adele Keke have relatively higher potential in agriculture and offer scope for off-farm activities. Garagodo in the Wolayta region is a densely populated region with a tradition of seasonal migration to find work in factories and state plantations. The other sites are relatively poorer, with low agricultural potential and offering little scope for lucrative off-farm work.

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policies seem to hinder the free movement of goods and migrant workers.

[7] Except for a short, abortive attempt in the beginning of the 1970s (Mackenzie, 1973).

[8] The data were collected for a study of the responses of households to food crises and the areas were selected because they all had suffered during the 1984-85 famine and other droughts that followed between 87-89. At least four of the areas are considered particularly vulnerable, while two (Debre Berhan and Adele Keke) may be less vulnerable but still suffered from the famine. For details on the experiences of the areas during the 1980s, and more information about the sample design and questionnaire, see Webb et al. (1992).

Table 1: Characteristics of the Sampled Communities in Ethiopia

Survey site	Region	Altitude	Access to trade routes?	Agricultural potential	Remarks
Debre Berhan	Shoa	2700 m (degga)	Good access (close to main route from Shoa to North)	High potential area; cereal-livestock area	Villages surrounding town of Debre Berhan on route from Addis Ababa to Desse.
Dinki	Shoa	1400 m (kolla)	No, rather remote	Low potential area	Strongly affected by 1984/85 famine.
Korodegaga	Arssi	1320 m (kolla)	No, rather remote	Low potential area	Drought prone area near very high potential areas; relatively forested.
Adele Keke	Hararghe	2000 m (woyna degga)	Good access (road to Harar and Dire Dawa)	High potential area; perennial-livestock area (chat)	Close to road between Harar and Dire Dawa.
Garagodo	Wolayta	1730 m (woyna degga)	Reasonable	High potential; perennial-livestock area (enset)	High population density; traditional migration area.
Domaa	Gama Gofa	1400 m (kolla)	No, remote	Very low potential area	Voluntary resettlement area; malaria-and drought-prone.

Source: based on community level investigations; USAID (1990) and Webb et al. (1992).

One expects that country-specific and area-specific characteristics will have an important effect on the type of income portfolios observed across households. Nevertheless, households within areas also have different compositions and characteristics, affecting both their choices and the constraints they face in entering profitable or risk-reducing activities. In the next section we focus on the differences across households in the areas considered and discuss the particular characteristics of the income portfolios obtained by different households.

Both data sets used are based on comprehensive household surveys. Income data were collected both for agricultural and non-agricultural activities, using specific modules for different types of activities, by season. The Tanzanian survey interviewed men and women separately about their non-agricultural incomes. In both surveys interviewees were asked about a large number of specific non-agricultural activities which allowed for the diversity of income sources. As in most surveys, recall errors are likely to have affected reported income. Given these problems, the emphasis in the analysis is on the composition of income portfolios[9].

[9] The household surveys also collected consumption data, using recall periods of different lengths depending on the type of commodities. In the Ethiopian data only food consumption was collected for all households. In both cases, no effort was made to capture seasonality in consumption patterns. Consequently, comparisons between the consumption and income data will not be attempted.

3. Incomes and Income Sources in Rural Ethiopia and Tanzania

The characteristics of the communities surveyed are reflected in the basic descriptive statistics for each site. Table 2 gives the yearly income per capita and the activities from which the income is derived. Mean income per capita is also expressed in US dollars to allow some comparison across the countries. Ignoring the many problems in cross-country comparisons, the mean income per capita is lower in all Ethiopian sites compared to the Tanzanian site, reflecting the relative poverty of Ethiopia and the fact that all the areas in the Ethiopian sample were chosen because they were considered vulnerable to famine. The relative mean incomes across areas in Ethiopia broadly reflect their agricultural potential as described in table 1. Debre Berhan is clearly the better-off area, followed by Harar while Domaa is the poorest. Garagodo is somewhat poorer than may be inferred from table 1, but both population density and the problems in correctly valuing the main crop (enset, a tuber) may explain this result; also, the area suffered greatly during the famine in 1984-85 (Webb et al., 1992).

Crop agriculture, which is mainly subsistence agriculture, is by far the most important source of income for the Ethiopian households providing about 61% of income. In Tanzania, cropping provides only a quarter of total income, which is both a reflection of the increasing importance of other income sources in the area as well as the relatively low prices obtained for maize and cotton in 1989 (Dercon, 1992). The main focus here, however, is the source of non-cropping income. First, remittances are generally less than 10 per cent in both countries. Off-farm activities constitute a more important source of income, on average about 20 per cent in either country. In Ethiopia, clear differences can be observed across the sites, in particular with respect to the actual type of off-farm income, reflecting some of the site-specific characteristics discussed in table 1. In Debre Berhan, off-farm income is mainly from sales of firewood, which is collected by the households to be sold in the town, both to local urban residents and to itinerant traders on their way to areas with scarce firewood[10]. Firewood collection and sales also provide virtually all the off-farm income in Korodegaga where trees in common woodlands are still abundant. In Dinki and in Garagodo, off-farm income is mainly derived from crafts and wage labour. Garagodo in Wolayta is a traditional migration area, and remittances account for about 10 per cent of income. Income from wage labour is particularly important in Adele Keke, where most off-farm income is earned from working on coffee and chat harvesting in the surrounding areas. In Domaa, the most remote and resource poor area, virtually no incomes are earned from either business or labour for wages; the only significant off-farm income is earned from renting out land to newly arrived settlers. In Shinyanga in Tanzania, the most important source of off-farm income is casual labour for wages in the surrounding areas, such as in the cotton harvest and in the ginneries. Livestock products and sales of live animals represents 14 per cent of income, on average, in the Ethiopian sample; and 50 per cent of income, on average in the Tanzanian sample.

[10] Firewood is scarce in the area, but in the particular villages concerned slightly less so since the consequences of cutting the trees in this relatively flat area are less dramatic than in some surrounding hilly areas.

Table 2: Income per capita and Income Sources from the Sampled Communities

	Debre Berhan (67 hhs)	Dinki (54 hhs)	Koro-degaga (89 hhs)	Adele Keke (60 hhs)	Gara- godo (56 hhs)	Domaa (97 hhs)	Shinyanga (79 hhs) (Tanzania)
Mean income per capita	236 Birr	145 Birr	71 Birr	163 Birr	46 Birr	40 Birr	21153 Tsh
in US dollar	$114	$70	$34	$79	$22	$19	$146
Composition of incomes (%)							
crops (including subsistence)	43	78	54	51	66	73	26
livestock products	14	0	0	8	4	0	25
livestock live sales	26	4	6	13	2	10	28
off-farm (wage and business)	16	10	38	24	19	7	20
remittances	2	6	1	5	10	8	2

Source: calculated from survey data. Using the official exchange rate of 145 Tanzanian Shillings per dollar and 2.07 Birr per dollar. Incomes are in current prices in all currencies.

These aggregate figures may give the misleading impression that all households in the sample are involved in all these different activities in every site. This is obviously not the case. Table 3 gives data on the percentage of households involved in different non-cropping activities. High income shares from a particular activity are obviously related to a larger number of households involved in the activity, but there are wide differences in the degree of participation in activities, even within each area. For example, the large off-farm incomes earned from farm wage labour in Gara Godo is only earned by about a third of the households. The large share of incomes from firewood in Adele Keke is earned by about half the sample, while in Debre Berhan such incomes are earned by virtually all households. Similarly, the relatively high share from crafts in Gara Godo is only earned by about a third of the households. Only about half the sample earns income from livestock in Adele Keke, where it amounts to more than a fifth of total income in the area. In Tanzania, a similar picture emerges: the relative high share from livestock and wage labour are earned by less than half the sample.

Table 3: Involvement in Different Non-Cropping (Cash) Activities in the Sampled Communities

Percentage of hhs involved in activity	Debre Berhan	Dinki	Koro-degaga	Adele Keke	Gara- godo	Domaa	Shinyanga (Tanzania)
agricultural wage labour	12	19	1	36	26	8	25
other wage income	14	4	0	16	13	0	46
trade and retailing	9	4	2	9	19	2	13
handicrafts and beer brewing	5	22	0	0	38	1	25
firewood collection	89	0	52	30	38	0	3
sale of livestock products	90	17	15	48	26	11	16
live sales of animals	82	39	18	46	13	28	34

Source: calculated from survey data.

This leads to the central question of this paper: are the observed patterns of income activities simply the consequence of choices by the households or are there particular activities from which some households are excluded by constraints they cannot overcome? This question becomes more important if the activities with entry constraints are high return activities which allow households to better themselves. While marginal returns to labour (or other factors) cannot be calculated using the data set, some light can be shed on this issue by looking at the different income terciles in the data and some of the characteristics of households in each group.

Table 4 : Income Sources and Characteristics Across Income per capita Terciles

	Ethiopia			Tanzania		
Percentage of income	**poor**	**middle**	**non-poor**	**poor**	**middle**	**non-poor**
livestock	4	13	27	15	22	63
off-farm	13	23	21	25	35	16
Percentage hhs who own livestock type						
cattle	13	43	74	31	48	69
livestock	18	51	81	50	67	81
Other characteristics						
per capita land area (in ha)	0.1	0.1	0.2	0.6	0.7	1.2
dependency ratio	1.7	1.5	1.5	0.9	1.1	0.9
livestock value p.c.	12 birr	86 birr	298 birr	6350 TSh	7477 TSh	57163 TSh
per capita assets	6 birr	11 birr	26 birr	231 TSh	81 TSh	426 TSh

Source: calculated from survey data. Assets per capita include farm implements and large household durables. The data on assets for Tanzania are incomplete.

In both countries, livestock income shares increase across income terciles: from 4 to 27 per cent in Ethiopia and from 10 to 51 per cent in Tanzania. Income shares from off-farm activities follow a different pattern. In Ethiopia, off-farm income constitutes the smallest share in the lowest tercile, while in Tanzania the off-farm income share is smaller in the top tercile. Off-farm income is, therefore, not likely to explain income differences. Livestock, however, is clearly an important differentiating factor in these mixed-farming environments, resulting in substantial inequality in both countries; mean per capita incomes in the rich group are more than ten times the mean incomes in the poor group.

This becomes even clearer if we examine differences in assets by households. Land areas per capita are larger for the richer tercile but only about double the mean land areas of the poorer group. This is unsurprising given the controlled land tenure environment in both countries. Differences in household composition are unlikely to be the main cause of inter-household income differences either, at least if dependency ratios across terciles are relied upon[11]. The clearest and largest difference across terciles is related to the ownership of livestock, especially cattle. Close to three-quarters of the households in the top tercile in both countries own cattle, while in the lowest tercile this is only 13 per cent in Ethiopia and 31 per cent in Tanzania. The differences in livestock values per capita reveal a similar picture with per capita holdings ten

[11] The dependency ratio is rather crudely measured here as the number of children under the age of 15 divided by the number of adults in the household since accurate data on the age of household members were not available.

times larger for the top tercile in Tanzania and even 24 times in Ethiopia.

If ownership of livestock serves to increase incomes, why do more households choose not to do so? It is unlikely that households in the sampled communities simply choose not to enter it. To back this up, some data on investment preferences are presented in table 5. In Ethiopia, they come from the same survey from 1989/90, in answer to an open question 'If you had a big amount of money today, how would you invest it?'. In Tanzania no such question was asked in 1989/90, but many years earlier, in 1964, a survey had posed a similar question in the communities included in the Tanzanian sample (von Rotenhan, 1966). While this reply is dated, the policy climate at that time was not much different from that in 1989/90. The similarity of the replies is striking.

Table 5: Investment Preferences in Ethiopia and Tanzania

Type of investment	Debre Berhan	Dinki	Koro-degaga	Adele Keke	Gara- godo	Domaa	Shin-yanga
livestock	45	87	80	58	68	78	49
trade/business	6	9	4	19	5	10	13
keep cash/bank	41	2	12	16	4	6	6
other	8	2	4	7	23	6	32
Memorandum item:							
livestock share in income	40	4	6	21	6	10	53

Source: calculated from survey data and von Rotenhan (1966). 'Other' includes jewellery, durables (especially important in Tanzania) and other specific items.

Investment in livestock is by far the most popular productive investment identified by the households: 69 per cent of the households in Ethiopia and 49 per cent in Tanzania preferred it over any other investment opportunity. It is definitely much higher than investment in trade or other business activity. The latter is a very significant item only in Adele Keke, which is close to the important trading route between Dire Dawa and Harar in eastern Ethiopia. It is preferred by 8 per cent of the households in Ethiopia, compared to 13 per cent in Tanzania, which may be a reflection of the disincentives for commercial activity in Ethiopia at the time. Finally, there is a close inverse relationship between the share of income coming from livestock and the preference for investment in livestock. For example, the highest preference for livestock investment is found in areas with very low livestock income shares (Domaa, Dinki, Garagodo and Korodegaga) while the richer areas with high shares of income from livestock (Adele Keke and Debre Berhan) have a lower preference for livestock as investment. In short, while households may not indefinitely prefer livestock as the route to further wealth, households in poorer communities definitely consider it important. Differences in farming systems or the environment cannot explain why households choose not to keep cattle and

other livestock[12].

Some information on the returns to livestock is available for both countries to further support the notion that potential earnings from livestock are important in all the farming systems. Gryseels (1988) conducted an in-depth analysis of the mixed-farming system in the same communities of Debre Berhan as in the data used here. Using far more detailed data on incomes and expenses for livestock, he found that cattle yielded a gross return of 40.7 per cent per year and a net return (taking into account all expenses, depreciation and mortality) of about 12.9 per cent per year. In Tanzania, various studies have observed gross returns of between 16 and 30 per cent per year for the survey area[13]. Gross returns in the present data set were found to be about 23 per cent for Tanzania. While risks are definitely non-negligible[14], livestock provides an attractive source of investment, particularly in view of the few alternatives available in the local economy[15].

So what constrains households from taking up cattle-rearing? While in Ethiopia grazing land is increasingly scarce, discriminatory access to common grazing land has not been reported during community investigations at the survey sites, while in Tanzania the scarcity is less pronounced. Imperfections in labour markets, resulting in problems in obtaining labour for herding and other livestock activities is also unlikely to be the most important factor. Herding is mostly done by young children and as table 4 shows, the dependency ratios are highest in the lowest tercile in Ethiopia, while in Tanzania the dependency ratio is not different between the lowest tercile and the highest tercile. Gryseels (1988) reports that hiring children for herding is very common in Debre Berhan despite the restrictions on labour hiring. Another possible reason, differences in skills and ability which give certain households a comparative advantage in livestock rearing may explain some part of the differences. As in all farming, some farmers will be better than others. Nevertheless, livestock and cattle-rearing are traditional activities in all areas considered, so it is unlikely that the wide income and asset differences are simply caused by the lack of skills.

The most likely explanation is that building up a profitable cattle herd requires substantial investment. Unlike land, which is allocated to each household and has limited tradability, livestock has to be acquired through purchase[16]. In the sample area in Tanzania, a cow costs

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[12] There does not seem to be any systematic difference across income terciles with respect to investment preferences with over 60 percent of both richest and the poorest tercile preferring livestock investment and only about 8 percent of both terciles preferring business or trade.

[13] Collinson (1972), von Rotenhan (1966), FAO/IBRD (1975).

[14] For a more detailed discussion of the risks involved in livestock investment see Dercon (1995) for Tanzania and Gryseels (1988) for Ethiopia.

[15] See above. For example, land is not a secure investment, but business and trade are also very risky investments, given the poor infrastructure in both countries; furthermore, the ongoing civil war and repression of trade in Ethiopia made such activities very difficult indeed.

[16] Bridewealth and inheritance are other means of acquisition in both countries, but the bulk of the herds are acquired through purchase and further breeding.

up to 15% of mean annual household income. Similarly, in Ethiopia, in the sample period, cows cost several hundred birr (approximately four times the mean level of income), while sheep still cost about 50 birr (about a quarter of mean income). The financing of this investment requires substantial surpluses or access to credit.

Credit markets are not entirely absent in either country, but formal credit is only available in limited quantities (Government of Tanzania, 1990; Due, 1983; Webb et al. ,1992). Informal credit is relatively scarce in Tanzania (Amani et al., 1987), and while more available in Ethiopia, remains limited to relatives and friends (Dejene, 1993)[17]. An alternative to formal and informal credit may be Roscas (Besley, 1995). In Tanzania no such institutions have been observed, but in Ethiopia they are quite widespread and known as Equbs. They usually pay households the total receipts per period, in strict rotation, and they are therefore ideally suited to meet the need for lumpy investment. Nevertheless, only 13 per cent of households admitted being a member of an equb, with the largest proportion of members in Debre Berhan. While the existing studies on these institutions do not find a clear relationship between wealth and membership of equbs (Dejene, 1993), in the sample this relationship does seem to exist: only 3 per cent of the poorest tercile were members, compared to 26 per cent of the households in the top income tercile.

Neither formal nor informal credit institutions seem to facilitate households' entry into the lucrative livestock investments, suggesting that these investments must be financed mainly through own savings. This will be easier for households with substantial endowments. Relatively small initial differences in land and labour endowments may ultimately result in a very different ability to invest in lucrative activities such livestock rearing. The data in table 3 are suggestive in this respect. Relatively small differences in land endowments (about twice for the richer tercile compared to the poorest tercile) may result in very substantial differences in livestock holdings and incomes in the long-run.

Similar investment constraints may also exist in off-farm activities, and credit constraints and low initial endowments will constrain entry into these activities. Also, some households may have a comparative advantage in off-farm activities due to particular skills and ability. The lack of these skills may provide an effective barrier to entry into these activities for other households. Nevertheless, it would be incorrect to suggest that all off-farm activities are liable to these type of investment or skill constraints. Certainly, handicrafts, such as weaving or pottery and specialized activities such as smithing or carpentry, will require skills and some investment. Other activities, such as firewood collection, simple food processing and beer brewing are not likely to suffer from high entry constraints.

Tables 3 and 4 show that off-farm incomes are not closely correlated with higher incomes. The hypothesis to be investigated is whether this is because the different off-farm activities include both low-return activities without entry constraints and entry-constrained high-return activities. In particular, in the Ethiopian sample we identify 18 households involved in

[17] Only 5 percent of the sample in Ethiopia declared that they ever borrowed from a private professional moneylender. For the poorest income tercile this was only 1 percent, suggesting that credit constraints are even tighter for those households with little wealth for collateral.

activities with likely skill and/or investment requirements: builders, a mechanic, a traditional healer, weavers, a potter, a blacksmith and a tailor; in Tanzania we identified carpenters, tailors, shop keepers and a civil servant. As will be demonstrated, it is likely that this group of households involved in off-farm activities with entry constraints is quite different from those involved in other less-constrained off-farm activities.

4. A Model of Activity Choice Under Constraints

In this section, we present a simple model of choice and constraints on activity portfolios. Each household is assumed to have a plot of land L and some household labour A. Markets for both land and agricultural labour are assumed to be missing, so that only household labour can be used in production. The household, which is risk-averse, maximizes its expected utility E(U(y)] for the period where y denotes the sum of incomes from all the activities.

All households are involved in crop agriculture, characterised by a constant returns-to-scale crop production function f(.) with land and labour as the only production factors[18], each subject to decreasing marginal returns. Agriculture is risky and both factors are assumed to be essential in production, so that at very low levels of labour input the marginal returns to labour are very high. We call p.f(.) the net revenue function from this activity. The household also has access to another activity where labour is the only input. This is the off-farm activity with low entry-constraints but relatively low returns and non-increasing returns to scale: activities such as casual off-farm labour or collecting firewood from common property resources. The net returns to this activity are denoted by w(A). The household decides the amounts of land and labour allocated to each activity. Given the assumptions, the first-order conditions for this programming problem allows very little diversification of income. First, since land can only be used in crop production, the high expected marginal returns to labour at low labour input will imply that it will always pay to cultivate the land with some labour, under reasonable assumptions of risk aversion and risk in agricultural income. A household need not take up any off-farm activity given the assumption that it offers low returns: if the marginal utility of allocating all labour to agriculture is larger than the marginal utility of off-farm work the household will not work off the farm. In general, this means we can write the relationship between the expected marginal utilities of both activities at the optimum as:

$$(1) \qquad E[U'(y).(\frac{\partial w}{\partial A})] \leq E[U'(y).(\frac{p.\partial f}{\partial A})]$$

in which U'(y) denotes the marginal utility of total income. Risk may be a factor in determining entry into either activity, and usually one would consider off-farm activities less risky than crop production, so a risk-averse household would sooner take up off-farm work

[18] Cattle are excluded as a factor in the crop production but they can be easily included (see Dercon, 1995, for an example).

relative to a less risk-averse household. This does not imply, however, that such households will have lower per-capita incomes but merely expresses the conditions for an optimal allocation of the marginal unit of labour. Ceteris paribus, it will be expected that households with higher labour to land endowments will be more likely to take up off-farm activities.

We now suppose that there is an alternative activity with high returns but high entry constraints, such as a minimum level of capital input for investment or a specific skill, denoted by S. Households who have access to the fixed input, S, can allocate labour to the activity and earn a return according to the revenue function g(A | S). Assume that marginal returns are declining with increasing labour, A[19]. This activity can be thought of as livestock rearing (using common property grazing land) or off-farm activities requiring skills or capital[20]. Households who have access to S are likely to allocate their labour to this activity as well as to cropping. Some households may still find it profitable to allocate labour to off-farm activities as well, especially if they have substantial amounts of labour at their disposal. Consequently, the first order optimal conditions for labour allocation will equalize the marginal utility of allocating labour to crops, the high return non-cropping activity and perhaps, low-return off-farm activities as well. The conditions expressing this notion are:

$$(2) \qquad E[U'(y) \cdot (\frac{\partial w}{\partial A})] \leq E[U'(y) \cdot (\frac{p.\partial f}{\partial A})] = E[U'(y) \cdot (\frac{\partial g}{\partial A})]$$

Rural households are observed to have a portfolio consisting of two or three activities. Risk aversion might well be a reason for entering low-return off-farm activities. However, the main factor driving the differences in marginal utilities across households is differential access to the high-return non-cropping activity. Indeed, one would expect that households with this activity in their portfolio will have higher marginal returns to their labour and higher incomes overall.

In particular, the model suggests that access to activities with entry constraints will result in income (and other welfare) outcomes which are significantly higher than for households without access to these activities. The inclusion of off-farm activities with low entry constraints in the portfolio may offer insurance against risky outcomes, but it is just as likely to reflect a re-allocation of labour endowments given land endowments. In terms of outcomes, these off-farm activities are unlikely to cause substantial outcome differences compared to households not involved in these activities.

To test this, households are divided in five groups: (1) households only involved in cropping, *the pure cultivators*, (2) households involved in cropping and off-farm activities with low entry constraints as well, *the cultivator-collectors*, (3) households involved in off-farm activities with

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[19] For example, it does not pay to allocate increasing amounts of labour to the same herd size.

[20] We do not try to model the underlying dynamics of capital accumulation. For an attempt, see Dercon (1995).

high entry constraints, *the cultivator-craftsmen* (4) households involved in cattle-rearing as well as off-farm activities without entry constraints and cropping, *the mixed-farmer-collectors*, and (5) households involved in cattle-rearing and cropping but without any earnings from off-farm activities, *the mixed-farmers*[21]. We examine the income, consumption and asset holdings per capita (as indicators of welfare outcomes) and ask whether there are significant differences across these groups. We expect that groups 1 and 2 will be very different from the other three groups if holdings of livestock drives differentiation.

5. Empirical Analysis

The data for each country were divided in the five groups as described above and table 6 presents the mean per capita incomes, per capita consumption per month[22] and per capita asset holdings (including livestock).

Table 6: Outcomes per Group in Ethiopia and Tanzania

	Ethiopia (amounts in Bir)					Tanzania (amounts in '00 T.Shillings)				
Mean outcomes by group**	1	2	3	4	5	1	2	3	4	5
income per capita per year	48	74	163	182	137	33	151	139	194	536
consumption per capita per month	16	13	23	21	19	9	12	13	14	24
assets per capita	7	6	22	23	29	5	6	80	373	704
number of observations	131	101	18	121	44	9	25	10	22	13

**Group (1): pure cultivators, group (2): cultivator-collectors, group (3): cultivator-craftsmen, group (4): mixed-farmer-collectors, and group (5) : mixed-farmers.

Source: calculated from survey data.

These figures suggest that groups 4 and 5, the *mixed-farmers*, are better-off relative to groups 1 and 2, the *cultivator-collectors*, in both countries: owning cattle clearly increases household welfare measured in terms of consumption, income and assets. Group 3, the households with activities which require specialised skills, seem to be similar to the cattle-owners or mixed-farmers in Ethiopia but not in Tanzania. T-tests on group means using a pooled variance estimate were performed on each group to test whether the observed differences are

[21] Group (3) includes also some households involved in off-farm activities with apparent entry constraints who also own some cattle. This group includes specific trades, handicrafts, shop keepers, etc. as discussed in the previous section. Some of the inclusions and exclusions of activities may seem arbitrary, but limited information is available to accurately assess this group. Nevertheless, the group is quite small and this does not undermine the general analysis in the paper.

[22] For Ethiopia, the consumption figures refer to per capita food consumption only, since no complete non-food consumption data were available for some households in the sample. Asset holdings include livestock holdings, farm assets and non-farm assets (including durables). In the Tanzanian data set the latter seem to be incomplete.

significant[23]. The results confirm that the means for the first two groups are significantly lower than the mean outcomes of the other three groups. In particular, groups 3, 4 and 5 combined together have significantly better outcomes as compared to groups 1 and 2. In sum, households involved in activities with entry constraints, whether cattle rearing or particular off-farm activities, have higher consumption, incomes and assets than households who are only involved in cropping and activities with low entry constraints. Note that incomes per capita seem different across groups 1 and 2, but this may a measurement problem rather than a true reflection of long-run differences since no evidence could be found of different consumption or asset positions.

As equations (1) and (2) suggest, the choice of income portfolio is dictated by differences in household characteristics and endowments. To investigate this further, we estimate a multinominal logit model of the likelihood of holding one of the five possible income portfolios. The independent variables include households characteristics (the number of male adults, the number of female adults and the number of children between 5 and 15 years of age) and land owned by the household. The labour supply characteristics available for Ethiopia were limited: for example, no age or education variables were available to qualify the quality of the labour supplied. In the Tanzanian data set these data were available, but they proved insignificant as an explanatory variable in these regressions so they are not reported[24].

Furthermore, the marginal returns households can obtain from their labour and land endowments will differ by area. As was discussed in section 2, the areas involved have different characteristics, in terms of agricultural potential, access to trade routes and demand centres, common property resources, output prices, etc. To capture this in the logit regression, we include fixed-effects for area. The coefficients represent the log-odds ratios and can be interpreted as the relative odds of holding a particular portfolio relative to being in group 1 which measures income from cropping alone. The results of the regression are available in the appendix.

The fixed effects of area are significant for all the groups[25] and allow a clear interpretation. For instance, households in the Garagodo (in the Kembata region of Ethiopia) are more likely to be involved in off-farm work than households with similar characteristics in other areas. The density of population in this area is high suggesting that the marginal product of labour in cropping in this area is low and therefore household members are more likely to enter other activities. Furthermore, migration links with the city are traditionally very strong here suggesting that entry into off-farm work is relatively easy. The more remote, low-fertile area of Domaa is associated with negative fixed effects in group 4 and likewise for Korodegaga in group 5; again, in these areas, households with characteristics similar to those in wealthier Debar Berhan for instance, are less likely to be able to acquire cattle or engage in specialised

[23] Tests on the Tanzanian data are problematic given the very small sample size in each group.

[24] The limited explanatory power of the variables measuring education is not surprising given the very low levels of education reported in the survey area.

[25] Estimates of fixed effects for the third group (those in specialised activities in addition to cropping) proved difficult since the observations were concentrated in particular sites in the Ethiopian data.

activities.

Fixed effects are not our main interest, however. The simple model suggested that an important reason for entry into off-farm activities with low entry constraints may be to reallocate labour to equalize marginal returns in a situation of fixed land allocation. The results for Ethiopia support this explanation; a male-headed household, or households with more children is associated with higher odds of being a *cultivator-collector* relative to being a *pure cultivator*. Children may well have a comparative advantage in collection of firewood and dungcakes relative to farm work.

Allocation to the third group, the *cultivator-craftsmen*, (i.e., to the group involved in specific off-farm activities with entry constraints), is linked to a higher number of female adults in Tanzania. In some activities, such as handicrafts and weaving, women may well have a comparative advantage. Nevertheless, since the reason for the entry constraints may be as diverse as (unmeasured) ability or capital constraints, this effect cannot be interpreted unambiguously. Similar results are obtained in Ethiopia; however, the small number of observations makes this even less reliable.

The most striking result is that, apart from fixed effects of area, higher farm size and family size are associated with a higher likelihood of being *mixed-farmers* or *mixed-farmer-collectors* relative to being *pure cultivators*.

Table 7: Testing Pooling Restrictions in Logit Regressions (Chi-squared tests)

	Ethiopia		Tanzania
	including fixed effects (13 restrictions)	excluding fixed effects (7 restrictions)	all coefficients (8 restrictions, including constant)
group 2 = group 1	41.94 **	16.14 *	6.52
group 4 = group 1	54.84 **	9.43 + +	13.82 +
group 5 = group 1	44.45 **	14.80 *	10.76 + +
group 5 = group 4	52.36 **	7.70	7.14
group 4 = group 2	51.50 **	11.97 +	15.77 *
group 5 = group 2	39.80 **	15.28 *	14.74 +
pooling rejected at:	** :1% , * : 5%, + : 10%, ++: 15 %		

Given the similarity in outcomes for groups 4 and 5 relative to groups 1 and 2, it is natural to ask whether these pairs can be pooled[26] on the basis of their characteristics. Table 7 demonstrates the results of the tests[27]. Clearly, the significance of the fixed effects in Ethiopia do not allow pooling of any of the groups as a whole: differences in the wealth and income earning possibilities in agriculture and off-farm activities across the areas are responsible for at least part of the differences in income portfolios of households. However, the tests point to strong similarities in the effects of household characteristics in particular groups, allowing us to impose cross-equation restrictions on the estimations. In both Tanzania and Ethiopia, the cattle-owning households (groups 4 and 5) are similar and significantly different from groups 1 and 2. For example, it is not possible to pool all households involved in agriculture alone (i.e. cropping and cattle-rearing) into a single group driven by the same characteristics. In fact, the only groups that can be pooled on the basis of their characteristics in both countries are groups 4 and 5, the *mixed-farmers and mixed-farmer-collectors*: the households that own cattle. These two groups are also very similar in outcomes. Therefore, the involvement of households in group 4 in off-farm activities (with low entry constraints) is not a clear differentiating factor - in fact these households look virtually identical in land and labour characteristics to households who own cattle but who are not involved in these activities. In Tanzania, groups 1 and 2 are also indistinguishable: there are no significant

[26] The test for pooling is based on Cramer and Ridder (1991] and determines whether the groups can be treated as the same by checking if the coefficients on the independent variables obtained from the estimation of the multinomial logit are identical; in short, the test checks whether there is a basis for distinguishing between groups based on their endowments and characteristics.

[27] Group (3) is excluded from these tests, since in neither country could it be distinguished from any of the other groups, reflecting the inaccuracy of the estimates as well as the theoretical point that many of the entry constraints relevant for these activities are not measured by the simple labour and land characteristics used.

differences in household characteristics between them[28].

These test results are exploited by re-estimating the model with cross-equation restrictions as suggested above to improve the efficiency of the estimates. In the Tanzanian sample this means pooling groups 1 and 2 (*the cultivators-collectors*) and groups 4 and 5 (*the mixed-farmers-collectors*). In the Ethiopian case, the groups could not be thus pooled since fixed effects differ; however, the coefficients on the land and labour endowments and household characteristics for groups 4 and 5 (*the mixed-farmers-collectors*) were treated as identical.

The results are very similar for both countries and consistent with the interpretation that households with a high income earning capacity are more likely to be able to take up cattle-rearing, controlling for fixed effects for different areas. Households with more male adult labour and larger farm size are more likely to be found in cattle-rearing in both Tanzania and Ethiopia. Since cattle are not grazed on private land and since the returns to labour in cattle-rearing do not appear to be higher for male labour, comparative advantage is not a plausible explanation. Similarly, larger farm size and more male labour cannot make a household more vulnerable to risk; diversification into cattle-rearing by such households is not likely to be a risk-reducing measure. Such households are able to exploit their ability to earn higher incomes and makes it easier for them to accumulate surpluses and invest such surpluses in high-return assets such as cattle.

The coefficient on children is positive and significant for households with cattle in both countries but it is considerably smaller than that for male adults, which is likely to reflect the smaller marginal returns to labour generated by child labour. In Tanzania we also observe a contribution by the number of female adults, but again the coefficient is lower for female adults than for male adults[29].

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[28] The point that off-farm activities do not distinguish the different income portfolio's of households is further illustrated by the fact that group (2) and group (4) - i.e. the groups that have taken up off-farm activities cannot be pooled. Furthermore, they differ enormously in their consumption, incomes and assets, particularly in Ethiopia.

[29] In Ethiopia we also observe a positive effect of the sex of the household head. One possibility is that discrimination means that male -headed households have access to better returns to activities, such as better prices for crops or off-farm activities. Alternatively, female headed households might spend more on consumption of the household members. This implies a higher rate of time preference which would reduce the surpluses for investment into cattle and therefore reduces the probability that a female-headed household would own cattle, ceteris paribus.

Table 8: Restricted Logit Regressions - Ethiopia and Tanzania

	Ethiopia: results from logit regressions with coefficients of group (4) set equal to group (5) coefficients; results relative to group (1)				Tanzania: combined group (4) and (5) relative to base group (1) and (2)		
	coefficient	t-value group 4		t-value group 5	coefficient	t-value	
Male headed	1.11	1.94	*	0.92	0.16	0.13	
No. male adults	0.72	2.38	*	1.23	1.71	1.69	+
No. male adults^2					-0.28	-1.46	
No. female adults	0.03	0.14		0.06	1.28	2.44	*
Farm size in ha	2.52	3.55	**	1.66	+	1.47	3.08	**
Farm size^2	-1.08	-3.81	**	-1.64	+	-0.09	-2.99	**
Children 5-15	0.26	2.84	**	1.71	+	0.53	2.26	*

+ = significant at 10%, * = significant at 5%, ** = significant at 1%

Remark: The estimates for the fixed effects are not reported for Ethiopia. Since no restriction was imposed on them (conform with the test results), they remain unchanged.

6. Conclusions

Peasant households derive income from various sources. Using data on rural households from Ethiopia and Tanzania, we focused on three broad groups: cropping, livestock rearing and off-farm activities. There are good reasons in the theory to believe that risk is a very important reason for diversifying income sources to include non-cropping activities. Nevertheless, in this paper we have argued that other explanations may be more important in explaining observed portfolios of incomes for rural households. The sample consists of areas in which mixed farming (combining cropping with livestock-rearing) has a long tradition. However, households hold very different portfolios of incomes and these in turn are associated with different levels of consumption, income and asset holdings.

Some part of the explanation lies in the differences in environment across the villages. However, they cannot serve to explain why households within a village derive their income from different sources. We suggested that constraints on entering activities is one of the main explanations; certain activities have very low entry constraints but others have high entry constraints, in the form of special skills or capital needs. Cattle-rearing and a small group of observed off-farm activities are likely to have such entry constraints, the former in the form of important investment needs which need to be financed from own savings since credit markets are incomplete. We found that having access to substantial livestock income results in significantly higher income and consumption outcomes in both countries, while off-farm

activities with low-entry constraints seem not to contribute to a higher mean consumption and assets. Furthermore, we found that a higher income-earning capacity, due to more male labour and a larger farm size, allows households to take up this high-return activity. The regression results demonstrate that comparative advantage or risk cannot explain the propensity of particular households to take up cattle-rearing. However, comparative advantage does explain entry into low-return off-farm activities such as firewood collection. It should be emphasized that the fact that households are involved in low-return activities like collection of firewood is not an indication of poverty; for instance, wealthier, cattle-owning households are also likely to use some of their labour in these activities if it pays them to do so.

In sum, the fact that rural households derive their income from various sources cannot be ascribed merely to the goal of trading higher returns for lower risk in incomes as is often assumed in the literature on coping strategies. Households possess very different advantages for particular types of activities which in turn induces them to take up such work; equally they might face entry constraints that prevent them from taking up lucrative opportunities. Both Ethiopian and Tanzanian households face very risky environments and no doubt risk management strategies explain some of their behaviour but not as much as is generally supposed.

Appendix 1: Logit Regression on Income Portfolios in Ethiopia and Tanzania

	Ethiopia			Tanzania		
	coefficient	t-value		coefficient	t-value	
group 2 vs group 1						
Constant	0.59	1.07		1.33	0.81	
Male headed	1.21	2.18	*	0.79	0.59	
No. male adults	-0.49	-0.70		-1.90	-0.88	
No.male adults^2	0.09	0.46		0.62	0.83	
No. female adults	0.06	0.36		0.30	0.49	
Farm size in ha	-0.41	-0.70		-0.09	-0.19	
Farm size^2	0.02	0.10		0.01	0.26	
Children 5-15 years	0.17	2.07	*	-0.10	-0.33	
Dinki	1.10	1.37				
Debre Berhan	0.45	0.38				
Korodegaga	-0.78	-1.58				
Garagodo	1.87	2.90	**			
Domaa	0.15	0.28				
group 3 vs group 1						
Constant	-16.62	-0.02		-4.29	-1.81	+
Male headed	0.60	0.41		2.04	1.11	
No. male adults	-2.31	-1.08		-0.98	-0.36	
No.male adults^2	0.43	0.65		0.25	0.28	
No. female adults	0.73	1.37		1.44	2.15	*
Farm size in ha	2.88	1.04		0.50	0.80	
Farm size^2	-2.36	-1.30		-0.03	-0.61	
Children 5-15	0.12	0.77		0.10	0.29	
Dinki	18.42	0.02				
Debre Berhan	17.81	0.02				
Korodegaga	-0.98	-0.00				
Garagodo	14.93	0.01				
Domaa	-1.14	-0.00				
group 4 vs group 1						
Constant	-0.27	-0..45		-8.53	-2.84	**
Male headed	0.53	0.91		-0.48	-0.27	
No. male adults	-0.24	-0.33		-0.82	-0.34	
No.male adults^2	0.12	0.58		0.48	0.62	
No. female adults	-0.25	-0.11		1.67	2.31	**
Farm size in ha	-0.08	-0.14		2.23	2.71	**
Farm size^2	0.18	0.88		-0.15	-2.25	*
Children 5-15	0.19	2.19	*	0.42	1.17	
Dinki	1.31	1.77	+			
Debre Berhan	3.27	3.30	**			
Korodegaga	-0.34	-0.74				
Garagodo	0.86	1.25				
Domaa	-3.62	-3.91	**			
group 5 vs group 1						
Constant	-2.16	-2.17	*	-5.22	-2.18	*
Male headed	0.77	0.85		1.12	0.71	
No. male adults	-0.14	-0.14		0.69	0.29	
No.male adults^2	0.22	0.89		0.15	0.19	
No. female adults	0.06	0.18		1.01	1.58	
Farm size in ha	2.62	1.99	*	0.70	1.28	
Farm size^2	-1.12	-1.66	+	-0.04	-0.87	
Children 5-15	0.27	2.34	*	0.31	0.32	
Dinki	2.68	3.29	**			
Debre Berhan	1.48	1.11				
Korodegaga	-2.16	-2.57	**			
Garagodo	0.18	0.19				
Domaa	-18.311	-0.01				
Joint Significance	$\chi^2(48)$	364.5	**	$\chi^2(48)$	51.7	**

** = significant at 5% * = significant at 1% + = significant at 10%

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